

# The Bulgarian Endemic *Belgrandiella angelovi* Pintér 1968 (Gastropoda: Risooidea): Taxonomical Features, Ecology and Distribution

*Dilian Georgiev*

Department of Ecology and Environmental Conservation, University of Plovdiv, Tzar Assen Str. 24, BG-4000 Plovdiv, Bulgaria;  
E-mail: diliangeorgiev@abv.bg

**Abstract.** New information on the morphology, anatomy, distribution and ecology of the Bulgarian endemic *Belgrandiella angelovi* Pintér 1968 was provided. In addition an identification key for the species of the genus *Belgrandiella* in Bulgaria was proposed as a result of the study.

**Key words:** endemic, aquatic, snail, Bulgaria.

## Introduction

The genus *Belgrandiella* Wagner, 1927, is the second most diverse one from the Risooidea superfamily in Bulgaria, having 10 known species so far (GEORGIEV, 2011a). There are two main ecological groups of species from the genus: stygobiotic (*Belgrandiella hessei* Wagner, 1927, *Belgrandiella pusilla* Angelov, 1959, *Belgrandiella bulgarica* Angelov, 1972, *Belgrandiella bureschi* Angelov, 1976, *Belgrandiella stanimirae* Georgiev, 2011) and spring species (*Belgrandiella angelovi* Pintér, 1968, *Belgrandiella zagoraensis* Glöer & Georgiev, 2009, *Belgrandiella dobrostanica* Glöer & Georgiev, 2009, *Belgrandiella bachkovoensis* Glöer & Georgiev, 2009, *Belgrandiella pandurskii* Georgiev, 2011, the last one is also found in cave waters) (WAGNER, 1927; ANGELOV, 1959, 1972, 1976; GLÖER & GEORGIEV, 2009; GEORGIEV, 2011b, c).

The species *Belgrandiella angelovi* was described by the Hungarian malacologist László Ernő Pintér from a water source at the Shipka pass in Stara Planina Mountains situated approximately in the middle of Bulgaria (PINTÉR, 1968). It was known only from its type locality for more than 40 years,

and no information on its actual distribution, morphology of the soft body and anatomy was available. The only data on its ecology was that it is a spring mountainous species.

In their summary works on the freshwater malacofauna of Bulgaria ANGELOV (2000) and HUBENOV (2005, 2007) categorised *B. angelovi* as a Bulgarian endemic species.

GLÖER & GEORGIEV (2009) provided a short description of its shell comparing *B. angelovi* with some other *Belgrandiella* species which were described by the authors as new in the paper. Also they published a color picture of the paratype (HNHM Budapest No. 11885).

GEORGIEV (2011d) reported of a new locality of this species near the village of Zeleno Darvo, west of Gabrovo town (not far from its type locality). The author published a short note on the penis morphology of the specimens collected, and did not notice any outgrowths on it.

This paper is intended to: (i) – redescribe the species *Belgrandiella angelovi*, (ii) –improve the knowledge on the species' ecology and distribution

in Bulgaria, and (iii) – provide an identification key to the species from this genus in the country.

## Material and Methods

The material was collected by hand and with a small brush from five localities:

1 – 20.09.2009, near village of Zeleno Darvo, west of Gabrovo, two springs in a beech forest, 18 ex., approximate geographic coordinates: N42 48 50.5 E25 17 16.2, altitude: 500-600 m a.s.l.

2 – 02.10.2011, Shipka Pass, water source at the north mountain slope, common hornbeam and beech forest, 23 ex., N42 49 01.9 E25 19 28.3, 489 m a.s.l.

3 – 02.10.2011, south of village of Kупen, steam in a beech forest, 32 ex., N42 49 28.2 E25 09 01.5, 570 m a.s.l.

4 – 02.10.2011, north of village of Stokite, steam in a mixed deciduous forest, 16 ex., N42 53 32.0 E25 04 10.0, 257 m a.s.l.

5 – 15.10.2011, near village of Gradets, Sliven area, wet stones under water source, common hornbeam and oak forest, 18 ex., N42 47 52.6 E26 33 14.8, 272 m a.s.l.

It was preserved in 75% ethanol and brought to the laboratory. The dissections and measurements of the shells were carried out by means of CETI stereo microscope and an eye-piece micrometer; the photographs were made with a camera system with a digital adapter. Five males were dissected and 37 shells measured.

The material is stored in the collection of the author at the Faculty of Biology (University of Plovdiv).

