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New subterranean freshwater Molluscs from Bosnia & Hercegovina (Mollusca: Hydrobiidae)

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Abstract

Recently collected materials from Bosnia & Hercegovina revealed 5 new species of the genus *Bythiospeum*: *B. blihensis* n. sp., *B. hrustovoensis* n. sp., *B. maroskoi* n. sp., *B. plivensis* n. sp., and *B. petroedei* n. sp. In addition a new *Islamia* could be found, described here as *I. steffeki* n. sp. Photos of holotypes and paratypes are presented in addition to descriptions.

Key words: *Bythiospeum*, *Islamia*, new species, Bosnia & Hercegovina.

Introduction

The genus *Bythiospeum* Bourguignat, 1882 is distributed from France and Italy to S-Germany, Austria and as far as Asia Minor (Boeters 1998: 31). Radoman 1983 only mentioned two species from the Balkans, *Paladilhiopsis robiciana* (Clessin, 1882) and *P. grobbeni* Kuščer, 1928, both species living in Slovenia. The species of *Paladilhiopsis* Pavlović, 1913 are nowadays assigned to the genus *Bythiospeum* (Boeters 1998: 30).

Islamia is a genus, widely distributed in the Balkans from Bosnia to the Near East and also in France, Spain and Italy (Bodon *et al.* 2001) and the species of which occur in underground water and springs.

Of both genera mentioned above the species predominantly have been described by the shells only, because the subterranean living specimens do not reach the surface and only empty shells can be found.

Recently, the junior author collected in springs in Bosnia & Hercegovina new hydrobiid snails which we describe here as new. Descriptions and photos of these species are presented in this paper.

Material and Methods

The snails were collected by the junior author from sand samples of the fraction 0.3-3 mm, fixed with alcohol and then wet screened under binocular microscope (Olympus SZ-11). The wet sand sample was consequently dried, and extracted the rest of the dry shells.

The dissections and measurements of the genital organs and the shells were carried out using a stereo microscope; the photographs were made with a digital camera system (Leica R8).



Figures 1-6. The sampling sites of the species under discussion. **1:** Hrustovačka pećina-spring2, **2-3:** Gornja Pećka, **4:** Izvor Plive 1A, **5:** Izvor Plive 1B, **6:** Hrustovačka pecina spring 2 (all photos Maroš Grego).

We work with an indirect species concept of which every species has at least one constant feature that allows us to distinguish it from other species. A constant distinguishing feature shows that speciation has taken place. In addition zoogeographical aspects should be also taken into consideration (see Glöer *et al.* 2010).

The used terms to describe the shells follow Hershler & Ponder (1999). The material is stored in the Hungarian Natural History Museum (HNHM), Budapest and in the private collections of the authors.

Results

Genus *Bythiospeum* Bourguignat, 1882

Type species: *Hydrobia quenstedti* Wiedersheim, 1873

Remarks: Species of the genus *Bythiospeum* have the following characteristics: Shell elongated conical to subcylindrical; 1.8 – 4.9 mm in height, smooth without spiral striations or sculptures, only with growth striae (Bernasconi 1990).

