



BYTHINELLA MOQUIN-TANDON, 1856 (GASTROPODA: RISSOOIDEA: BYTHINELLIDAE) IN ROMANIA: ITS MORPHOLOGY WITH DESCRIPTION OF FOUR NEW SPECIES

ANDRZEJ FALNIOWSKI¹, MAGDALENA SZAROWSKA¹, IOAN SIRBU²

¹Department of Malacology Institute of Zoology, Jagiellonian University, R. Ingardena 6, 30-060 Kraków, Poland (e-mail: faln@zuk.iz.uj.edu.pl)

²Department of Ecology and Environmental Protection, Lucian Blaga University, 31 Oituz St., 550337 Sibiu, Romania

ABSTRACT: The shell, penis, and female reproductive organs of six molecularly distinct *Bythinella* species from Romania are described. The species were found by the authors in their earlier study based on mt DNA COI, and rRNA ITS-1. None of the species is identical with *B. austriaca* (Frauenfeld, 1857). Two of them are identified as *B. dacica* Grossu, 1946 and *B. molcsanyi* H. Wagner, 1941. The other four species are described as new. The occurrence of *B. melanostoma* (Brancsik, 1889), and of *B. austriaca ehrmanni* Pax, 1938 in Romania is rejected. The sympatric occurrence of two species in four studied springs was stressed. The molecular distinctness of the studied species is not reflected in their morphology, the morphological differences are poorly marked, their variability ranges overlapping.

KEY WORDS: *Bythinella*, Romania, species, description, morphology

INTRODUCTION

The genus *Bythinella* Moquin-Tandon, 1856 ranges from West Europe (Iberian Peninsula), through Central and East Europe (Ukraine), to western Asia. These dioecious, oviparous snails which can breed in any season of the year (SZAROWSKA 1996), with minute, ovoid shells, inhabit springs (GIUSTI & PEZZOLI 1980, FALNIOWSKI 1987, SZAROWSKA 2000, BOETERS 1998) and small brooks, but also subterranean waters. They may be very abundant on mosses and other aquatic plants, but may also be found among fallen leaves in spring-fed marshes. In Romania, as observed by one of the authors (IS), *Bythinella* can be found almost always on hard beds, especially on and under stones and boulders, exclusively in rivulets and brooklets, in limestone but also in volcanic mountains. The shell and other morphological characters are widely variable. This, combined with the poor distinctness of the taxa assigned to this genus, makes the taxonomy within the genus unclear.

The abundant literature on *Bythinella* covers mainly West, South and Central Europe (RADOMAN 1976, 1983, 1985, JUNGBLUTH & BOETERS 1977, GIUSTI & PEZZOLI 1977, FALNIOWSKI 1987, 1992, BOETERS 1998, BERNASCONI 2000, GLÖER 2002, SZAROWSKA & WILKE 2004). The earliest descriptions of the species are based on the shell morphology alone. Next, soft part morphology, especially the anatomy of the reproductive system, was commonly used in the taxonomy of the genus which, however, remained unclear. Recently, BICHAIN et al. (2007) and HAASE et al. (2007), who applied molecular data, have proved the species distinctness of several taxa of *Bythinella*.

In contrast to West and South Europe, where dozens of *Bythinella* species were described (RADOMAN 1976, 1983, 1985, GIUSTI & PEZZOLI 1977, BERNASCONI 2000, BICHAIN et al. 2007), or Central Europe where several species were described and redescribed (JUNGBLUTH & BOETERS 1977, FALNIOWSKI 1987,

1992, BOETERS 1998, GLÖER 2002, SZAROWSKA & WILKE 2004, HAASE et al. 2007), information on the Romanian *Bythinella* is scarce, fragmentary and, apart from purely distributional data and ecological notes, deals only with high levels of conchological variation (GROSSU 1942, 1946, 1956, 1974, 1986, 1999, Soós 1943, GROSSU & NEGREA 1963, SÁRKÁNY-KISS 1983, SIRBU & BENEDEK 2004). The latter phenomenon is common to all the *Bythinella* (e.g. GIUSTI & PEZZOLI 1977, 1980, FALNIOWSKI 1987, 1992, MAZAN 2000, MAZAN & SZAROWSKA 2000a, b). As GROSSU (1986, p. 246) wrote, referring to the Romanian *Bythinella*, “there could be still many surprises in this group, because it is not well researched in Romania, the fauna

of many mountain brooks and springs being still unknown.”

