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Maxim V. Vinarski[a], Dmitry M. Palatov[b] & Peter Glöer[c]

[a] Museum of Siberian Aquatic Molluscs, Omsk State Pedagogical University, Omsk, Russian Federation

[b] Department of Hydrobiology, Biological Faculty, Moscow State University, Moscow, Russian Federation

[c] Biodiversity Research Laboratory, Hetlingen, Germany

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# Revision of '*Horatia*' snails (Mollusca: Gastropoda: Hydrobiidae sensu lato) from South Caucasus with description of two new genera

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[a]*Museum of Siberian Aquatic Molluscs, Omsk State Pedagogical University, Omsk, Russian Federation;* [b]*Department of Hydrobiology, Biological Faculty, Moscow State University, Moscow, Russian Federation;* [c]*Biodiversity Research Laboratory, Hetlingen, Germany*

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Four nominal species of the genus *Horatia* Bourguignat, 1887 were described by Russian authors from Caucasian caves (*H. borutzkii* Shadin, 1932, *H. birsteini* Starobogatov, 1962, *H. ljovushkini* Starobogatov, 1962 and *H. sokolovi* Starobogatov, 1962). Hitherto all the species were known from type series (presented by empty shells) only. Examination of newly obtained samples from the caves of South Caucasus has shown that the four species actually do not belong to the genus *Horatia* due to obvious differences in the morphology of the copulatory organs between *H. klecakiana* Bourguignat, 1887 (the type species of this genus) and the Caucasian snails. Moreover, statistical analysis of conchological variation has revealed that the species *H. birsteini*, *H. ljovushkini*, and *H. sokolovi* are conspecific. Two genera are described: *Pontohoratia* (includes *P. birsteini* and *P. smyri* sp. nov.) and *Motsametia* (with the single species *M. borutzkii* comb. nov.). The two genera can be distinguished on the basis of the structure of their copulatory organs. The distribution and ecology of the Caucasian *Horatia*-like mollusks are briefly outlined.

http://zoobank.org/urn:lsid:zoobank.org:pub:4EDFB2AE-CB1D-4113-8CC7-3A1BBB46D838

**Keywords:** Hydrobiidae; South Caucasus (Transcaucasia); taxonomy; *Motsametia* gen. nov; *Pontohoratia* gen. nov.; new species; stygobiont snails



## Introduction

The genus *Horatia* Bourguignat, 1887 (type species *Horatia klecakiana* Bourguignat, 1887) comprises a small group of stygobiont freshwater snails distributed in Southern Europe and, perhaps, in Asia Minor. The diagnosis of this genus given by Radoman (1983, p. 51) as: 'Shell valvatoid, with a strongly developed last whorl and semiclosed, deep umbilicus. The outer lip of ovoid aperture oblique, its lower end being drawn backwards'. Anatomically, the genus is characterized by penis with one simple lobe, two seminal receptacles and large kidney-shaped bursa copulatrix (Bodon et al. 2001).

In most recent taxonomic surveys, *Horatia* is included in the subfamily Belgrandiinae De Stefani, 1887 of the family Hydrobiidae Stimpson, 1865 (s. l.) (Bouchet and Rocroi 2005; Bank 2013). Radoman (1973) placed this genus into a subfamily of its own, Horatiinae Radoman, 1973,[1] that has recently been corroborated by a molecular study (Wilke et al. 2013), whereas in the Russian malacological literature a separate family Horatiidae Radoman is accepted (see, for example,

*Corresponding author. Email: radix.vinarski@gmail.com

Starobogatov and Sitnikova 1983). The genus *Horatia* has a rather complicated taxonomical history, briefly outlined by Kabat and Hershler (1993, p. 27), and its true species content and geographical range are not known exactly. At least three species of *Horatia* occur in the former Yugoslavia (Radoman 1983; Bank 2013), one from Bulgaria (Angelov 1967), and one or two species are endemics of Turkey (Schütt 1965; Yildirim et al. 2006).[2] Several hydrobiid species described from France, Spain, Caspian Sea and even from such remote areas as North America and New Zealand and placed originally or subsequently into the genus *Horatia* (Pilsbry 1916; Logvinenko and Starobogatov 1968; Climo 1977; Burch 1989; Arconada and Ramos 2003) are regarded now as belonging to other genera of Hydrobiidae (Kabat and Hershler 1993; Starobogatov 2000; Bodon et al. 2001; Arconada et al. 2007; Haase 2008).

In 1932 and 1962, four nominal species of *Horatia* were described from the caves of Caucasus by Russian authors (Shadin 1932; Starobogatov 1962). Their taxonomic identity remains unresolved as no new information concerning these species has appeared since 1962. All the species are known from the type series only and none of them was studied anatomically. The primary taxonomic data on the four species are given below:

1. *Horatia borutzkii* Shadin, 1932. Type locality: 'Rion-Höhle bei Kutais' (=Tskhal-Tsiteli Cave near Kutaisi, Georgia). The type series (lost now) included two shells of syntypes.
2. *H. birsteini* Starobogatov, 1962. Type locality: Tsebeldinskaya Cave, Abkhazia. The type series consists of one empty shell (holotype).
3. *H. ljovushkini* Starobogatov, 1962. Type locality: Nizhneshakuranskaya Cave, Abkhazia. The type series consists of one empty shell (holotype).
4. *H. sokolovi* Starobogatov, 1962. Type locality: Nizhneshakuranskaya Cave, Abkhazia. The type series includes four empty shells (the holotype and three paratypes).

The Russian authors (Kantor and Sysoev 2005; Kantor et al. 2010) still consider these four species as belonging to the genus *Horatia*, but Bodon et al. (2001, p. 175) consider placement of these species in the genus *Horatia* as being 'dubious or very uncertain'. The point is that all these species of Caucasian valvatiform hydrobiids are still not characterized anatomically, and only conchological characters have been studied to the date.

