

## **New species of snails (Mollusca: Gastropoda: Risooidea) from cave waters of Bulgaria**

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### **ABSTRACT**

Four new species of freshwater cave gastropods from different genera were described from Bulgaria. One of the species was a representative of an unknown genus. The new species described were: *Balkanica yankovi* sp. n., gen. nov. (Izvora cave, Stara Planina Mnt), *Bythiospeum schniebsae* sp. n. (Izvora cave, Stara Planina Mnt), *Belgrandiella stanimirae* sp. n. (Zmeyova Dupka cave, Stara Planina Mnt) and *Bythinella stoychevae* sp. n. (Manuilova Dupka cave, West Rhodopes Mnt).

**Key words:** cave, freshwater, gastropods, Bulgaria, new species.

Specie të reja kërmijsh (Mollusca: Gastropoda:  
Risooidea) prej ujërave të shpellave të Bullgarisë

### **PËRMBLEDHJE**

Përshkruhen nga Bullgaria katër specie të reja gastropodësh të ujërave të ëmbël të shpellave, të gjinive të ndryshme. Njëra prej specieve është përfaqësuese e një gjinie të panjohur. Speciet e reja të përshkruara janë: *Balkanica yankovi* sp. n., gen. nov. (Izvora cave, M. Stara Planina), *Bythiospeum schniebsae* sp. n. (Shpella Izvora, M. Stara Planina), *Belgrandiella stanimirae* sp. n. (Shpella Zmeyova Dupka, M. Stara Planina) and *Bythinella stoychevae* sp. n. (Shpella Manuilova Dupka, M. Rodope Perëndimore).

### **Introduction**

The family Hydrobiidae (Gastropoda: Risooidea) is one of the most numerous and taxonomically diverse mollusc families (ARCONADA & RAMOS, 2003) and has a hot spot of species radiation on the Balkans, and especially in

Bulgaria (ANGELOV, 2000, GLÖER & GEORGIEV, 2009). The Bulgarian cave malacofauna is still insufficiently studied though the traditions of the Bulgarian biospeleology are dating back to 1922 (BERON et al., 2009), and many species are still remaining undetected. In this paper we describe four new species one of which is a representative of a new genus collected in caves of Stara Planina and Rhodopes Mountains in Bulgaria.

### **Material and methods**

The living snails were collected and preserved in 75% ethanol. The shells were collected by sieving the cave river deposits by 1x1 and 2x2 mm mesh width sieves. The material from the smaller meshed sieve was then brought to the laboratory and dried. After it was again put into water and the floating shells were collected by a strainer and small brush.

The dissections and measurements of the shell were carried out by means of CETI stereo microscope and an eye-piece micrometer considering the criteria of RADOMAN (1983), and HERSHLER & PONDER (1984). 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).

Abbreviations used: N – number of specimens, H - Shell height, W - shell width, AH - aperture height, AW = aperture width, MTD - Museum für Tierkunde Dresden.

### **Results and discussion**

Class Gastropoda CUVIER, 1795

Subclass Orthogastropoda PONDER & LINDBERG, 1995

Order Neotaenioglossa HALLER, 1892

Family Hydrobiidae TROSCHER, 1857

Genus *Balkanica* gen. nov.

Type species *Balkanica yankovi* sp. n.

**Diagnosis:** The shell morphology and the structure of the penis discern the new genera from the rest of the Hydrobiidae species known from Europe and Asia Minor (ANGELOV, 2000; BOETERS, 1970, 1987, 1998; BODON et al., 1992, 2001; GIUSTI, 1979; GIUSTI & PEZZOLI, 1980; GIUSTI & BODON, 1983; GLÖER, 2002; GLÖER & MEIER-BROOK, 2003; KABAT &

HERSHLER, 1993; RADOMAN, 1976, 1983; SCHÜTT, 1972; ARCONADA & RAMOS, 2003).

The shell is ovate-conic with relatively fast growing 3.5 protruded whorls, with fine growth lines, and deep suture. The aperture is oval to pyriform with well developed lip. The body is not pigmented, with translucent mantle, no eyes, relatively long and thin tentacles. The penis is situated relatively far behind the neck, having a broad base, thinner middle part about double longer than the base, and hunchbacked distal part which is regularly tapered. Small glandular field is present on the left side of the penis at the beginning of its thinner part.

