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A new *Bythinella* (Mollusca: Gastropoda: Rissooidea) in the Slovak Republic

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Abstract

The four *Bythinella* species so far reported from Slovakia have been compared with a recently collected unknown species, described herein as new for science. Photos of the holotype and four paratypes in addition to the male copulatory organ are provided. All *Bythinella* spp. from Slovakia are depicted for comparison.

Key words: Slovakia, *Bythinella*, new species, spring.

Introduction

Until 1991 only *Bythinella austriaca* (Frauenfeld 1859) and *Bythinella pannonica* (Frauenfeld 1865) (as *Sadleriana pannonica*) had been reported from Slovakia (Lisický 1991: 225, 226). Čejka et al. (2007: 52) added *B. hungarica* Hazay, 1881 and *B. metarubra* Falniowski, 1987 to the known fauna. Horsák et al. (2013: 45) reduced the inventory by the two latter species because their taxonomic status was not fully resolved. On the other hand Bank & Neubert (2018) accepted both species in their checklist of Fauna Europaea, and both species have been accepted by WoRMS (World Register of Marine species: www.marinespecies.org). While we have a clear evidence of *B. metarubra* from the territory of Slovakia, the presence of *B. hungarica* was not clearly confirmed so far. Two more geographically close *Bythinella* species are reported from Bükk Mountains in Hungary: *B. tornensis* (Frauenfeld, 1856) and *B. thermophila* Glöer, Varga & Mrkvicka, 2015. Karol Brancsík (1898) reported four more *Bythinella* species (*B. solidula*, *B. fuscata*, *B. melanostoma* and *B. longula*), but their taxonomical status is so far not confirmed.

Haase et al. (2007: 1) found cryptic *Bythinella* spp. because there are species which are genetically distinct (*B. angelitae* and *B. opaca*) but can morphologically only be separated by the radular marginal teeth, on the other hand there are distinct species (*B. robiciana* and *B. opaca*) which are morphologically well defined but genetically not. Thus, taxonomy in *Bythinella* has to be based on the integration of morphology, anatomy and genetics (Haase et al. 2007: 1).

We follow Haase et al. (2007) and state if representatives of two populations are different in shell characters or anatomical characters which are constant, they belong to different species.

The aim of this paper is to describe a new *Bythinella* sp. found in Kunova Teplica at the foot of Plešivecká Planina Plateau in Slovenský Kras Mountains.

Materials and methods

Samples were collected from stones and gravel at the bottom of spring rivulet and spring lake by sieving through 3mm metal sieve. The photos were made with a digital camera system (Leica), measurements are made with a Zeiss Microscope with an eye-piece micrometer. The pH, water temperature and conductivity were taken by portable WTW Multi 3510 IDS.

Abbreviations

SMOPaJ	Slovak Museum of Nature Protection and Speleology, Liptovský Mikuláš, Slovakia
SNM	Slovak National Museum, Bratislava
NHMUK	Natural History Museum London, UK
HNHM	Hungarian Natural History Museum, Budapest, Hungary
NHMW	Naturhistorisches Museum Wien, Austria
SMF	Senckenberg Museum, Frankfurt, Germany
NMBE	Naturhistorisches Museum, Bern, Switzerland
FMNH	Field Museum, Chicago, USA
OSUM	Ohio State University Museum of Biological Diversity, Columbus, Ohio, USA
MZUSP	Museu de Zoologia da Universidade de São Paulo, Brazil
MNHN	Muséum National d'Histoire Naturelle, Paris, France
ZMH	Zoologische Museum Hamburg, Germany
ZMB	Zoological Museum, Berlin



Figure 1. The sampling site of *Bythinella steffeki* n. sp. (red dot).