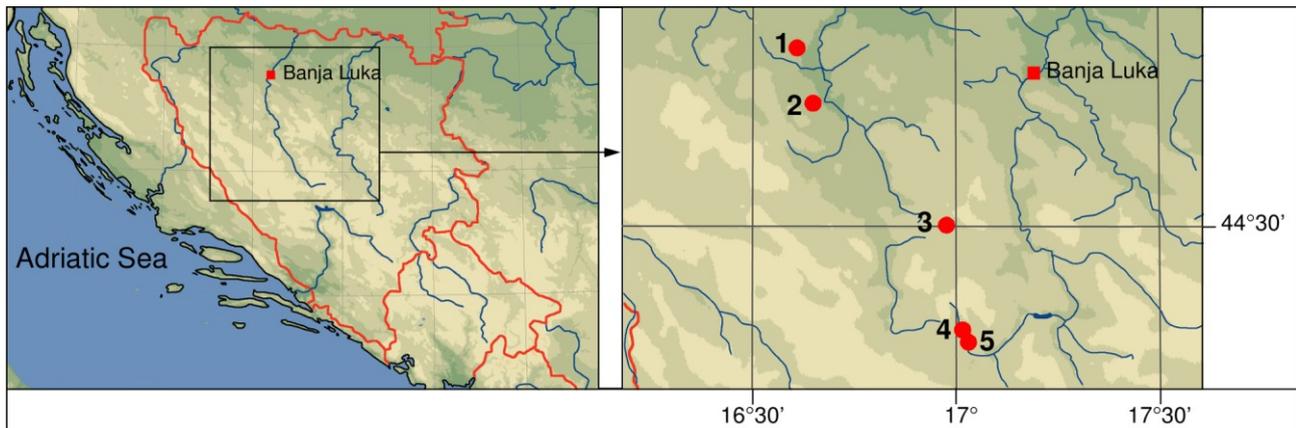


Figure 7. Locations of the sampling sites in Bosnia & Herzegovina. 1 Donji Kamengrad, Livona district. 2 Hrustovačka pećina-spring. 3 Gornja Pećka. 4 Izvor Plive 1A. 5 Izvor Plive 1B.

***Bythiospeum blihensis* n. sp.**

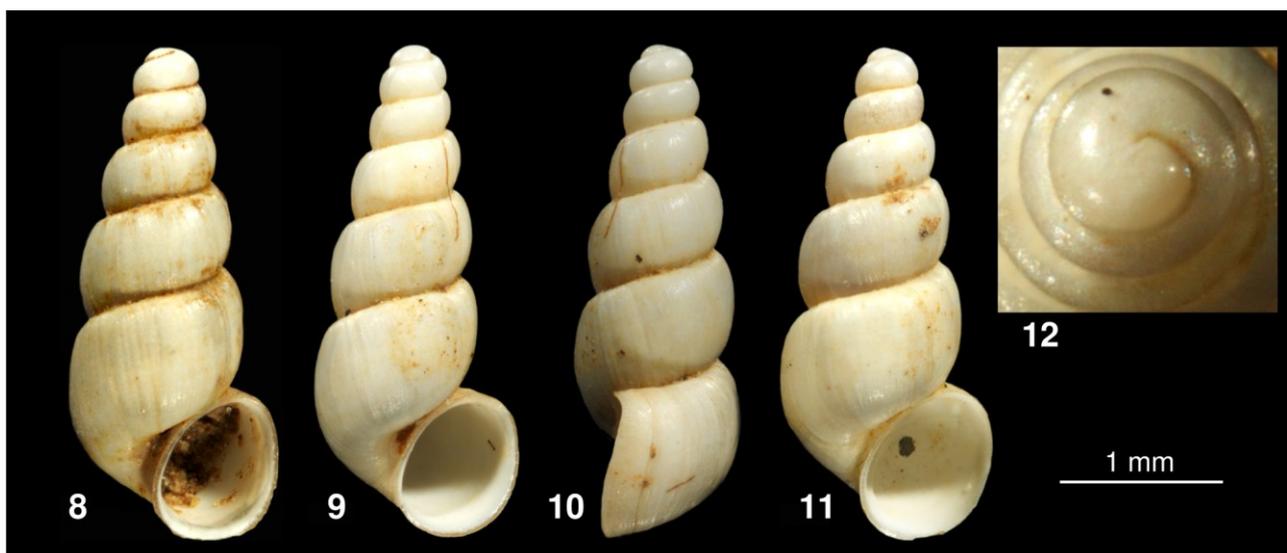
(Figs 8-12)

Holotype: shell height 3.1 mm, width 1.3 mm, HNHM 99421.

Paratypes: 4 specimen + some broken shells, HNHM 99422; 2 specimen in coll. Glöer; 3 specimens in coll Grego.

Locus typicus: Bosnia & Herzegovina, Bosnian Federation, Bihać district, Donji Kamengrad, about 1 km S of crossing from road R405 direction below quarry, about 250 m from last houses at S side of the village. Spring at left side of old dry canyon of Bliha (situated about 1 km south from the active canyon), a small spring among bushes and vegetation with small rocky cascades reaching the meadow. On the meadow at valley bottom is a small rock ring supported well where had been detected the same species. Sandy sediment from spring zone (1) and from well (2): N44.779470°, E16.566431° (spring) and N44.779547°, E16.566860° (well); Jozef and Maroš Grego leg., 04. 04.2015.