**Ethymology:** Named after the mountain where the species lives – Stara Planina (= Balkan Mountain).

***Balkanica yankovi* sp. n.**

**Material examined:** 20 ex. From the type locality, 05.02.2011, D. Georgiev, L. Yankov leg.

**Holotype:** H = 1.29 mm, W = 0.83 mm, AH = 0.59 mm, AW = 0.63 mm, in ethanol, SNSD Moll S3280 (Fig. 1, Tab. 1).

**Paratypes:** 5 ex. in ethanol, SNSD Moll S3281, rest in coll. D. Georgiev.

**Locus typicus:** Izvora (Padaloto, Yantra) cave, near village of Sulari, Gabrovo town district, Stara Planina Mountain, Central Bulgaria, N 42° 57'23.08''E 25°18'52.30''.

**Etymology:** Named after the speleologist and cave rescuer Liubomir Yankov (Speleological Club “Salamander – Stara Zagora”) who lead the author to the Izvora Cave and helped during the collection of the material.

**Description:** Shell: very small (H = 1.3-1.5 mm, W = 0.8-1.1 mm), translucent, ovate-conic (H/W = 0.6-0.8) with relatively fast growing 3.5 protruded whorls, with fine growth lines, and deep suture. The aperture is oval to pyriform with well developed lip, and is about 45% from the shell height. The operculum is brown and relatively soft, oval, circular, spiral, paucispiral, nucleus submarginal.

Soft body: not pigmented, translucent mantle, no eyes, relatively long and thin tentacles.

Penis: situated relatively far behind the neck, with broad base, thinner middle part about double longer than the base, and hunchbacked distal part which is regularly tapered, a small glandular field present on the left side of the penis, at the beginning of its thinner part (Fig. 2).

**Distribution:** Found only at the type locality, possibly a local endemic species.

**Habitat:** The cave is developed in limestone, is horizontal, with two floors, 1400 m in length, and its entrance size is 6x3.5 m. The cave river flows on the lower floor and is an influx of the Yantra River when emerge on the surface. The spring has an average capacity of 50 l/s (BERON et al., 2009). In the cave river deposits studied there were organic materials as small pieces of plants and fish vertebrae, so we suppose that part of the water in the cave comes from surface waters penetrating from somewhere in the cave system.

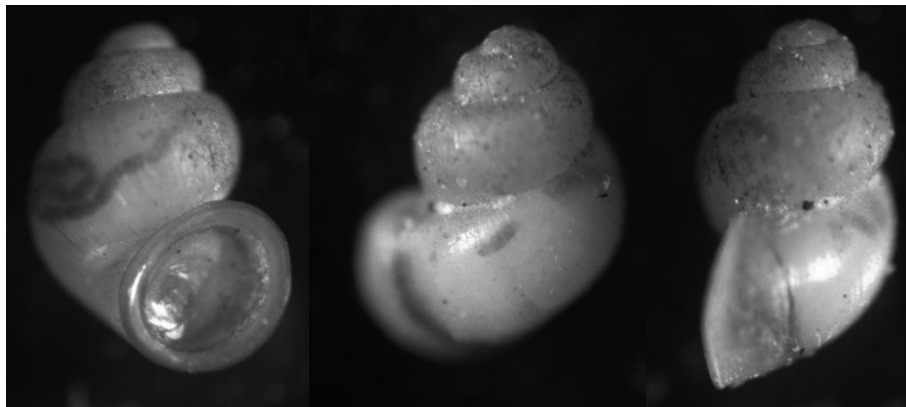
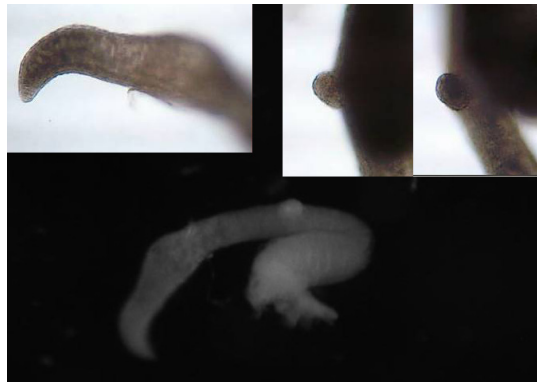


Figure 1. Front, back and side view of the shell of the holotype of *Balkanica yankovi* sp. n., gen. n. from the Izvora Cave.