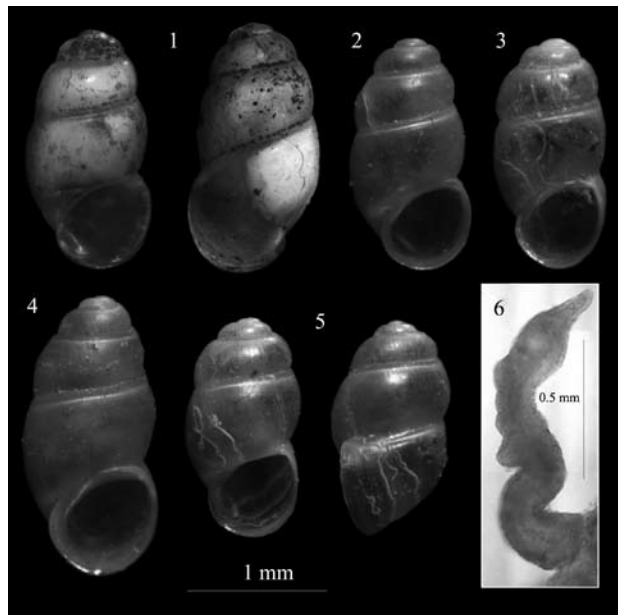
## Results and Discussion

### *Belgrandiella angelovi* Pintér, 1968

*Belgrandiella angelovi* Pintér: PINTÉR (1968); ANGELOV (2000); HUBENOV (2005, 2007); GLÖER & GEORGIEV (2009); GEORGIEV (2011b, d).

#### 1. Description

**Shell.** Morphology (Fig. 1). The shell is small, ovate-cylindrical, cylindrical or cylindrical-conical with fine growth lines, colorless to greenish-yellowish (in some specimens totally covered by dark-brown algae), translucent, and consists of 4-4.5 regularly growing whorls that are slightly rounded to



**Fig. 1.** Shell variations of *Belgrandiella angelovi* and penis morphology: 1 – front and back side of specimen in ethanol from Shipka Pass, 2-5 – dry shells from the locality near the village of Kупen, 6 – penis of a specimen from Shipka Pass.

slightly flattened with a weak suture. The surface is silky. The apex is slim and obtuse, the umbilicus is slit-like. The aperture is ovally broad.

**Morphometry** (Table 1). Shell height = 1,68-2,18 mm (average 1,90 mm); shell width = 0,74-1,19 mm (average 0,99 mm); aperture height = 0,66-0,86 mm (average 0,74); aperture width = 0,66-0,89 mm (average 0,74); last whorl height = 1,25-1,55 mm (average 1,39); shell width/shell height = 0,39-0,59 (average 0,52); aperture height/shell height = 0,33-0,41 (average 0,39); last whorl height/shell height = 0,67-0,80 (average 0,73). The most variable were the shell height (index of variation = 0,0159) and the aperture width (index of variation = 0,0180). The variation index had almost zero values for the proportions aperture height/shell height and last whorl height/shell height. The other morphometric features had almost the same but slightly higher values.

**Operculum.** The chitinous, relatively soft, bending operculum is paucispiral with an excentric nucleus. Its middle part is more intensively reddish-orange colored than the periphery.

**Soft body.** The entire animal is white-yellow but in some specimens there are patches of dark pigmentation on the back side of the mantle. The tentacles are with a rounded apical part and slightly or rather passing over the snout length. The eyes are black and well developed.

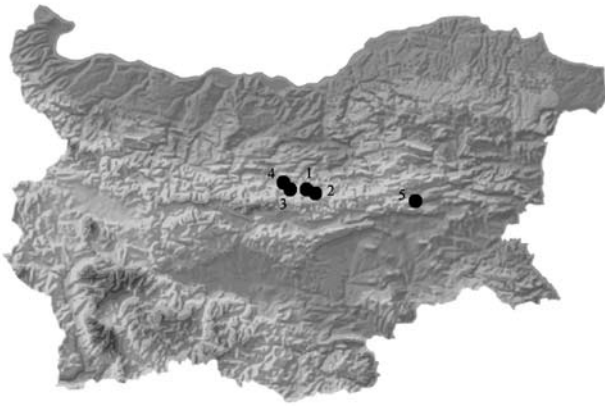
**Table 1.** Results from the shell morphometry of *Belgrandiella angelovi*. Legend: Loc. – locality (numbers correspond to those in Material and Methods), H – shell height, W – shell width, AH – aperture height, AW – aperture width, LH – last whorl height, SD – standard deviation, Var – index of variation.

