

Two New Species of a New Genus *Devetakia* gen. n. (Gastropoda: Hydrobiidae) from the Caves of Devetashko Plateau, North Bulgaria

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Abstract: Two unknown hydrobiid species are described here as new. We compared these species with all known ones from Bulgaria and surrounding countries and found that both species, *Devetakia krushunica* sp. n. and *Devetakia pandurskii* sp. n., belong to a new genus group, *Devetakia* gen. n.

Key words: Northern Bulgaria, Hydrobiidae, *Devetakia* genus n., *Devetakia krushunica* sp. n., *Devetakia pandurskii* sp. n.

Introduction

The family Hydrobiidae (Gastropoda: Risooidea) is one of the most numerous and taxonomically diverse mollusk families (ARCONADA & RAMOS 2003). They originated in Laurasia during the transition period between Carboniferous and Permian, as much as around 280 million years ago (KNIGHT *et al.* 1960). The family consists of about 400 recent and fossil genera (KABAT & HERSHLER 1993), and has more than 1000 described living species (BOSS 1971). The majority of European Hydrobiids have a circum-Mediterranean distribution, which encompasses three regions: Balkans, Apennine, and Iberian Peninsulas (ANGELOV, 2000; ARCONADA & RAMOS 2003). These areas could be considered as evolutionary centres especially for some stygobiont species (DAVIS 1982; RADOMAN 1983). For example, from Bulgaria there were three endemic genera described: *Insignia* ANGELOV 1972, *Pontobelgrandiella* RADOMAN 1978 and *Cavernisa* Radoman 1978 (ANGELOV 1972, 2000). The natural habitats of the species of this family are inland water

basins that are well oxygenated and have a constant, moderate flow. Stygobiont species make up almost all the mollusk fauna associated with subterranean continental waters (BOLE & VELKOVRH 1986).

The shell shape of Hydrobiids is often used as the primary means of characterising species and genera, and is also occasionally even used to diagnose some higher taxa (HERSHLER & PONDER 1984). That is sometimes the only way to describe such stygobiotic snail species, because there is not any possibility for the scientists to reach living populations in the underground and study the soft body of the gastropods. As an example for Bulgaria, there are the species *Paladilhiopsis bureschi* WAGNER 1927, *Belgrandiella hessei* WAGNER 1927, *B. bureschi* ANGELOV 1976, *B. pussila* ANGELOV 1959, and *Iglica acicularis* ANGELOV 1959, which were registered only due to empty shells found in the rivers' deposits emerging from the caves (WAGNER 1927; ANGELOV 1959, 1976, 2000). The new genus *Insignia* with the species *I. macrostoma* ANGELOV 1972 was also

described only by means of finds of empty shells. Many gastropods from other countries which live in caves and underground waters were also described in the same way (DE MATTIA 2007).

Bulgarian cave malacofauna is still insufficiently studied though the traditions of Bulgarian biospeleology are dating back to from 1922 (BERON *et al.* 2009) and the family Hydrobiidae evidently has a hot spot of species radiation in this country (ANGELOV 2000; GLÖER & GEORGIEV 2009). In this paper we describe two new species from a new genus collected in three caves of Devetashko Plateau, a karstic area in North Bulgaria.

Material and Methods

Investigations of caves of Devetashko Plateau (North Bulgaria, Lovech town area) were made on 31.10.2009 and 01.11.2009. The small Hydrobiid snails were searched in the caves by sieving the bottom substrate (sand, clay and bat guano) or by observing the surface of stones in the river.

The shell morphology was studied in the laboratory under a binocular microscope considering the criteria of RADOMAN (1983), and HERSHLER & PONDER (1984).

The type material is stored in the Zoological Museum of Hamburg (ZMH), Germany.