**Fig. 2.** Penis of *Balkanica yankovi* sp. n., gen. n. from the Izvora Cave. Light microscope pictures of the penis tip (left) and side and up view of the penis glandular field (right) (magnification x40).

№	H	W	AH	AW	W/H	AH/H
1 (holotype)	1.29	0.83	0.59	0.63	0.64	0.46
2	1.55	0.99	0.66	0.73	0.64	0.43
3	1.42	0.86	0.69	0.69	0.60	0.49
4	1.39	0.76	0.53	0.50	0.55	0.38
5	1.49	0.92	0.56	0.69	0.62	0.38
6	1.39	0.89	0.66	0.63	0.64	0.48
7	1.35	1.06	0.69	0.66	0.78	0.51
Average	1.41	0.90	0.63	0.65	0.64	0.45

**Tab. 1.** Shell measurements of *Balkanica yankovi* sp. n., gen. n. from Izvora Cave. Abbreviations were explained in Material and Methods.

**Discussion:** The new genus *Balkanica* discern from the European and Turkish Hydrobiidae with similar shell shapes as *Pseudamnicola*, *Radomaniola*, *Grossuana*, *Sadleriana*, by its more regularly growing whorls, oval aperture, the well developed aperture lip, the smaller shell size, and the lack of eyes. Its penis morphology and position is similar with two endemic species of monotypic Hydrobiid genera: the *Pauluccia minima* (PAULUCCI, 1881) from the Appenine Peninsula (Italy) (GIUSTI & PEZZOLI, 1980) and the *Falsibelgrandiella bunarica* RADOMAN, 1973 (Fig. 3) from Asia Minor (Turkey) (RADOMAN, 1983). These two species occur far away from the type locality of *Balkanica yankovi* sp. n., and have quite different shell shapes (*Pauluccia* – conical shell with a pyriform aperture, *Falsibelgrandiella* nearly cylindrical shell with blunt apex), they also have eyes and inhabit spring waters.



**Fig. 3.** Head and penis morphology of *Falsibelgrandiella bunarica* RADOMAN, 1973 (according RADOMAN, 1983), a species with similar penis morphology with this one of the newly described *Balkanica yankovi* sp. n., gen. n.

**Genus *Bythiospeum* BOURGUIGNAT, 1882**

***Bythiospeum schniebsae* sp. n.**

**Material examined:** 8 specimens: 5 entire adult shells, 1 adult shell with broken apex, 2 juvenile shells, 05.02.2011, D. Georgiev, L. Yankov leg.

**Holotype:** H = 2.21 mm, W = 1.16 mm, AH = 0.76 mm, AW = 0.73 mm, SNSD Moll S3284 (Fig. 4, Tab. 2).

**Paratypes:** 2 ex., SNSD Moll S3285, rest in coll. D. Georgiev.

**Locus typicus:** Izvora (Yantra) cave, near village of Sulari, Gabrovo town district, Stara Planina Mountain, Central Bulgaria, N 42° 57'23.08"E 25°18'52.30".