№	Loc.	H	W	AH	AW	LH	W/H	AH/H	LH/H
1	3	1,68	0,92	0,66	0,73	1,35	0,55	0,39	0,80
2	3	1,82	0,89	0,69	0,69	1,35	0,49	0,38	0,75
3	3	1,85	0,92	0,66	0,73	1,29	0,50	0,36	0,70
4	3	2,18	1,12	0,83	0,89	1,55	0,52	0,38	0,71
5	3	1,82	0,96	0,69	0,76	1,32	0,53	0,38	0,73
6	3	2,01	0,99	0,83	0,79	1,52	0,49	0,41	0,75
7	3	1,95	0,96	0,76	0,79	1,45	0,49	0,39	0,75
8	3	2,01	1,19	0,83	0,83	1,45	0,59	0,41	0,72
9	3	1,88	0,99	0,76	0,79	1,45	0,53	0,40	0,77
10	3	1,72	0,89	0,66	0,66	1,35	0,52	0,38	0,79
11	3	1,72	0,86	0,66	0,69	1,25	0,50	0,38	0,73
12	3	1,98	0,99	0,79	0,76	1,52	0,50	0,40	0,77
13	3	1,72	0,96	0,66	0,74	1,32	0,56	0,38	0,77
14	3	1,78	0,96	0,69	0,73	1,30	0,54	0,39	0,73
15	3	1,83	0,96	0,73	0,74	1,39	0,52	0,40	0,76
16	2	1,98	0,99	0,66	0,78	1,42	0,50	0,33	0,72
17	2	1,91	1,07	0,76	0,79	1,35	0,56	0,40	0,71
18	2	1,91	0,97	0,76	0,81	1,34	0,51	0,40	0,70
19	2	2,10	1,09	0,86	0,86	1,52	0,52	0,41	0,72
20	2	1,75	0,99	0,69	0,73	1,25	0,57	0,40	0,72
21	2	1,75	0,99	0,69	0,69	1,25	0,57	0,40	0,72
22	2	1,88	0,99	0,73	0,73	1,39	0,53	0,39	0,74
23	1	2,16	1,09	0,83	0,86	1,45	0,50	0,38	0,67
24	1	2,01	0,96	0,76	0,76	1,42	0,48	0,38	0,70
25	1	1,95	1,01	0,73	0,74	1,42	0,52	0,37	0,73
26	1	1,91	0,99	0,73	0,73	1,39	0,52	0,38	0,72
27	1	2,08	1,06	0,79	0,79	1,45	0,51	0,38	0,70
28	5	1,82	0,97	0,74	0,74	1,29	0,54	0,41	0,71
29	5	1,85	1,02	0,76	0,76	1,35	0,55	0,41	0,73
30	5	2,01	1,12	0,83	0,79	1,39	0,56	0,41	0,69
31	5	1,77	0,96	0,73	0,73	1,29	0,54	0,41	0,73
32	5	1,88	0,97	0,76	0,74	1,35	0,52	0,40	0,72
33	4	2,01	0,97	0,79	0,74	1,45	0,48	0,39	0,72
34	4	2,01	0,99	0,79	0,79	1,45	0,49	0,39	0,72
35	4	1,91	0,99	0,74	0,76	1,39	0,52	0,39	0,72
36	4	1,95	1,02	0,78	0,73	1,42	0,53	0,40	0,73
37	4	1,88	0,74	0,76	0,00	1,42	0,39	0,40	0,75
<b>Average</b>		1,903	0,987	0,744	0,739	1,387	0,519	0,391	0,730
<b>SD</b>		0,126	0,079	0,056	0,134	0,078	0,034	0,016	0,027
<b>Var</b>		0,0159	0,0062	0,0032	0,0180	0,0062	0,0011	0,0003	0,0008

**Penis.** The penis is long (0,79-0,99 mm), regularly broad (0,066-0,083 mm), its width consists of about 1/12-1/13 of its length. On its middle left side it bears a small single lobe which slightly widens the penis to about 0,1 mm. The penis is sharply tapered at the top, sometimes slightly hunchbacked before the tapering.

## 2. Distribution

**Horizontal distribution.** Endemic for the Central and Eastern Stara Planina Mountain chain. Found at five localities (see chapter “Material and Methods”) in a stretch of about 120 km along it, approximately between Sliven and Apriltsi towns (Fig. 2).