Results

After our examination of the material and the literature concerning the Hydrobiidae of Europe and Asia Minor (BOETERS 1970, 1987, 1998; BODON *et al.* 1992; GIUSTI 1979; GIUSTI & PEZZOLI 1980; GIUSTI & BODON 1983; KABAT & HERSHLER 1993; RADOMAN 1976, 1983; SCHÜTT 1972; ARCONADA & RAMOS 2003), we found that the empty shells of these specimens belonging to an unknown Hydrobiid genus, which were collected from river deposits of three caves on Devetashko Plateau: Devetashka cave and the connected Urushka Maara and Vodopada caves.

Class Gastropoda CUVIER 1795

Subclass Orthogastropoda PONDER & LINDBERG 1995

Order Neotaenioglossa HALLER 1892

Family Hydrobiidae TROSCHEL 1857

Genus *Devetakia* gen. nov.

Type species *Devetakia krushunica* sp. nov.

Differential diagnosis: The shells of collected Hydrobiid snails are most similar to three stygobiotic genera of Hydrobiidae known to live in Europe: *Bythiospeum* BOURGUIGNAT 1882, *Paladilhiopsis* PAVLOVIĆ 1913, and *Iglica* WAGNER 1927, so the analysis of the differentiating features was made according to these taxa.

The new genus *Devetakia* differs from the genus *Iglica* by its more conical and not so elongated shell (regularly conical, sometimes nearly cylindrical, and elongated in *Iglica*) and the more convex and lower number of whorls (4-4.5 compared to more than 5). From *Bythiospeum* and *Paladilhiopsis* it differs by the round shape of the aperture (compared to the pyriform shapes of the genera mentioned), its simple outer lip, not so pointed shell apex and more convex whorls. In most species of these genera also the number of whorls is higher than 5.

Description: The shell is dextral, conical, very small ($H < 2$ mm) with an obtuse apex. The shell surface is shining and has fine irregular growth lines. It has regularly growing convex whorls. The aperture has a regular round shape and a simple outer lip. The umbilicus is open and narrow. Operculum and anatomy are not known.

Etymology: Named after the region where the two new species from the genus were found – Devetashko Plateau karstic area.

Devetakia krushunica sp. nov.

Material examined: 37 spec. from type locality, 31.10.2009, D. Georgiev leg.

Holotype: H = 1.75 mm, D = 0.9 mm, ZMH 79137 (Fig. 1).

Paratypes: 10 spec. ZMH 79138, 26 spec. coll. Glöer, 3 spec. coll. Georgiev (Plovdiv University).

Locus typicus: Vodopada cave near the village of Krushuna, Devetashko Plateau, Pre-Balkan area between Danube River valley and Stara Planina Mountain, North Bulgaria, N 43° 14' 33.2" E 25° 02' 09.2", 239 m alt.

Etymology: Named after the village of Krushuna, in the surroundings of which the two caves where the species was found are situated.

Description: The shell is dextral, conical, with obtuse apex. The shell surface is shining and has fine

irregular growth lines. It has 4 regularly growing convex whorls. The aperture has a regular round shape and a simple outer lip. The umbilicus is open and narrow. Operculum and anatomy are not known.

Diagnosis: *D. krushunica* differs from *D. pandurskii* by its smaller size, regularly round aperture, slimmer shell shape and lower number of whorls.

Distribution: Found as empty shells in the type locality and in the lower possibly connected by underground waters cave Urushka Maara, N 43° 14' 41.7" E 25° 02' 45.4", 191 m alt. According to BERON *et al.* (2009) it was proven that Vodopada cave is connected with the waters of another cave in the same Krushuna area river catchement – Boninska cave (N 43° 14' 25.4" E 25° 02' 53.8", 279 m alt.), where *D. krushunica* can also be expected.

Habitat: Vodopada cave is 1995 m in length, constantly going upwards and its river is forming a large waterfall (vodopad = the waterfall) with many sinter pools. The mean annual flow rate of the river is 100 L/s. The Urushka Maara cave is 1600 m in length, entrance is 10 in width and 4 in height, the cave river is of varying capacity, and is deep, forming a lot of pools which can be investigated only by experienced divers.

Devetakia pandurskii sp. nov.

Material examined: 51 spec from type locality, 01.11.2009, D. Georgiev leg.