Extensive samples of freshwater gastropods made over the last few years by one of us (D. P.) in different waterbodies situated on the East Black Sea coast allowed us to re-examine the taxonomic status of all nominal species of *Horatia* described from the South Caucasian region. Having examined several representative samples of these snails (mostly from the type localities of previously described species), we tried to check the validity of all species allegedly belonging to the genus *Horatia* from Caucasus by means of multivariate statistical analysis of their conchological variation as well as by study of the anatomical traits.

## Material and methods

The *Horatia*-like snails were collected between 2009 and 2012 from brooks and lakes in four caves situated in Abkhazia and Georgia (Table 1; Figure 1). Samples

Table 1. Sampled localities and species of *Horatia* collected.

| Locality, sampling year(s) | Coordinates | Species | *n** |
|---|---|---|---|
| Tsebeldinskaya Cave (2012) | 43° 1′ 52.30″ N<br>41°16′ 8.92″ E | *Pontohoratia birsteini* | 41 (8) |
| Nizhneshakuranskaya Cave (2012) | 42° 16′ 19.62″ N | *'Horatia' ljovushkini* (=*P. birsteini*) | 25 (0) |
| | 42° 44′ 1.63″ E | *H. sokolovi* (=*P. birsteini*) | 75 (11) |
| Novoafonskaya Cave (2009, 2010) | 43° 5′ 28.16″ N<br>40° 48′ 32.41″ E | *Pontohoratia smyri* sp.nov. | 72 (7) |
| Tskhal-Tsiteli Cave (2012) | 43° 01.796″ N<br>41° 20.034″ E | *Motsametia borutzkii* | 9 (4) |

Notes: **n*: number of measured specimens. In brackets, the number of fixed specimens is given.




Figure 1. The map of locations (caves) studied.

were taken from the three caves which are the type localities of all the known Caucasian *Horatia*-like snails (and in one additional cave). The snails were sampled by means of a sieve of 0.2 mm mesh or by hand from sand (empty shells) or submerged stones (living mollusks). In total, nearly 300 specimens belonging to all nominal Caucasian species of *Horatia* were collected. Shells of 222 specimens were measured with accuracy to the nearest 0.1 mm. Six standard measurements were taken from each shell: shell height (SH), shell width (SW), aperture height (AH) and width (AW), spire height (SpH) and body whorl height

(BWH). The whorls number was also counted. The results of the measurements were analysed by means of discriminant and canonical analyses in statistical software STATISTICA 6.0 for Windows. (Statsoft Inc, USA). The Kolmogorov–Smirnov (K-S) test for evaluation of normality in distribution of values of some conchological indices was used.

We studied the holotypes of all species of *Horatia* described by Starobogatov (1962) that are kept in the collection of the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg (ZIN hereafter). Taxonomic identification of newly collected snails was determined by comparison with the holotypes and by using papers by Shadin (1932) and Starobogatov (1962). The latter one contains the determination key for all nominal species of Caucasian '*Horatia*'.

Scanning electron microscopy (SEM) photos were made in the Electronic Microscopy laboratory of the Biological Faculty of the Moscow State University by means of Jeol JSM-6308LA and Cam Scan S2 microscopes.



## Results and discussion

The four nominal species of Caucasian *Horatia* are similar in their shell appearance, all having valvatoid shells with relatively high spire and more or less rounded aperture (Figure 2). SH of all species does not exceed 2.0 mm. Interspecific differences lie mostly in different shell proportions (Starobogatov 1962), with *H. ljovushkini* having the tallest spire, and *H. birsteini* having the widest body whorl (see Figure 2). One more (previously undescribed) species of *Horatia*-like snail was found in the Novoafonskaya Cave. It can be distinguished from all previously described species of Caucasian *Horatia* by very low spire and much wider body whorl (see below).

The multivariate analyses revealed that all *Horatia*-like snails from Transcaucasia can be divided into two large groups forming two distinct 'clouds' in the multivariate space (Figure 3). The first cloud comprises all hitherto described species, whereas the second one includes only specimens from the Novoafonskaya Cave, designated above as the fifth morphospecies of *Horatia*. The latter may be distinguished with 100% accuracy by means of the discriminant analysis (Table 2). *Horatia borutzkii* does not differ from other nominal species of *Horatia* by shell proportions but, as was mentioned by Starobogatov (1962), it has an almost round aperture, whereas all other described species of South Caucasian *Horatia* are characterized by an angular aperture; its form is not so regularly round as it is in *H. borutzkii*. There are no qualitative differences in the protoconch sculpture in the species studied. In all taxa it is represented by irregular honeycomb-like pits (terminology after Anistratenko 2013), but the density of ornamentation may differ among species (Figure 4). We failed to reveal any significant difference in the protoconch size and proportions in the taxa studied. Further, we can report some anatomical differences between *H. borutzkii* and other *Horatia*. The penis in *H. borutzkii* has a small and slim tapered outgrowth on the left side (Figure 5A), whereas in other dissected specimens, determined according to Starobogatov (1962) as belonging to the species *H. sokolovi*, the penis is simple, without any outgrowth or penial lobe (see Figure 5C). In *H. klecakiana*, however, the penis bears one simple lobe that is rather short, obtuse and of bud-like shape (see Bodon et al. 2001, figure 110). Since the genera of valvatiform hydrobiid genera are