**Fig. 2.** Localities of *Belgrandiella angelovi* (black dots) in Bulgaria, the locality numbers correspond to those used in the Material and Methods.

**Vertical distribution.** The species was registered from 252 to 570 m a.s.l. Its vertical distribution possibly ranges from the upper-most edge of the oak belt, and comprises the beech belt up to its higher parts.

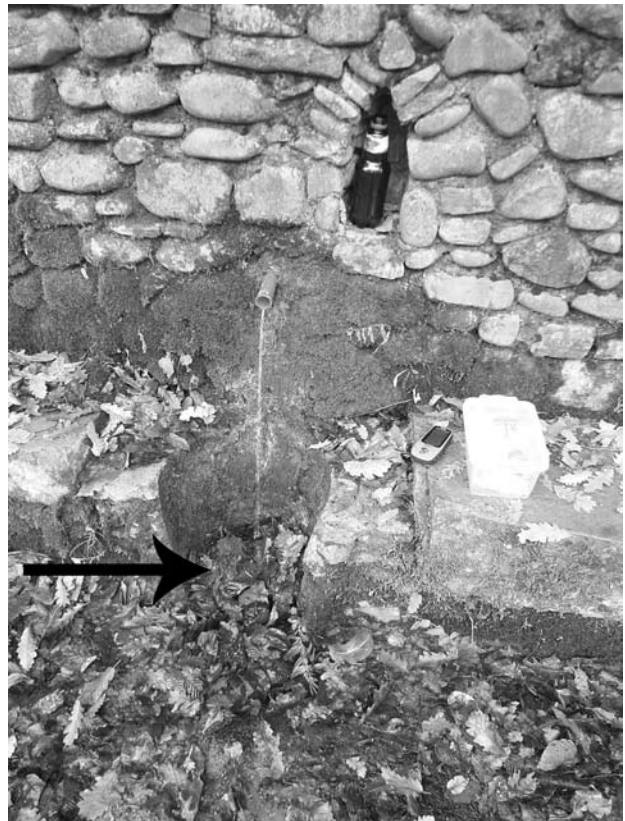
### 3. Ecology and conservation

**Habitat.** Inhabits both oligotrophic and eutrophic streams and springs, rich of detritus (mainly leaf litter), with sandy bottom, on stones, dead leaves and moss in deciduous forests dominated by oak (*Quercus* sp.), common hornbeam (*Carpinus betulus*) and beech (*Fagus sylvatica*). The species was found also in terrestrial habitats around springs – wet moss, stones and leaf litter around springs and water sources (Fig. 3). It is not a strictly calcareous species and can be found on granite rock terrains.

**Associated molluscs.** In some springs *B. angelovi* lives together with *Galba truncatula* (O.F. Müller, 1774).

**Possible ways of dispersion.** Being abundant in some of its localities and inhabiting both aquatic and terrestrial environments, *B. angelovi* could be assumed to have two main ways for invasion of new habitats: passive dispersion by animals (for example song birds, washing their feather coat in the springs), and flood waters during heavy rains in the mountain.

**Threats and conservation needs.** In some of the localities of *B. angelovi* we found a lot of plastic remains, and some water sources were used for washing with detergents by passing people. Also some traces of undetermined oil (possibly car oil or benzene) were observed in the water. Catching of the springs for drinking needs, a very frequent practice



**Fig. 3.** Typical habitat of *Belgrandiella angelovi*, Sliven town area, Stara Planina Mountains, 15.10.2011.

in the mountain areas, could also be a critical factor for the species survival. Being a forest semi aquatic species, the conservation of the woods around the springs and streams can be proposed.

**Conservation status.** Species included in the IUCN Red List – 2011 as Vulnerable (VU) (CUTTELOD et al., 2011).

### Conclusion

On the basis of the knowledge on the anatomy and morphology of *B. angelovi* and the information available on the other species from the genus *Belgrandiella* in Bulgaria (WAGNER, 1927; ANGELOV, 1959, 1972, 1976; GLÖER & GEORGIEV, 2009; GEORGIEV, 2011b, c) the following identification key can be provided:

1. Umbilicus open ..... *B. bulgarica*
- Umbilicus closed or slit-like ..... 2.
2. Aperture lip well developed ..... *B. hessei*
- Aperture lip simple ..... 3.
3. Shell very small, height < 1.4 mm .....
- ..... *B. bureschi*
- Shell height > 1.4 mm..... 4.