Holotype: H = 2.0 mm, D = 1.1 mm, **ZMH 79139** (Fig. 1).

Paratypes: 10 spec. ZMH 79140, 40 spec. coll. Glöer, 20 spec. coll. Georgiev (Plovdiv University).

Locus typicus: Devetashka cave near the village of Devetaki - Devetashko Plateau, Pre-Balkan area between Danube River valley and Stara Planina Mountain, North Bulgaria, N 43° 14' 03.3" E 24° 53' 12.6", 125 m alt.

Etymology: Named after Dr Ivan Pandurski (Institute of Biodiversity and Ecosystem Research, BAS), a speleologist and stygobiologist, an expert on cave Copepoda who found a lot of caves as localities of freshwater gastropods, and independently with D. Georgiev also noticed the cave Hydrobiids in Devetashka cave.

Description: The shell is dextral, conical, with an obtuse apex. The shell surface is shining and has fine irregular growth lines. It has 4.5 regularly growing convex whorls. The aperture has a round to

ovoid shape and a simple outer lip. The umbilicus is open and narrow. Operculum and anatomy are not known.

Diagnosis: *D. pandurskii* differs from *D. krushunica* by its larger size, the round to ovoid aperture with slight upper angle, more protruded and conical shell shape and higher number of whorls.

Distribution: Found as empty shells only in the type locality.

Habitat: The entrance of Devetashka cave is 30x35 m and leading into a huge cavern with an area of 25 000 m². The highest point of the chamber is 51 m. There is a river fed by a total of 14 cave springs emerging from various points in the 2442 m long cave. The river is not very deep but is forming a lot of ponds, and for penetration inside the cave a boat is needed. The water temperature is 9-13 °C (BERON *et al.* 2009).

Discussion

The high endemism of Balkans, Apennine, and Iberian Hydrobiidae is very likely related to former processes of geographic isolation and hydrobiids limited dispersal capacity. Their circum-Mediterranean distribution was considered as a result of successive dispersal, vicariance, speciation and extinction processes that took place during Eocene-Miocene, and species survival on the three peninsulas of Europe as refugees without glaciation during the Pleistocene (ARCONADA & RAMOS, 2003).

According to RADOMAN (1985), when allopatric populations are anatomically similar but conchologically different, they can be defined as allopatric species if the localities of populations are completely spatially isolated. So we consider that *Devetakia krushunica* is distinct from *D. pandurskii* because these two taxa have different shell shapes and were for a very long time isolated from each other, but they are similar enough to believe that both belong to one and the same genus.

The shells of the species of *Devetakia* gen. nov. have some characters, similar to other Hydrobiids, like *Iglica* or *Bythiospeum*, both known from Bulgaria. *Iglica* is much slender than *Devetakia* and has more whorls, and the shells of *Bythiospeum* spp. are more conical than those of *Devetakia* spp.