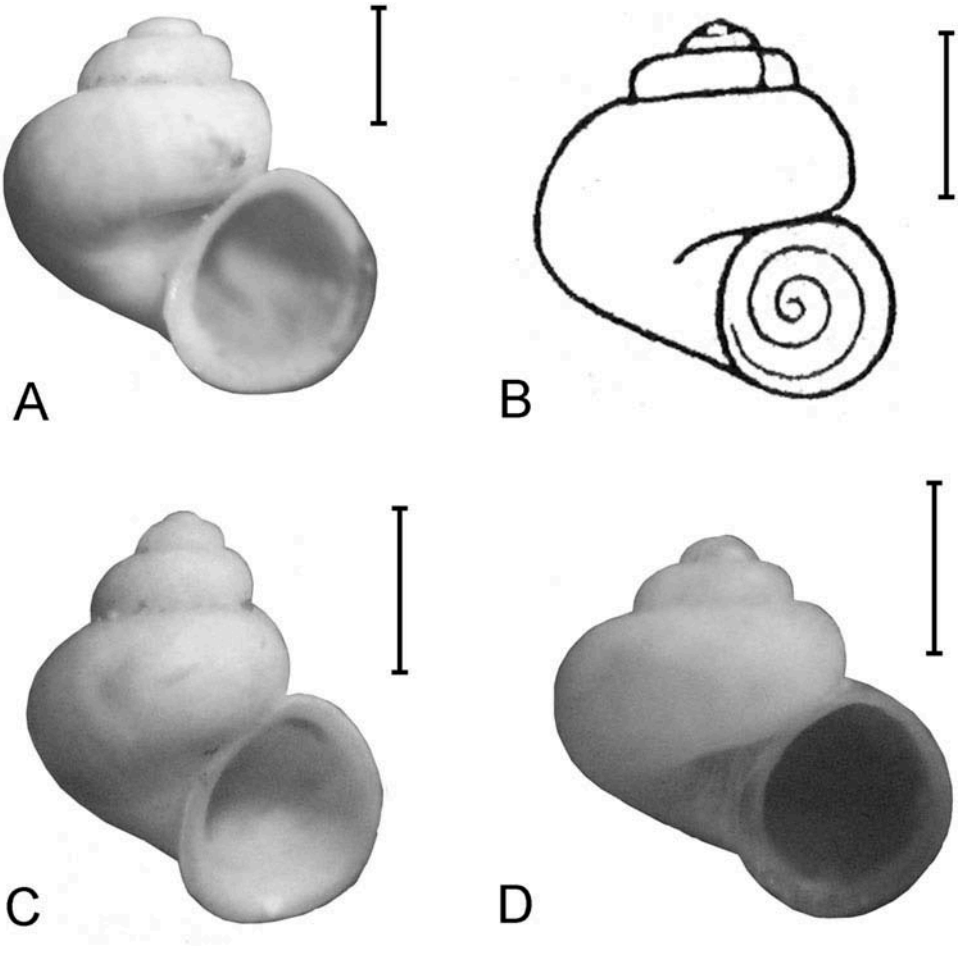


Figure 2. Shells of type specimens (holotypes and syntypes) of nominal Caucasian species of '*Horatia*'. (A) *Horatia sokolovi* (ZIN); (B) *H. borutzkii* (after Shadin 1932); (C) *H. ljovushkini* (ZIN); (D) *H. birsteini* (ZIN). Scale bars 0.5 mm.

delineated on the basis of different penial structure, this fact indicates that the Caucasian *Horatia*-like snails cannot be placed in the genus *Horatia*. Given the obvious differences in the penis morphology between *H. borutzkii* and other Caucasian taxa of '*Horatia*', it seems valid to separate all *Horatia*-like snails from the region into two distinct and previously undescribed genera, one of them containing the species *H. borutzkii* and the second one to include all other taxa. Morphometric analysis reveals that there are no real differences between the three species described by Starobogatov (1962) that form a single 'cloud' of points in the multivariate space (see Figure 3) and have no qualitative differences in their shell shape, protoconch sculpture and anatomy. All the three species were described on the basis of very small samples, and one could find a full spectrum of intermediates in a sufficiently large sample of these snails. We failed to find any definite boundary to separate the three species by using the conchological features. For instance,

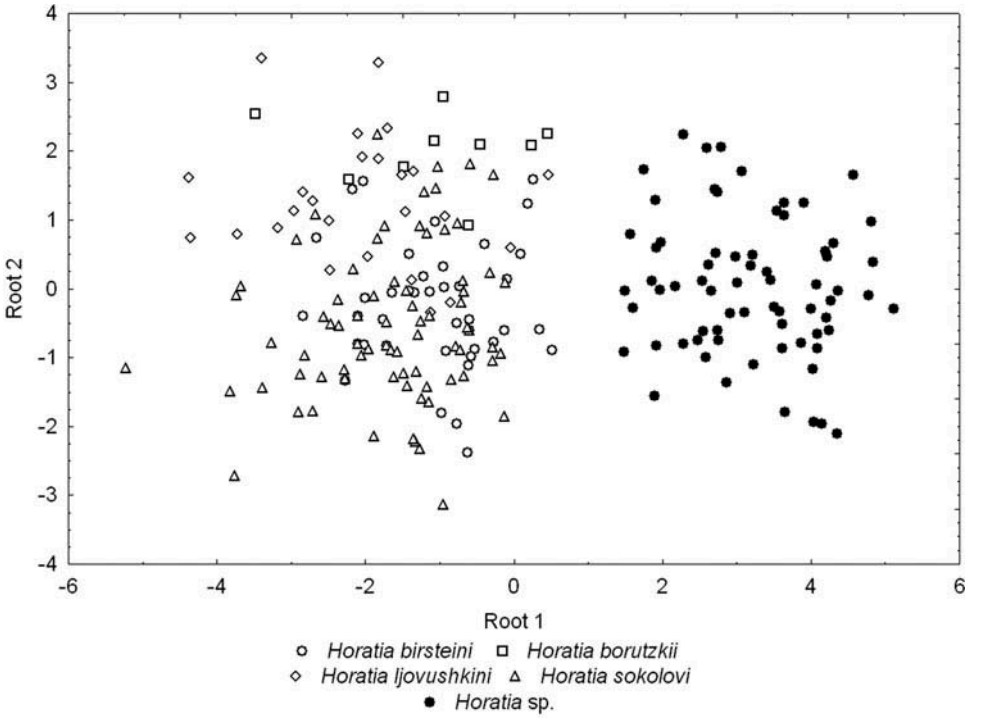


Figure 3. Canonical roots provided by discriminant analysis run for five morphospecies of *Horatia*-like species from South Caucasus.