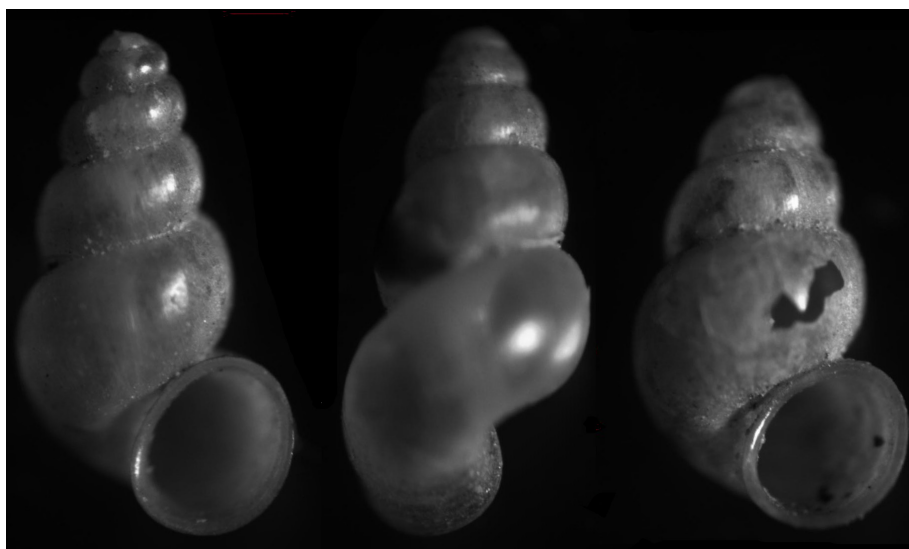
**Etymology:** Named after Katrin Schniebs (Zoological Museum of Dresden, Germany) who contributed so much in studies of the Bulgarian freshwater snails and Succineids as direct investigations of specimens or sending a lot of valuable literature to the author.

**Description:** Shell: The shell is elongate-conic with 4.5-5 regularly to fast growing, rounded whorls, shell surface is shining, and the apex is relatively pointed. The aperture is oval with well developed lip. Shell measurements are: H = 1.8-2.2 mm, W = 1.0-1.2 mm, W/H = 0.5-0.6 (Tab. 2).

**Differential diagnosis:** The new species differs from *Bythiospeum bureschi* (WAGNER, 1927) by its sharp apex (versus blunt in the species discussed), more convex whorls, wider last whorl and respectively more conical shell, and from *Bythiospeum copiosus* (ANGELOV, 1972) by its well developed aperture lip (Fig. 5). *B. schniebsae* sp. n. differs from the species discussed and by its measurements. Its shell is similar in height but is wider compared to this of *B. bureschi* (W = 0.7-0.9 mm) (WAGNER, 1927), and *B. copiosus* (W = 0.90-0.95 mm) (ANGELOV, 1972).

**Distribution:** Found only at the type locality, possibly a local endemic species.

**Habitat:** Same as *Balkanica yankovi* sp. n., gen. n.



**Fig. 4.** *Bythiospeum schniebsae* sp. n. from Izvora Cave: front and back view of the shell of the holotype, front view of the shell of the paratype (specimen №3, see Table 2).

№	H	W	AH	AW	W/H	AH/H
1 (holotype)	2.21	1.16	0.76	0.73	0.52	0.34
2	2.01	0.99	0.66	0.69	0.49	0.33
3	1.98	1.19	0.76	0.76	0.60	0.38
4	1.78	0.99	0.63	0.63	0.56	0.35
5	1.78	0.99	0.63	0.73	0.56	0.35
Average	1.95	1.06	0.69	0.71	0.55	0.35

**Tab. 2.** Shell measurements of all entire adult shells of *Bythiospeum schniebsae* sp. n. from Izvora Cave. Abbreviations were explained in Material and Methods.

**Discussion:** Even it is well known that the representatives of the genus *Bythiospeum* are local endemics and in most cases a given species occurs only in a single cave (GLÖER, 2002) we compared the new species and with those known to live on the Balkans (SCHÜTT, 1970). The shell of the new *B. schniebsae* a little bit resembles by morphology and proportions to some forms of *Bythiospeum robiciana* CLESSIN 1882 from Slovenia which have smaller

aperture and aperture lip but the size of the species discussed is quite larger than the Bulgarian species (H = 3.5 mm, W = 1.5 mm).

**Genus *Belgrandiella* (WAGNER, 1927)**

***Belgrandiella stanimirae* sp. n.**

**Material examined:** 10 specimens from the type locality (8 adults, 2 juveniles), 13.03.2011, Stanimira Deleva leg.

**Holotype:** H = 1.88 mm, W = 0.99 mm, AH = 0.79 mm, AW = 0.83 mm, SNSD Moll S3282 (Fig. 5, Tab. 3).

**Paratypes:** 2 ex., SNSD Moll S3283, rest in coll. D. Georgiev.

**Locus typicus:** Zmeyova Dupka cave, near Tryavna town, Stara Planina Mnt, Bulgaria, N 42° 52' 35.0" E 25° 28' 35.1", 512 m alt.