- |  |  |  |
|--|--|--|
| 4. The outer margin of the aperture is vertica .....   | - Penis simple .....   | 9.   |
| ..... <i>B. zagoraensis</i>  | 8. Penis with broad base, hunchbacked at its distal part ..... | <i>B. pandurskii</i>   |
| - The outer margin of the aperture is louvered.....  | 5.   | - Penis with narrow base, not hunchbacked at its distal part.....  |
| 5. Shell with rough surface, irregular growth lines, and thick periphery of the aperture ....                                | <i>B. stanimirae</i>   | 9. Shell height $\geq$ 1.9 mm, shell width $\geq$ 1.0 mm, aperture height/shell height $\geq$ 0.40 ..... |
| - Shell with smooth surface, fine growth lines, and thin periphery of the aperture, slightly thickened at the columella..... | 6.   | ..... <i>B. bachkovoensis</i>  |
| 6. Shell height < 1.6 mm.....  | <i>B. pussila</i>  | - Shell height $\leq$ 1.9 mm, shell width $\leq$ 1.0 mm, aperture height/shell height $\leq$ 0.40 .....  |
| - Shell height > 1.6 mm.....   | 7.   | ..... <i>B. dobrostanica</i>   |
| 7. Penis with an outgrowth.....  | 8  |  |

## References

- ANGELOV A. 1959. Neue Gastropoden aus den unterirdischen Gewässern Bulgariens. – *Archiv für Molluskenkunde*, **88** (1/3): 51-54.
- ANGELOV A. 1972. Neue Hydrobiidae aus Höhlengewässern Bulgariens. – *Archiv für Molluskenkunde*, **102** (1/3): 107-112.
- ANGELOV A. 1976. Ein neuer Vertreter der Gattung *Belgrandiella* A. Wagner, 1927 (Gastropoda, Hydrobiidae) von Grundwassern Bulgariens. – *Acta Zoologica Bulgarica*, **4**: 78-80.
- ANGELOV A. 2000. Mollusca (Gastropoda et Bivalvia) aquae dulcis, catalogus Faunae Bulgaicae. Pensoft & Backhuys Publ., Sofia, Leiden, 54 p.
- CUTTELOD A., M. SEDDON M., E. NEUBERT 2011. European Red List of Non-marine Molluscs. IUCN Global Species Programme, IUCN Regional Office for Europe, IUCN Species Survival Commission, 98 p.
- GEORGIEV D. 2011a. Check list of the Bulgarian minor freshwater snails (Gastropoda: Risooidea) with some ecological and zoogeographical notes. – *Zoonotes*, **24**: 1-4.
- GEORGIEV D. 2011b. A New Species of *Belgrandiella* (Wagner 1927) (Mollusca: Gastropoda) from Caves in Northern Bulgaria. – *Acta Zoologica Bulgarica*, **63** (1): 7-10.
- GEORGIEV D. 2011. New species of snails (Mollusca: Gastropoda: Risooidea) from cave waters of Bulgaria. – *Buletin Shkenkor, Ser. Shkenkat Natyrore*, **61**: 83-96.
- GEORGIEV D. 2011d. New localities of four Bulgarian Hydrobiidae species (Gastropoda: Risooidea). – *Zoonotes*, **24**: 1-4.
- GLÖER P., D. GEORGIEV 2009. New Risooidea from Bulgaria (Gastropoda: Risooidea). – *Mollusca*, **27** (2): 123-136.
- HUBENOV Z. 2005. Malacofaunistic diversity of Bulgaria. – In: PETROVA A. (Ed.): Current state of Bulgarian biodiversity – problems and perspectives. Bulgarian Bioplattform, Sofia, 199-246. (In Bulgarian).
- HUBENOV Z. 2007. Fauna and zoogeography of marine, freshwater, and terrestrial mollusks (Mollusca) in Bulgaria. In: FET V., A. POPOV (Eds.): Biogeography and ecology of Bulgaria. Springer, Dordrecht, 141-198.
- PINTÉR L. 1968. Eine neue Wasserschnecke aus Bulgarien. – *Archiv für Molluskenkunde*, **98** (1/2): 61-63.
- WAGNER A. 1927. Studien zur Molluskenfauna der Balkanhalbinsel mit besonderer Berücksichtigung Bulgariens und Thraziens, nebst monographischer Bearbeitung einzelner Gruppen. – *Annales Zoologici Musei Polonici Hist. Nat.*, **6** (4): 263-399.

Received: 07.05.2012  
Accepted: 29.02.2013