Table 2. Results of discriminant analysis of conchological characters of the species studied.

| Group (predicted) | % of correct | Group (observed) | | | | |
|---|---|---|---|---|---|---|
| | | *H. birsteini* | *H. borutzkii* | *H. ljovushkini* | *H. sokolovi* | *H.* sp. |
| *H. birsteini* | 48.8 | 20 | 0 | 3 | 18 | 0 |
| *H. borutzkii* | 77.8 | 0 | 7 | 2 | 0 | 0 |
| *H. ljovushkini* | 72.0 | 1 | 1 | 18 | 5 | 0 |
| *H. sokolovi* | 76.0 | 12 | 4 | 2 | 57 | 0 |
| *H.* sp. | 100.0 | 0 | 0 | 0 | 0 | 72 |

Starobogatov (1962) believed that the BWH/SH ratio is a good index to discriminate between species of *Horatia*. However, the distribution of values of this index in a large sample (Figure 6) does not differ significantly from the normal (K-S test for goodness of fit $P > 0.20$; $D = 0.059$). It means that there are no discrete morphological groupings in a sample where two alleged species of 'Horatia' (*H. ljovushkini* and *H. sokolovi*) are mixed. In this case, we think that the species *Horatia birsteini, H. ljovushkini* and *H. sokolovi* are full synonyms.

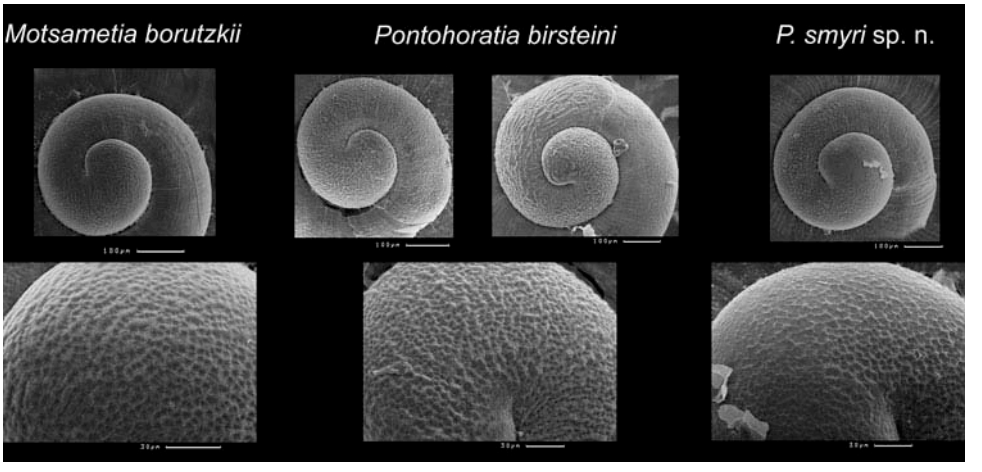


Figure 4. The protoconch sculpture of the species studied. Scale bars 100 μm.

'*Horatia*' sp. from the Novoafonskaya Cave is so different conchologically from all other species studied that it should be described as a new species.

Thus we recognize three valid species of the Caucasian *Horatia*-like hydrobiids belonging to two previously undescribed genera. Their description is given below.

## Taxonomy

Class **GASTROPODA** Cuvier, 1795
Clade **LITTORINOMORPHA** Golikov et Starobogatov, 1975
Superfamily **RISSOOIDEA** Gray, 1847
Family **HYDROBIIDAE** Simpson, 1865 (sensu lato)
Subfamily **BELGRANDIINAE** Di Stefani, 1877
Genus ***Pontohoratia*** gen. nov.

Type species: *Horatia birsteini* Starobogatov, 1962

### *Diagnosis*

Shell small (up to 2.0 mm in height), ovate-conical (valvatoid) to semi-planispiral, with relatively large angular aperture. Whorls (up to 4.0) convex, separated by a deep suture. Surface of protoconch covered by irregular honeycomb-like pits of variable density. Surface of teleoconch covered by thin and dense growth lines. Umbilicus deep and wide, funnel-like. Operculum unknown. Penis slender, elongated, slightly swollen in its middle part. Penial lobes or outgrowths absent.