Etymology: Named after rivulet Bliha which formed the dry canyon with the type locality and recently draining the active canyon about 1km north.



Figures 8-12. *Bythiospeum blihensis* n. sp. 8 holotype, 9-11 paratypes, 10 lateral view with sinuated apertural margin, 12 apex.

Description

Shell. The whitish and silky shell is elongate-conic with 5.5-6 convex whorls separated by a deep suture, apex blunt. The umbilicus is slit-like, aperture oval, slightly sinuated outer lip from lateral view. Shell height 2.9–3.1 mm, width 1.3 mm.

Differentiating features: *Bythiospeum blihensis* n. sp. is the largest species of the here described species, only *B. plivensis* n. sp. is similar in size but *B. plivensis* n. sp. has a very large aperture.

Distribution: Only known from type locality.

Associated species: *Sadleriana sadleriana* (Frauenfeld, 1863), *Lanzaia bosniaca* Bole, 1970, *Belgrandiella fontinalis* (F.J. Schmidt, 1847), *Radix labiata* (Rossmassler, 1835), *Pisidium casertanum* Poli, 1791), *Hauffenia* sp.

***Bythiospeum hrustovoensis* n. sp.**

(Figs 13-17)

Holotype: from spring 1: shell height 2.1 mm, width 1.1 mm, HNHM 99423.

Paratypes: 5 specimen (spring 1), HNHM 99424, 2 specimen from spring 3 in coll. Glöer; 3 specimens from spring 3 in coll. Jozef Grego.

Locus typicus: Bosnian Federation, Bihać district, Hrustovo, 1.5 km E of village, at bottom of valley below entrance of cave Hrustovačka pećina- spring 1 under dense vegetation coming from large debris with sand deposits at bottom of spring zone and at side of spring rivulet; N44.674682°, E16.700246°; 04.05.2015 Jozef and Maroš Grego leg.

Remark: Between spring 1 (closest to cave entrance) and spring No. 3 150 m E of spring 1 is a spring No. 2 with cleaned out sediments, weak flow rate and stagnant water in a flooded cave entrance during our visit. The species had been found only in spring 1 and 3 so far (Figs. 1, 6).

Etymology: Named after village of Hrustovo in which vicinity the locus typicus is located.



Figures 13-17. *Bythiospeum hrustovoensis* n. sp. **13** holotype, **14-16** paratypes, **15** lateral view with slightly sinuated apertural margin, **17** apex.

Description

Shell. The whitish and silky shell is elongate-conic with 5.5 convex whorls, apex blunt. The umbilicus is closed, aperture oval, slightly sinuated outer lip from lateral view. Axis of aperture inclined. Shell height 2.1–2.3 mm, width 1.0–1.2 mm.