**Etymology:** Named after the student on biology and speleologist Stanimira Deleva who collected the new species.

**Description:** Shell: The shell is cylindrical, white with well visible, irregular rough growth lines, the operculum is reddish, and the aperture is oval with very thick edge (thickest of all known Bulgarian species from this genus). The shell surface in all specimens collected was rough with irregular ridges and furrows, and looked eroded (Fig. 5). Shell measurements are: H = 1.88-2.08, W = 0.99-1.09, W/H = 0.52-0.58 (Tab. 3).

Soft body: The animal is not pigmented, white-yellowish, but with well visible eyes.

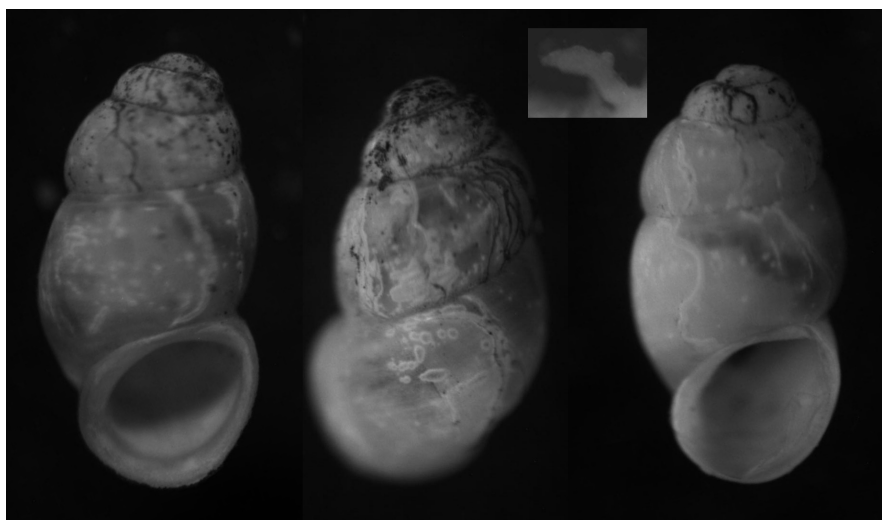
Penis: The penis is regularly broad, with a small appendix at its middle part, and at the end is regularly tapered (Fig. 5).

**Differential diagnosis:** The rough shell surface and the thick, but simple aperture lip discern the new species from all known species from this genus in Bulgaria. The only species known to have a penial appendix is *B. pandurskii* (GEORGIEV, 2011) from the waters of the entrances of Devetashko Plateau caves. From this species *B. stanimirae* discerns by its regularly broad and shorter penis and smaller appendix (versus not regularly broad hunchbacked penis in *B. pandurskii*).

**Distribution:** Known only from the type locality.

**Habitat:** The species was collected on stones in the underground river of Zmeyova Dupka cave. Water temperature is 10.3° C, and air temperature 9.4° C (Boyan Petrov, pers. comm.).





**Fig. 5.** *Belgrandiella stanimirae* sp. n.: shell of the holotype front (left) and back view (in the middle), shell of a paratype (right), and penis (up).

№	H	W	AH	AW	W/H	AH/H
1 (holotype)	1.88	0.99	0.79	0.83	0.53	0.42
2	1.85	0.99	0.79	0.69	0.54	0.43
3	2.08	1.09	0.83	0.79	0.52	0.40
4	1.91	1.09	0.83	0.79	0.57	0.43
5	1.91	1.09	0.86	0.76	0.57	0.45
6	1.82	1.06	0.79	0.79	0.58	0.44
Average	1.91	1.05	0.81	0.78	0.55	0.43

**Tab. 3.** Shell measurements of *Belgrandiella stanimirae* sp. n. from Zmeyova Dupka cave. Abbreviations were explained in Material and Methods.