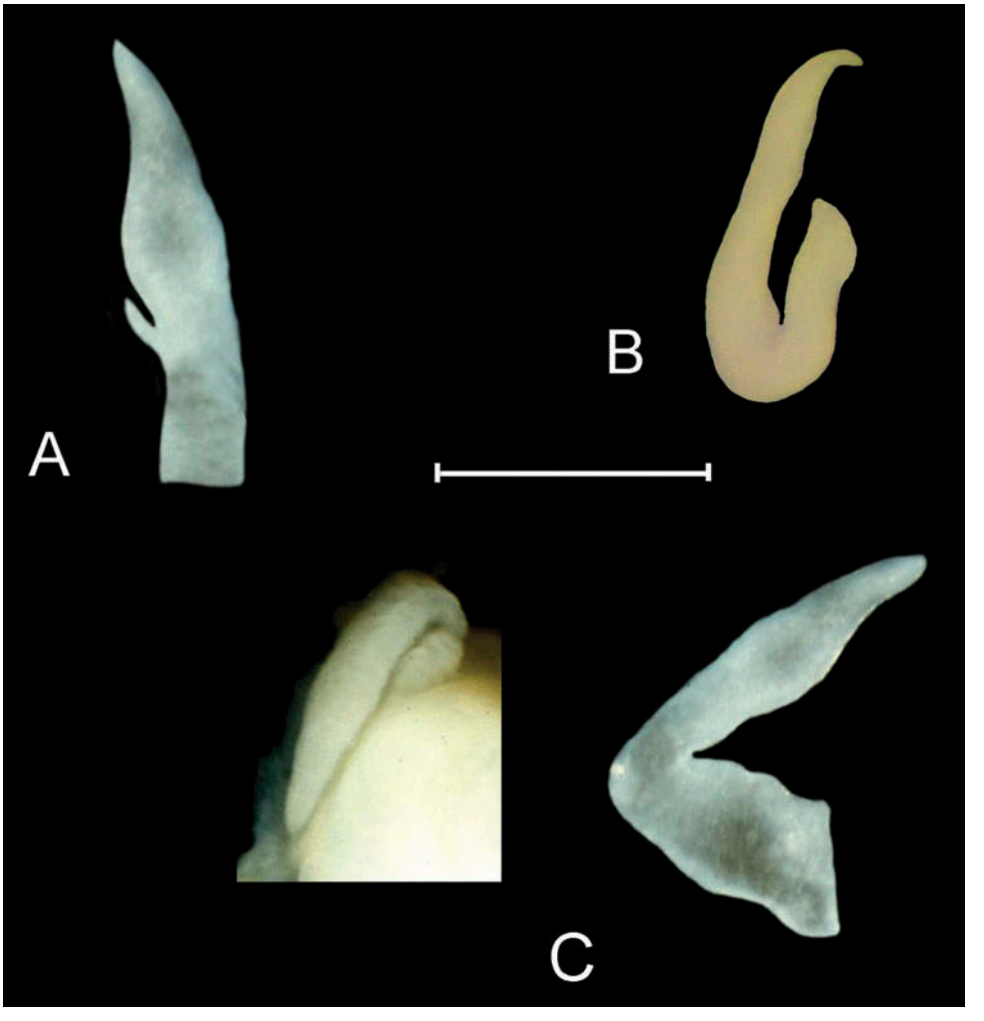


Figure 5. The penis morphology in Caucasian '*Horatia*'. (A) *Motsametia borutzkii* (Tskhal-Tsiteli Cave); (B) *Pontohoratia smyri*; (C) '*Horatia*' *sokolovi* = *Pontohoratia birsteini* (Nizhneshakuranskaya Cave). Scale bar 0.5 mm.



*Etymology*

The name is derived from 'Pontos Euxeinos' ('Hospitable Sea') – an ancient Greek name for the Black Sea, and *Horatia* – the generic name previously applied to the species of this genus. Gender – female.

*Differential diagnosis*

Conchologically, the species of *Pontohoratia* are similar to species belonging to the genus *Horatia* sensu Bodon et al. (2001) but differ from the latter by simple penis without penial lobe(s).

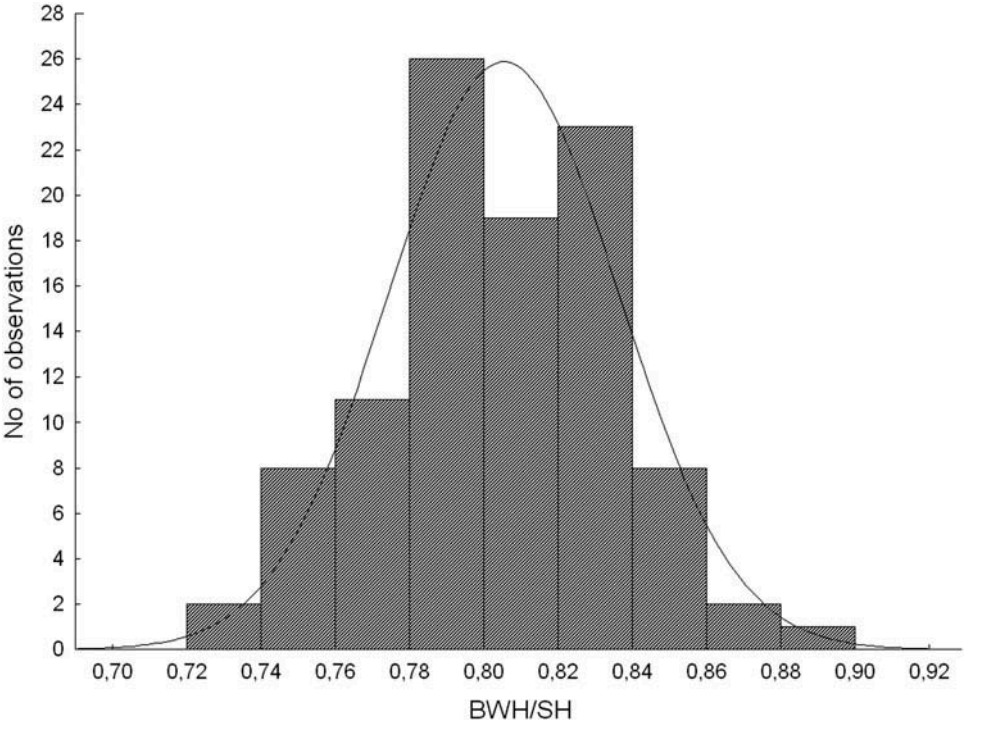


Figure 6. Distribution of values of the BWH/SH index in a sample of *'Horatia'* sp. from Nizhneshakuranskaya Cave ($n$ = 100). Associated normal-distribution curve is given.