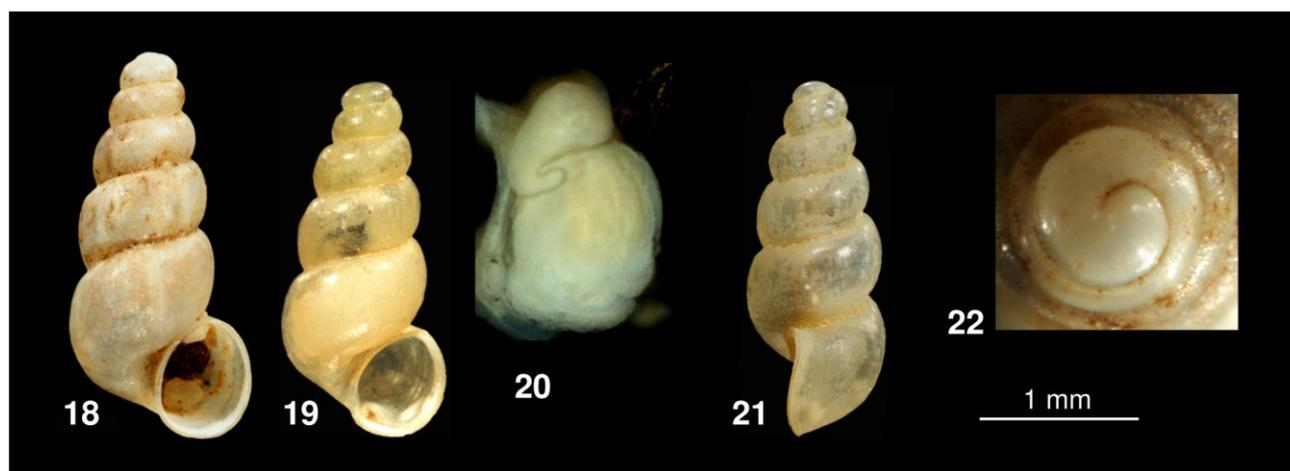
Differentiating features: *Bythiospeum hrustovoensis* n. sp. is smaller than *B. blihensis* n. sp. and *B. plivensis* n. sp. In *B. hrustovoensis* n. sp. the axis of aperture is inclined while it is in *B. maroskoi* n. sp. and *B. petroedei* n. sp. it is nearly vertical. In addition the outer lip of the aperture is only slightly sinuated.

Distribution: Only known from type locality.

Associated species: *Ancylus fluviatilis* O.F. Müller, 1774.

***Bythiospeum maroskoi* n. sp.**

(Figs 18-22)

Holotype: shell height 2.1 mm, width 1.0 mm, HNHM 99425.**Paratypes:** > 100 specimens in ethanole, > 100 specimens empty shells, HNHM 99426, 2 specimen in coll. Glöer, 30 specimens in coll. Grego.**Locus typicus:** Republika Srpska in region of Banja Luka, in a karst spring 500 m S of Gornja Pečka, on road from Donji Barači to Izvor Sana, 2 km before bridge over Sana near travertine waterfall cascades, among houses 350 m W of cascades. Spring coming from several sites under limestone cliffs, few springs caught to wells for tap water supply. The small settlement with several old watermills is situated on travertine platform ca. 4 m above the valley. Sandy sediment at the middle spring; N44.307255°, E16.899490°; 05.04.2015, Jozef & Maroš Grego leg. (Figs. 2, 3).**Etymology:** Named after Maroš (Maroško) Grego, young enthusiastic documentarist of the Balkans, son of junior author, who helped to collect the species within the field trip.**Figures 18-22.** *Bythiospeum maroskoi* n. sp. 18 holotype, 19, 21 paratypes, 20 penis in situ, 21 lateral view with sinuated apertural margin, 22 apex.**Description****Shell.** The whitish and silky shell is elongate-conic with 5.5 convex whorls and deep suture, apex blunt. The umbilicus is slit-like, aperture nearly oval, slightly sinuated outer lip from lateral view. Shell height 2.3–2.5 mm, width 1.0–1.1 mm.**Anatomy.** The penis is triangular, distally pointed.**Differentiating features:** *Bythiospeum maroskoi* n. sp. is smaller than *B. blihensis* n. sp. and *B. plivensis* n. sp. In *B. hrustovoensis* n. sp. the axis of the aperture is inclined while it is in *B. maroskoi* n. sp. vertical. From *B. petroedei* n. sp. it differs in the embryonic shell, which ratio of the first half whorl to first whorl is in *B. maroskoi* n. sp. 0.5 and in *B. petroedei* n. sp. 0.75.**Distribution:** Only known from type locality.**Associated species:** *Sadleriana sadleriana* (Frauenfeld, 1863), *Belgrandiella fontinalis* (F.J. Schmidt, 1847), *Ancylus fluviatilis* O.F. Müller, 1774, *Islamia blihensis* n. sp.***Bythiospeum plivensis* n. sp.**

(Figs 23-27)

Holotype: shell height 2.8 mm, width 1.5 mm, HNHM 99427.**Paratypes:** 17 specimens + some broken shells + 2 specimens in ethanole, HNHM 99428, 2 specimen in coll. Glöer, 3 specimens in coll. Grego.**Locus typicus:** Republika Srpska, Draganić, Izvor Plive 1A, ca 150 m E of Izvor Plive 1, side spring in a house yard at right side of path to Izvor Plive 1, sandy sediment at the bottom of the spring zone; N44.240797°, E17.017108°; 05.04.2015 Jozef Grego leg. (Fig. 4)

Etymology: Named after village Izvor Plive in which vicinity the locus typicus is located.