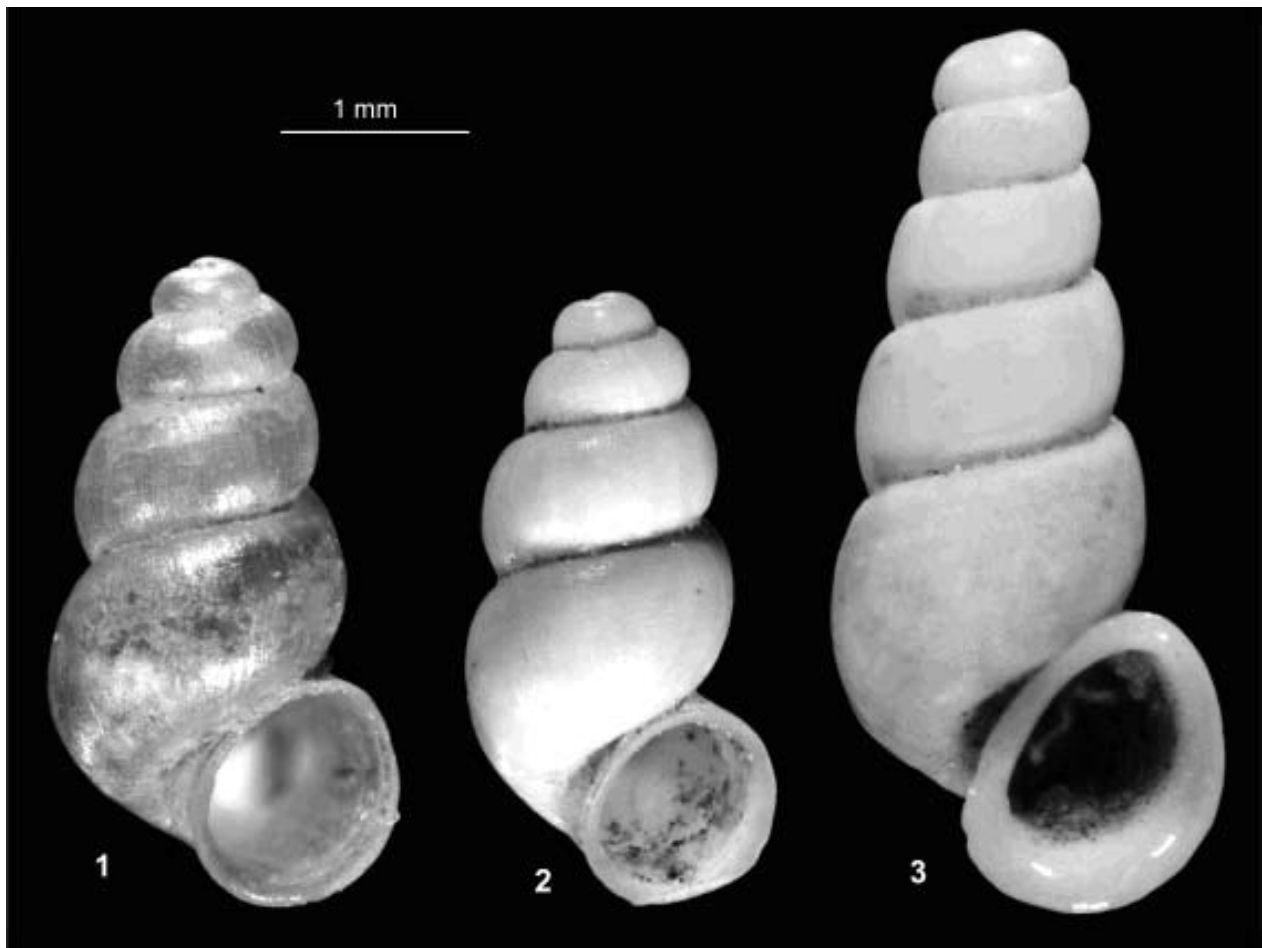


Fig. 1. 1: Shell of the holotypes of *Devetakia pandurskii* sp. n. (Devetashka cave, Bulgaria) – 2: *D. krushunica* (Vodopada cave, Bulgaria) – 3: topotype of *Bythiospeum bureschi* (WAGNER 1927) (Locus typicus: Temnata Dupka cave, Lakatnik). Photo: P. Glöer.

On the other hand most of the other stigobite snail genera known to occur in Bulgaria as *Belgrandiella*, *Pontobelgrandiella*, *Cavernisa*, *Insignia*, and *Bythinella* are all with more cylindrical shells than it, blunt apex and often well developed aperture lip, and the *Hauffenia* has a completely different flat shell (RADOMAN 1983).

The genus *Paladilhiopsis*, mentioned by RADOMAN (1983), and ANGELOV (2000) from the Balkans, is, considering BOETERS (1998: 31), a synonym to *Bythiospeum* BOURGUIGNAT 1882, which is distributed from France and W Germany in the west to the Balkans, Asia Minor, Caucasus and Uzbekistan in the east. The *Bythiospeum* spp. known so far, are also more conical than *Devetakia* spp. described here as new. Because no known genus group could be found to which our new species could belong, we had to describe the new genus *Devetakia* nov. gen.

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