*Distribution and species content*

The genus is endemic for South Caucasus (Transcaucasia) and includes two species: *P. birsteini* (Starobogatov, 1962) and *P. smyri* sp.nov.

### ***Pontohoratia birsteini* (Starobogatov, 1962)**

(Figures 2A, C, D; 7A–C)

*Horatia birsteini* Starobogatov, 1962: 42, fig. 1, A.
*Horatia ljovushkini* Starobogatov, 1962: 44, fig. 1, G.
*Horatia sokolovi* Starobogatov, 1962: 43, fig. 1, B.

*Type locality*

Tsebeldinskaya Cave, Abkhazia (see Table 1).

*Type series*

ZIN (accession number 1). Includes the only empty shell (holotype).

The types series of *Horatia ljovushkini* (ZIN, accession number 1) has been also studied by us.

Table 3. Morphometric characteristics of shells of *Motsametia* and *Pontohoratia* species. Above lines – limits of variation, below lines – means ± standard deviation.

| Character (index) | Species, locality (in brackets – number of measured specimens) | | | |
|---|---|---|---|---|
| | *Motsametia borutzkii* Tskhal-Tsiteli Cave (9) | *Pontohoratia birsteini* Nizhneshakuranskaya Cave (100) | *P. birsteini* Tsebeldinskaya Cave (41) | *P. smyri* Novoafonskaya Cave (72) |
| Whorls number | 2.75–3.50<br>3.17 ± 0.22 | 3.00–4.00<br>3.40 ± 0.21 | 3.25–3.75<br>3.49 ± 0.12 | 2.75–3.37<br>3.13 ± 0.13 |
| SH, mm | 1.0–1.5<br>1.2 ± 0.2 | 1.1–1.9<br>1.5 ± 0.2 | 1.3–1.7<br>1.5 ± 0.1 | 1.0–1.4<br>1.2 ± 0.1 |
| SW, mm | 1.0–1.4<br>1.2 ± 0.1 | 1.1–1.8<br>1.4 ± 0.2 | 1.4–1.8<br>1.5 ± 0.1 | 1.3–1.7<br>1.5 ± 0.1 |
| SpH, mm | 0.5–0.9<br>0.6 ± 0.1 | 0.5–0.9<br>0.7 ± 0.1 | 0.5–0.8<br>0.7 ± 0.1 | 0.3–0.7<br>0.5 ± 0.1 |
| BWH, mm | 0.8–1.2<br>1.0 ± 0.1 | 0.9–1.5<br>1.2 ± 0.1 | 1.1–1.3<br>1.2 ± 0.1 | 0.7–1.2<br>1.0 ± 0.1 |
| AH, mm | 0.5–0.8<br>0.7 ± 0.1 | 0.6–1.1<br>0.9 ± 0.1 | 0.7–1.0<br>0.9 ± 0.1 | 0.5–0.8<br>0.7 ± 0.1 |
| AW, mm | 0.4–0.7<br>0.5 ± 0.1 | 0.5–1.0<br>0.7 ± 0.1 | 0.6–0.9<br>0.7 ± 0.1 | 0.5–0.8<br>0.6 ± 0.1 |
| SW/SH | 0.85–1.05<br>0.96 ± 0.07 | 0.81–1.08<br>0.98 ± 0.06 | 0.93–1.12<br>1.01 ± 0.05 | 1.15–1.45<br>1.29 ± 0.08 |
| SpH/SH | 0.43–0.52<br>0.48 ± 0.03 | 0.33–0.54<br>0.45 ± 0.04 | 0.39–0.53<br>0.45 ± 0.03 | 0.33–0.57<br>0.48 ± 0.05 |
| BWH/SH | 0.73–0.89<br>0.80 ± 0.03 | 0.73–0.89<br>0.80 ± 0.03 | 0.74–0.89<br>0.81 ± 0.03 | 0.64–0.95<br>0.81 ± 0.05 |
| AH/SH | 0.41–0.63<br>0.50 ± 0.04 | 0.41–0.63<br>0.50 ± 0.04 | 0.44–0.58<br>0.51 ± 0.03 | 0.48–0.64<br>0.55 ± 0.03 |
| AW/AH | 0.70–1.00<br>0.85 ± 0.07 | 0.70–1.00<br>0.85 ± 0.07 | 0.75–1.00<br>0.87 ± 0.07 | 0.77–1.28<br>0.93 ± 0.08 |



*Other material studied*

More than 140 specimens collected in two caves (see Table 1).

*Diagnostic traits*

Shell small (up to 2.0 mm), ovate-conical (valvatoid), with visibly high spire, semi-transparent, yellowish-white. SH is nearly equal to SW (Table 3). Whorls number up to 4.0. Body whorl moderately wide. Aperture irregularly roundish, with weakly developed angle in its upper part. Soft body not pigmented, eye spots are absent (presumably animals are blind). Penis without lobe(s).