Systematic part

Superfamily: Truncatelloidea Gray, 1840
Family: Bythinellidae Locard, 1893
Genus: *Bythinella* Moquin-Tandon, 1856

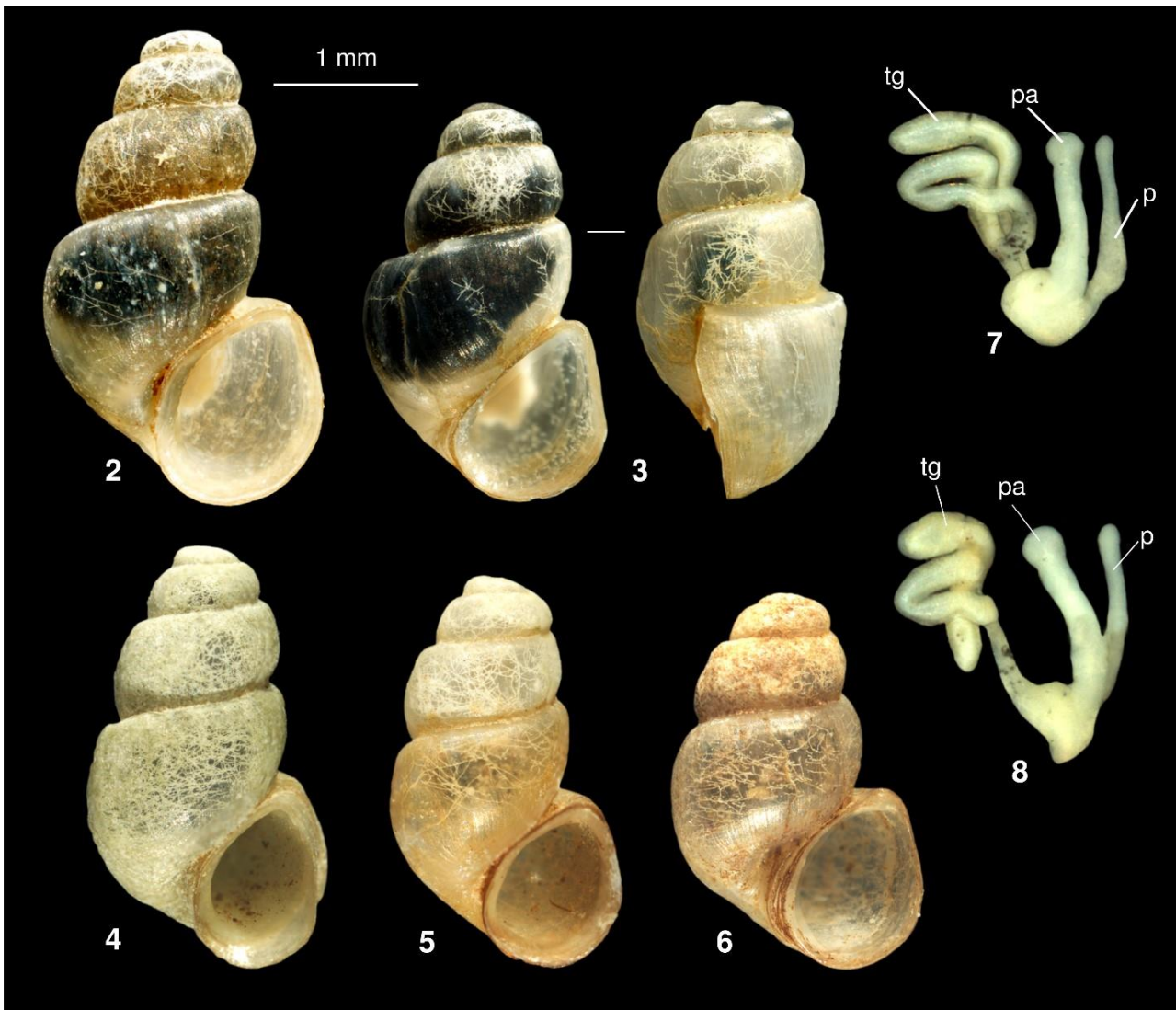
***Bythinella steffeki* n. sp.**
 (Figs. 2-8, 11)

Type locality: Slovensky Kras Mountains, Plešivecká Planina Plateau, Kunova Teplica, Zavodná Vyvieracka spring, inside the SMZ machinery factory. N 48°36.435'; E 20°23.452', 250m alt. (Fig. 1, Fig. 9).

Type material:

Holotype: H 2.8 mm; W 1.7mm; WB 1.1 mm; HA/H 0.47, HB/H 0.28, from type locality: Jozef Grego and Eubomíra Vavrová leg. 03. August 2018: Coll. SMOPaJ 1/2019.