Figures 23-27. *Bythiospeum plivensis* n. sp. 23: holotype, 24-26: paratypes, 25: lateral view with slightly sinuated apertural margin, 27: apex.

Description

Shell. The whitish and silky shell is elongate-conic with 5.5 regular growing convex whorls with a deep suture, apex blunt. The umbilicus is closed, aperture nearly circular and large, slightly sinuated outer lip from lateral view. Shell height 2.7–2.8 mm, width 1.3–1.5 mm.

Differentiating features: *Bythiospeum petroedei* n. sp. differs from *B. maroskoi* n. sp. in size. From *B. blihensis* n. sp. it differs in the aperture, which is in *B. plivensis* n. sp. larger.

Distribution: Only known from type locality.

Associated species: *Belgrandiella fontinalis* (F.J. Schmidt, 1847), *Bythiospeum plivensis* n. sp., *Islamia steffeki* n. sp.

Bythiospeum petroedei n. sp.

(Figs 28-32)

Holotype: shell height 2.1 mm, width 1.0 mm, HNHM 99429.

Paratypes: 6 specimen + some broken shells from Izvor Plive 1A, > 50 specimens, HNHM 99430, 6 specimen in coll. Glöer, 10 specimens in coll Grego from Izvor Plive 1B.

Locus typicus: Bosnia & Hercegovina, Izvor Plive 1B, ca. 200 m E of izvor Plive 1, side spring 2 just under left side of path to Izvor Plive1; sandy sediment directly at bottom of spring outlet; N44.240893°, E17.018252°; 05.04.2015 Jozef & Maroš Grego leg. (Fig. 4, 5)

Etymology: Species is names after EdePetró, untimely deceased avid malacologist from Budapest, Hungary, who contributed the study of spring fauna of Northern Hungary.

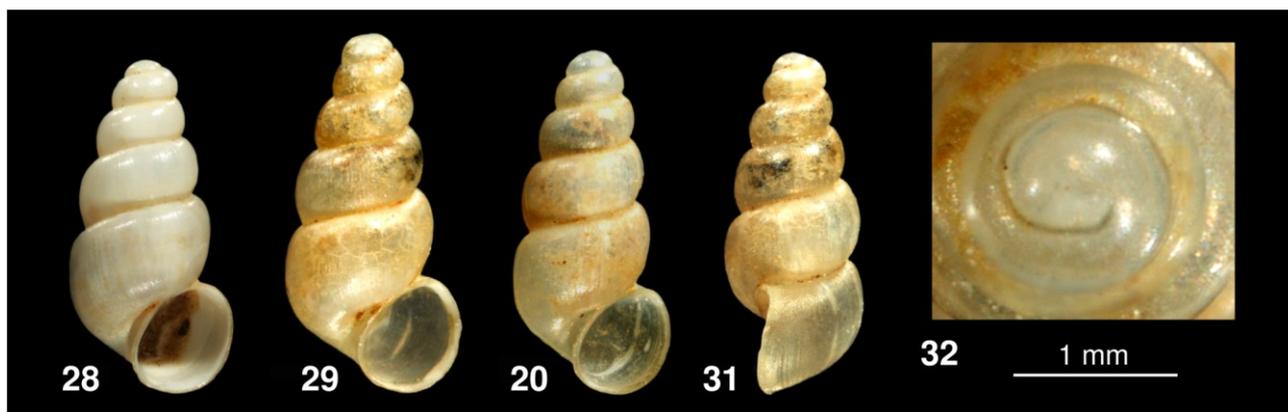
Description

Shell. The whitish and silky shell is elongate-conic with 5.5 whorls, apex blunt. The umbilicus is closed, aperture oval, slightly sinuated outer lip from lateral view. Shell height 2.0–2.3 mm, width 1.0–1.1 mm.