*Distribution and ecology*

*Pontohoratia birsteini* is known from two caves (Tsebeldinskaya and Nizhneshakuranskaya) in Abkhazia. Ecologically, *P. birsteini* may be characterized as rheophilic species preferring hard substrates (rock, pebbles). The living mollusks were collected from underground brooks with flow velocity up to 0.3 m/sec (Figure 8). The species of stygobiont snails associated with *P. birsteini* are *Belgrandiella abchasica* Starobogatov, 1962, *Paladilhiopsis schakuranica* Starobogatov, 1962, *Paladilhiopsis* sp., and «*Geyeria*» *horatieformis* Starobogatov, 1962. In addition to gastropods, several species of stygobiont crustaceans were found to co-occur with *P. birsteini*. These are amphipods *Niphargus magnus* Birstein, 1940, *Niphargus inermis* Birstein, 1940 (Niphargidae), and *Zenkevitchia admirabilis* Birstein, 1940 (Typhlogammaridae). The most important component of this community are cave shrimps *Troglocaris* (*Xiphocaridinella*) *osterloffi* Jusbaschjan, 1940 (Atyidae).

***Pontohoratia smyri*** sp. nov.
(Figure 5B; 7D)

*Type locality*

Anatolia Lake in the Novoafonskaya Cave, Abkhazia (see Table 1).

*Type series*

ZIN, accession number 1 (the holotype), and 2 (seven paratypes). 25 paratypes in the collection of the Museum of Siberian Aquatic Mollusks (Omsk State Pedagogical University), accession number 07-033. The snails from the type series were collected in 2009.

*Other material studied*

39 specimens sampled in 2010 in the collection of Dmitry Palatov (Moscow).

*Holotype shell dimensions at 3.25 whorls (in mm)*

SH 1.2; SW 1.4; SpH 0.6; BWH 0.9; AH 0.7; AW 0.6.

*Morphological description*

Shell very small (up to 1.4 mm), almost planispiral, yellowish-white or corneous, with very wide body whorl and relatively low spire. Shell walls moderately thick. Umbilicus wide and deep, opened. Whorls number up to 3.50. Whorls convex, separated by deep suture. Aperture angular, visibly deflected.

Penis simple, without a lobe (see Figure 5B).

*Etymology*

The species is named after Givi Smyr, a speleologist, who discovered the Novoafonskaya Cave in 1961.

*Differential diagnosis*

*Pontohoratia smyri* differs from *P. birsteini* by much lower spire and much wider body whorl (see Figure 7). SW is 1.15–1.45 times more than SH, whereas in *P. birsteini* this ratio is around 1.00 (see Table 3). Whorls number in *P. smyri* is lower than in *P. birsteini*. The honeycomb-like pits on the protoconch surface of the new species are somewhat wider than those of *P. birsteini* (see Figure 4).

*Distribution and ecology*

*Pontohoratia smyri* is known from the type locality and the closest vicinities of the Novoafonskaya Cave (floodplain of the Psyrtskha River). Perhaps, the original habitat of *P. smyri* is an underground brook inflowing to the lake Anatolia and the shells were carried out by its flow. The same is true also for empty shells of this species found in several springs in the floodplain of the Psyrtskha River. Empty shells of two other gastropod species were collected along with *P. smyri*: *Paladilhiopsis shadini* Starobogatov, 1962 and *Belgrandiella* (?) *abchasica* Starobogatov, 1962. The invertebrate community of this cave is very specific and includes some crustacean taxa: amphipods *Niphargus* spp. (Niphargidae) and *Anopogammarus* sp. (Typhlogammaridae), and decapod *Troglocaris (Xiphocaridinella) fagei* Birstein, 1939.

Genus ***Motsametia*** gen. nov.

*Type species*

*Horatia borutzkii* Shadin, 1923

*Diagnosis*

Shell very small (up to 1.5 mm in height), ovate-conical (valvatoid), with relatively large rounded aperture. Whorls (up to 3.5) convex, separated by a deep suture. Surface of protoconch is covered by small and densely situated honeycomb-like pits. Surface of teleoconch covered by rather rough growth lines. Umbilicus deep and narrow, funnel-like. Operculum unknown. Penis slender, elongated, slightly swollen in its middle part. Its lobe situated about 1/3 of the penis length is thin and slim tapered.

*Etymology*

The name is derived from the Motsameta ('Martyrdom') Monastery in Kutaisi (Georgia) located near the locus typicus of the single species of this genus. Gender – female.