Paratypes: same data, coll. SMOPaJ 2/2019-10 specimens; HNHM-MOL-10438 - 10 specimens, NHMW 111677 - 10 specimens, NMBE 561273 -10 specimens, MZUSP 144822 - 10 specimens, NHMUK 20190539 - 10 specimens, FMNH 344770 - 10 specimens, OSUM 46106 - 10 specimens, SMF 356660 - 10 specimens, coll. Grego 608 wet and 515 dry specimens, coll. Glöer 10 specimens, coll. T. Čejka 10 specimens; type locality, Jozef Grego leg. 30. August 2014, coll. Grego 189 wet and 2 dry specimens; type locality, Zoltán Peter Eröss, Zoltán Fehér and Jozef Grego, leg.10. April 2009: HNHM-MOL-097634 - 20specimens and COI in gen bank MK673142; Type locality, Jozef Grego and Jozef Šteffek leg. 24. August 2006, SNM-SZ10921 - 10 specimens, coll. Grego 47 wet and 1dry specimen.



Figures 2-8. *Bythinella steffeki* n. sp. **2:** holotype, **3-6:** paratypes, **7-8:** penis. Abbreviations: p = penis, pa = penial appendix, tg = tubular gland.

Etymology: Named in honor of untimely deceased renowned Slovak malacologist, ecologist and an ever-helpful friend Prof. Jozef Šteffek from Banská Štiavnica, Slovakia.

Description: Shell: The cylindrical shell is corneous with 4-4.5 whorls which are slightly convex with a deep suture. Anterior to the suture the whorls are somewhat flattened. The aperture is ovate, usually compressed

and angled at its apical insertion. The umbilicus is slit-like to closed. The peristome is sharp, straight or slightly reflexed at the umbilicus. The shell is 2.9-3.4 mm high.

Animal: The animal is dark to light grey pigmented.

Anatomy: The penis and the penial appendix are of the same length; the tubular gland is of medium length, regularly broad and slightly inflated at the distal end.