Differentiating features: *Bythiospeum petroedei* n. sp. differs from *B. blihensis* n. sp. and *B. plivensis* n. sp. in size. From *B. hrustovoensis* n. sp. it differs by the sinuated outer lip, which is in *B. hrustovoensis* n. sp. only weak developed. From *B. maroskoi* n. sp. it differs in the embryonic shell, which ratio of the first half whorl to first whorl is in *B. maroskoi* n. sp. 0.5 and in *B. petroedei* n. sp. 0.75.

Distribution: Only known from type locality.

Associated species: *Belgrandiella fontinalis* (F.J. Schmidt, 1847), *Ancylus recurvus* von Martens, 1873, *Bythinella* sp. (juv.), *Hauffenia* sp.



Figures 28-32. *Bythiospeum petroedei* n. sp. 28 holotype, 29-31 paratypes, 31 lateral view with sinuated apertural margin, 32 apex.

Genus *Islamia* Radoman, 1973

Type species: *Hydrobia valvataeformis* Möllendorf, 1873

Remark: The species of this genus have the following characteristics: Shell valvatoid, aperture roundish-ovoid, straight outer lip. The umbilicus is semis-opened or opened and deep. Operculum yellowish and flattened without any outgrowth (Radoman 1983, Bodon *et al.* 2001).

Islamia steffeki n. sp.

(Figs 33-36)

Holotype: shell height 1.65 mm, width 1.7 mm, HNHM 99431.

Paratypes: 3 juv, specimens in ethanol, 20 specimens + some broken shells HNHM 99432 and 8 specimens coll Grego from Izvor plive 1A + 5 specimens from spring in Gornja Pečka HNHM 99434 + 11 specimens from Izvor Plive 1B, HNHM 99433, 2 specimen in coll. Glöer.

Locus typicus: Republika Srpska, Draganić, Izvor Plive 1A, ca 150 m E of Izvor Plive 1, side spring in a house yard at right side of path to Izvor Plive 1, sandy sediment at the bottom of the spring zone; N44.240797°, E17.017108°; 05.04.2015 Jozef Grego leg. (Fig. 4).

Etymology: The species is named after the ever helpful and untimely deceased prof. Jozef Šteffek, a dedicated malacologist of Banská Štiavnica, Slovakia.



Figures 33-36. *Islamia steffeki* n. sp. 33-35: holotype, 34: umbilicus, 35: paratype, 36: apex.

Description

Shell. The whitish shell is conical with 5.5 fast growing convex whorls separated by a deep suture. The aperture is circular, the umbilicus as wide as the half of the penultimate whorl. Shell height 1.6–1.7 mm, width 1.7–1.9 mm.

Operculum light orange, concave without a peg.

Differentiating features: The spire is higher and the whorls are more convex than all *Islamia* spp. mentioned by Radoman (1983) and Bodon *et al.* (2001).

Distribution: Known from type locality and sampling site 3 at Gornja Pećka and Izvor Plive 1A and 1B.

Discussion

The shells of the genus *Iglica* Wagner, 1927 look similar to *Bythiospeum*, but the outer lip of the aperture is straight and not sinuated, therefore we assigned the new species to the genus *Bythiospeum*. In addition the shells of the new species look similar to *Bosnidilhia* Boeters, Glöer & Pešić, 2013 but the shells of which are smaller and cylindrical and not elongated conical.

The species seem to be locally endemic as it is in other countries. Interestingly on sampling site Izvor Plive two obviously distinct species occur (*B. plivensis* n. sp. and *B. petroedei* n. sp.) in relatively close springs.

We assigned *Islamia steffeki* n. sp. to the genus *Islamia* because this genus is widely distributed in the Balkans. All other valvatiform hydrobiids are locally restricted (Bodon *et al.* 2001). In addition we could find an operculum of this species which has no peg and is similar to those of other *Islamia* spp.

Recent studies showed that the Hydrobiidae and Moitessieriidae are underexplored in Bosnia & Hercegovina and so many new species could be found in the last years (Boeters *et al.* 2013, Glöer & Pešić 2014a, 2014b) and ongoing research is needed.

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