### **Genus *Bythinella* MOQUIN-TANTON, 1856**

#### ***Bythinella stoychevae* sp. n.**

**Material examined:** 28 specimens: 27 adult, and 1 juvenile, 19.02.2011, Slaveya Stoycheva, Ana Moralieva leg.

**Holotype:** H = 2.01, W = 1.19, AH = 0.89, SNSD Moll S3276.

**Paratypes:** 2 ex., SNSD Moll S3277, rest in coll. D. Georgiev.

**Locus typicus:** Manuilova Dupka cave, near village of Ribnovo, West Rhodopes Mts., Bulgaria, N 41° 42' 53" E 23° 46' 58", 1150 m alt.

**Etymology:** Named after the biologist and caver Slaveya Stoycheva who initiate and collected the new species.

**Description:** Shell: The shell is colorless, cylindrical having fine growth lines, and consists of 3.5-4 whorls. The apex is obtuse (often very flat) and the aperture is ovoid. The operculum is translucent. Shell measurements are: H = 1.85-2.34 mm, W = 1.12-1.32 mm, AH = 0.42-0.48 mm (Tab. 4).

Soft body: mantle is yellow with small spots of pale grey pigment, eyes are well visible, snout, tentacles, head, and foot are not pigmented.

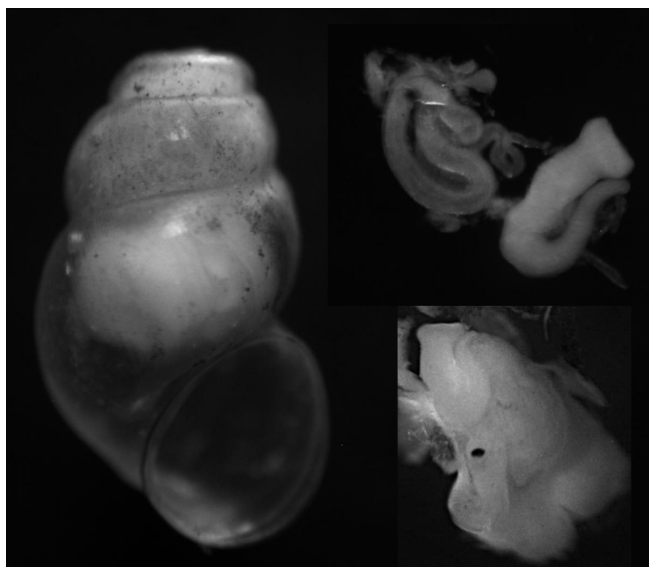
Penis: the penis is not pigmented, and is longer than the tubular accessory gland, at the end tapered, and the flagellum is long and regularly broad (Fig. 6).

**Differential diagnosis:** The new species discerns from the rest of the representatives of Genus *Bythinella* in the Rhodopes by the proportions of the penis according to the tubular gland. No any species previously described from the mountain has penis longer than the tubular gland. From the rest of the stygobite *Bythinella* species from the Rhodopes *B. stoychevae* discern and by its slightly pigmented mantle (versus not pigmented in *B. markovi* GLÖER & GEORGIEV, 2009, and grey with white edge in *B. gloeeri* (GEORGIEV, 2009), and the tapered penis end (versus rounded in the species discussed). Also the head, snout and tentacles are slightly pigmented in *B. gloeeri*, and not pigmented in the new species.

**Distribution:** Known only from the type locality.

**Habitat:** The Manuilova Dupka cave is 2115 m long, situated on 1150 m altitude, and developed in proterozoyan marbles (BERON et al., 2009). The species was collected from stones in the underground river in the cave.

Nº	H	W	AH	W/H	AH/H
1 (holotype)	2.01	1.19	0.89	0.59	0.44
2	2.34	1.32	0.99	0.56	0.42
3	2.15	1.25	0.92	0.58	0.43
4	1.85	1.12	0.89	0.61	0.48



**Fig. 6.** Shell of the holotype of *Bythinella stoychevae* sp. n. (left), penis, tubular gland and part of the flagellum (right, up), and foot, head with penis, and tubular gland (right, down).

5	1.98	1.25	0.89	0.63	0.45
6	2.21	1.22	0.99	0.55	0.45
7	2.05	1.19	0.89	0.55	0.43
Average	2.08	1.22	0.92	0.58	0.44

**Tab. 4.** Shell measurements of *Bythinella stoychevae* sp. n. from manuilova Dupka cave. Abbreviations were explained in Material and Methods.

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