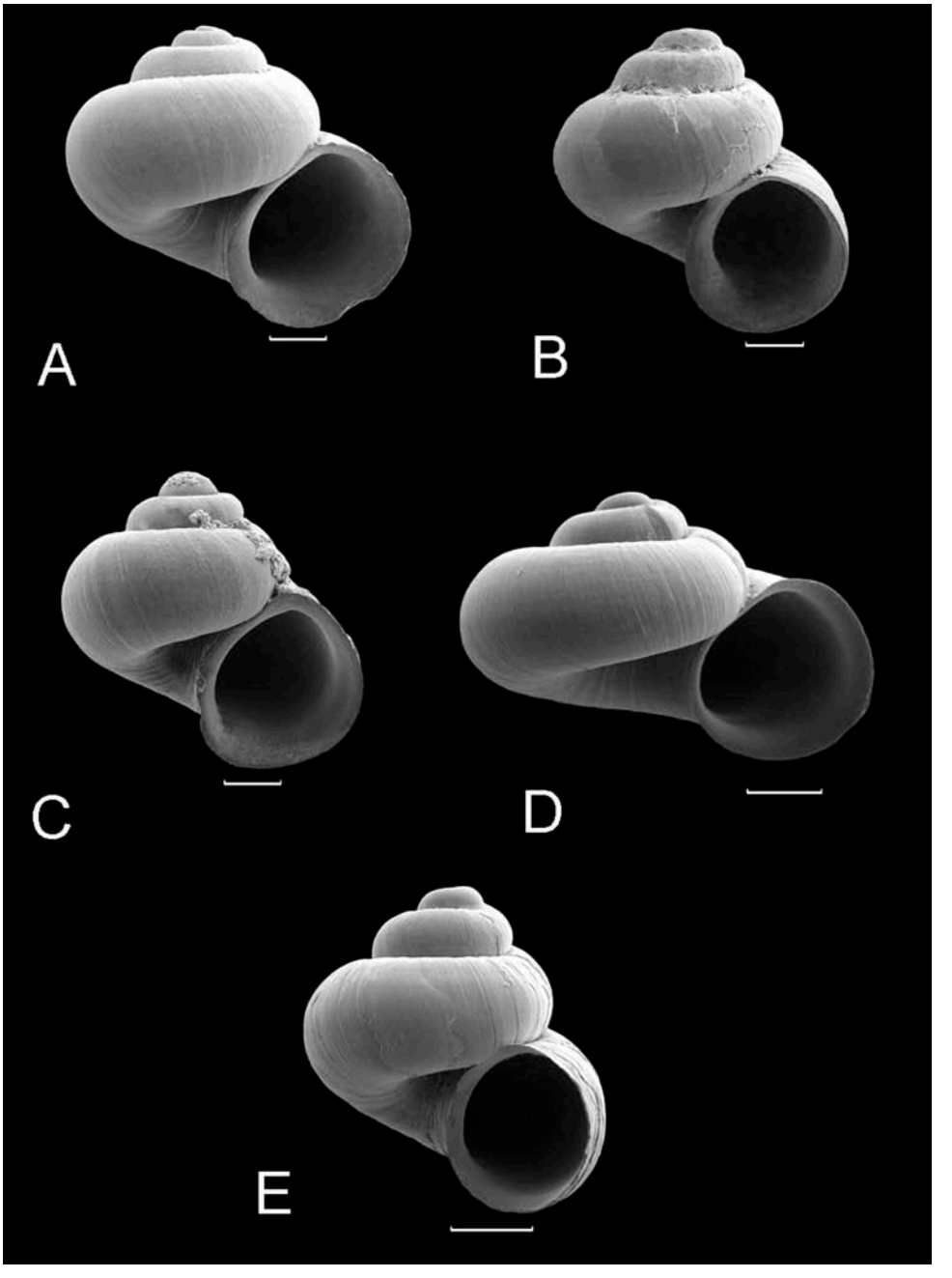


Figure 7. Shells of *Motsametia* and *Pontohoratia*. (A, B) *Pontohoratia birsteini* comb. nov., Tsebeldinskaya Cave; (C) *Pontohoratia birsteini* comb. nov., Niznheshakuranskaya Cave; (D) *Pontohoratia smyri*, holotype (Novoafonskaya Cave); (E) *Motsametia borutzkii*, topotype (Tskhal-Tsiteli Cave). Scale bars 300 μm.

Figure 8. Habitats of *Horatia*-like snails in the caves of the South Caucasus. Left – Nizhneshakuranskaya Cave, right – Tskhal-Tsiteli Cave.



*Differential diagnosis*

Conchologically, snails of the genus *Motsametia* are similar to species belonging to the genera *Horatia* sensu Bodon et al. (2001) and *Pontohoratia* gen. nov. The differences between *Motsametia* and *Horatia* lie in the form and proportions of a penial lobe (short and obtuse in *Horatia*, thin and slim tapered in *Motsametia*). The differences between *Motsametia* and *Pontohoratia* lie in different penis morphology (simple penis without penial lobes in *Pontohoratia*; penis with a single penial lobe in *Motsametia*). In addition, the aperture shape in *Pontohoratia* is angular, whereas in *Motsametia* it is almost regularly round.

*Distribution and species content*

The genus is endemic to South Caucasus (Transcaucasia) and includes the only species: *M. borutzkii* (Shadin) that is still known from its type locality only. The diagnostic characters of the species coincide with those of the genus. This is a rheophilic species found in underground brooks and springs. The stygobiont community of this cave was partially described by Birstein (1933). Besides *Motsametia*, it includes several endemic species of crustaceans: *Niphargus borutzkyi* Birstein, 1933 (Niphargidae), *Troglocaris (Xiphocaridinella) kutaissiana* (Sadovsky, 1930) (Atyidae), and *Asellus monticola fontinalis* Birstein, 1936 (Asellidae).

Table 4 provides a morphological comparison of the two genera described here with other taxa of stygobiont valvatiform hydrobiids living in the South European region.

Table 4. Comparative morphological characteristics of certain stygobiont genera of valvatiform hydrobiids occurring in the southern part of Europe.

| Genus | Character | | |
|---|---|---|---|
| | Shell shape | Protoconch microsculpture | Penis morphology |
| *Hauffenia* Pollonera, 1898* | Valvatiform to planispiral | Malleated | Penis rather short, with 1–2 slightly evident lateral lobes. Apex of penis is obtuse |
| *Horatia* Bourguignat, 1887* | Valvatiform to ovoid | Malleated | Penis rather elongated and slender with pointed apex and single or double, rather evident lobe at about 2/3 of its length |
| *Islamia* Radoman, 1973* | Ovoid to planispiral | Non decribed | Penis with one glandular lobe. Apex of penis is truncated |
| *Motsametia* gen. nov. | Valvatiform | Honeycomb-like | Penis rather elongated, with one short and slim tapered lobe situated at about 1/3 of its length. Apex of penis is pointed |
| *Pontohoratia* gen. nov. | Valvatiform to semi-planispiral | Honeycomb-like | Penis rather elongated, simple, without lobe(s). Apex of penis is pointed |

Note: *The data are taken from Bodon et al. (2001).



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## Notes

1. According to Bouchet and Rocroi (2005), the true authorship of this family should be referred to as D.W. Taylor, 1966.
2. Bodon et al. (2001) regard the placement of Turkish species into the genus *Horatia* as doubtful.

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