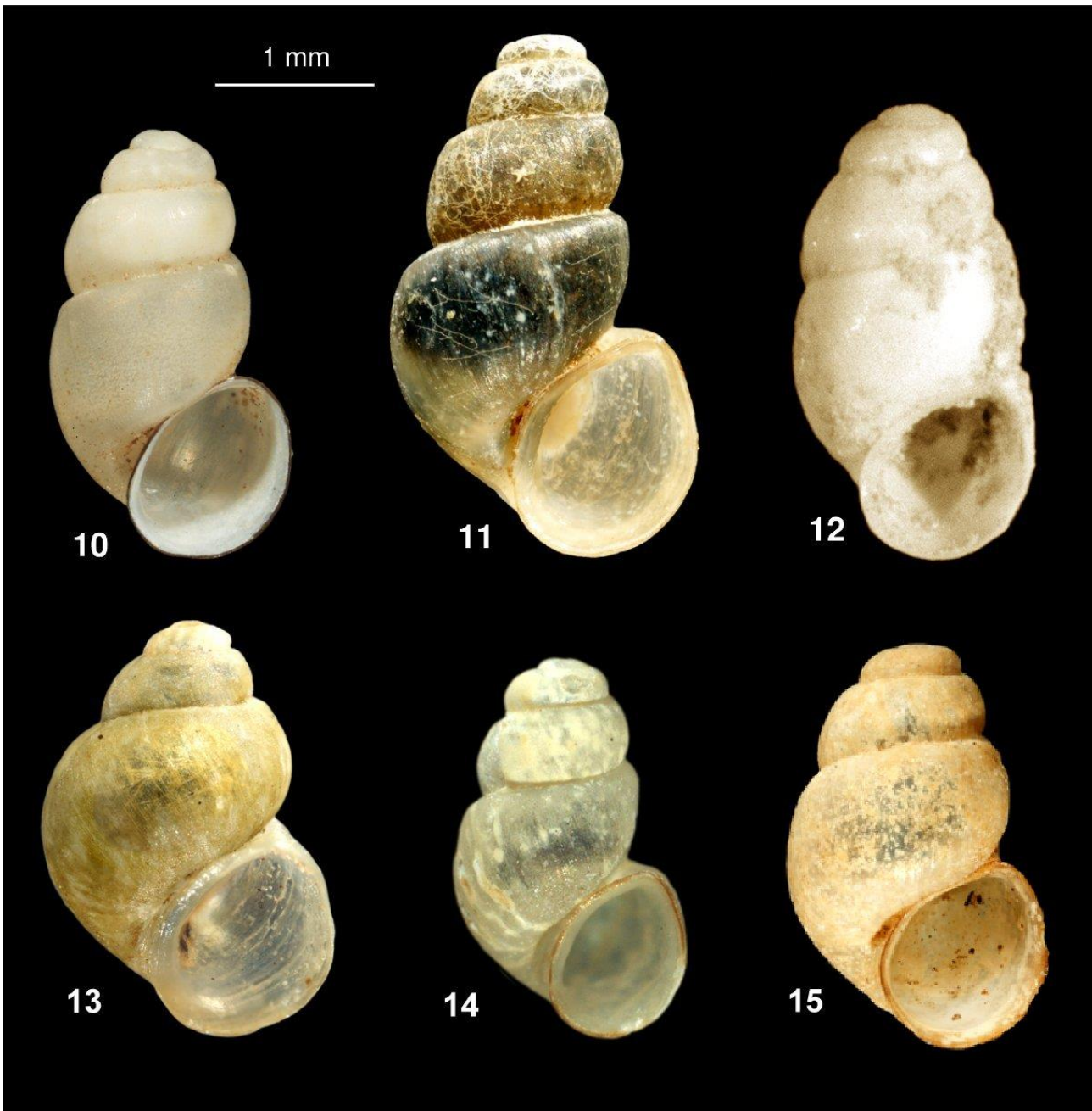
Differentiating characters: It can be distinguished from the other *Bythinella* spp. of this region by the deep suture and the angle at the top of the aperture. The tubular gland of *B. austriaca* is slim proximally and thicker at the distal end while in *B. steffeki* it is regularly stout over the full length.

Habitat: The new species inhabits a karstic spring zone of Závodná Vyvieračka (Fig. 9), consisting of an artificial concrete channel, small travertine waterfall, short river bed with larger limestone boulders, and an artificial pond adjacent to the spring. The spring is associated with a short conglomerate cave, inhabited by *Hauffenia* sp., but without presence of *B. steffeki* n. sp. The water outlet of the spring seasonally varies from 40-200 l/s with average temperature 10.2° C, pH 7.485 and conductivity 508 µS. The single known locality is inside an engineering plant in an industrial zone. Despite the environmental care of the management, it is still threatened by handling of mineral oils and recycling of iron deposits nearby.



Figure 9. The type locality of *Bythinella steffeki* n. sp. in Slovenský Kras Mountains at foot of Plešivecká Plateau in Kunova Teplica. Spring Závodná Vyvieračka: **A.** General view on the spring zone with a travertine cascade; **B.** Artificial water outlet from Závodná Cave; **C.** Spring pond at high spring water outlet; **D.** The same pond during dry summer.

Distribution: So far known only from the type locality. All the neighboring springs host only *B. austriaca* or *B. pannonica*.



Figures 10-15. The *Bythinella* spp. of Slovakia: **10.** *B. austriaca*; **11.** *B. steffeki* n. sp., Holotype; **12.** *B. hungarica*, Topotype; **13.** *B. pannonica*; **14.** *B. metarubra*; **15.** *B. melanostoma*, Syntype, ZMB 93002

Remarks: The population of the new species was monitored by Jozef Šteffek and the first author during the year 2002. That action initiated the inclusion of this site among the 36 monitored localities for *B. pannonica* within the State Environmental Protection of Slovak Republic program in the years 2013-2015 and a visit in 2018. During the monitoring fresh material for this study was collected. The COI sequence in the GenBank under number MK673142 indicates a close relation of the new species to some of the *B. austriaca* clades. The shell morphology comparison of *Bythinella* species reported from Slovakia are at Fig. 10-14.

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