In our molecular study (FALNIOWSKI et al. submitted) applying two molecular markers (COI and ITS-1) we found clear evidence that six *Bythinella* species occur in Romania. We identified two of them with *B. dacica* Grossu, 1946 and *B. molcsanyi* H. Wagner, 1941, respectively (see Discussion). The other four we provisionally distinguished as *Bythinella* sp. 1, 2, 4, and 6. The aim of the present paper is to present morphological characteristics of the six species, to redescribe *B. dacica* and *B. molcsanyi*, and to describe as new the other four species.

MATERIAL AND METHODS

In 2005–2007 snails were collected from twelve localities in Romania. This material was used for a molecular study, and the description of the localities, the exact geographic coordinates included, are given in FALNIOWSKI et al. (submitted). The distribution of those twelve localities is shown in Fig. 1. For the present study, some additional material, collected earlier by one of the authors (IS), was also used. Snails were collected with a sieve, or by hand. Some of them were fixed with alcohol (80%) as follows. Firstly, they were washed twice and left to stand

for ca. 12 hours. Afterwards, the alcohol was replaced and left to stand for another 24 hours, after which it was again replaced. Some other specimens were fixed in 10% buffered formaline, after a couple of days replaced with 80% ethanol. The latter technique resulted in fixation much more appropriate for a morphological study. The shells were cleaned in an ultrasonic cleaner and photographed with NIKON DS-5 digital camera under NIKON SMZ-U stereomicroscope. The same microscope was used for dissection.

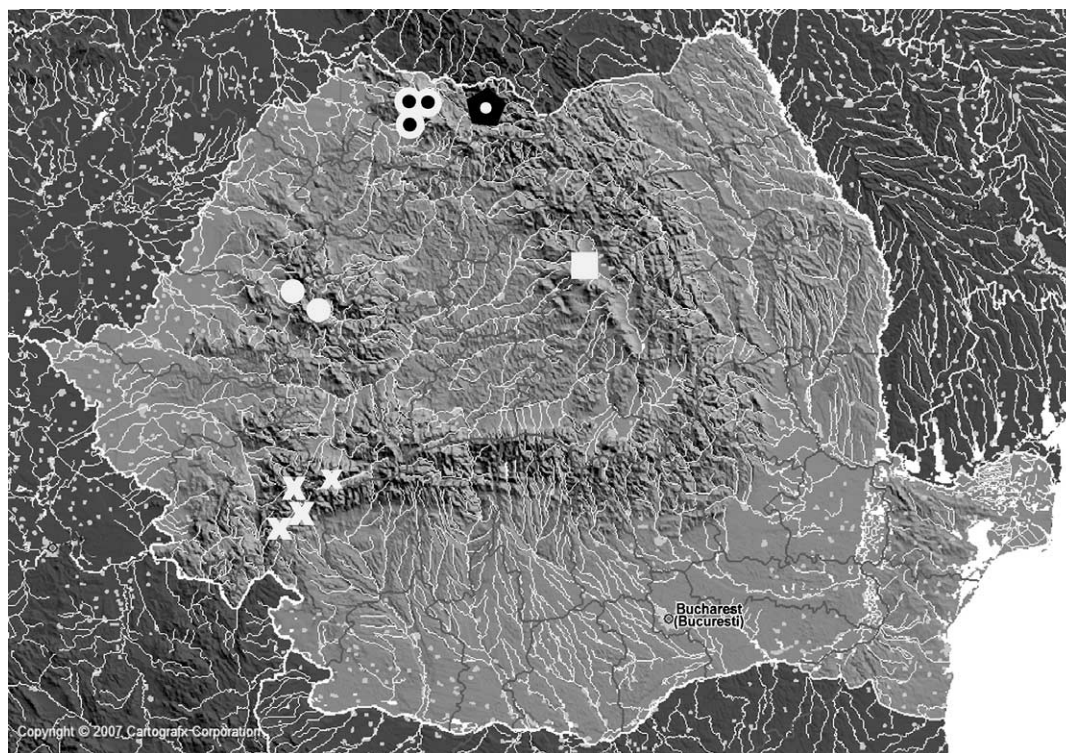


Fig. 1. Distribution of *Bythinella* species considered in this paper: white x – *Bythinella dacica*, white circle with black circle inside – *B. molcsanyi* and *B. grossui* (sympatric occurrence), white circle – *B. radomanii*, white square – *B. calimanica*, black pentagon with white circle inside – *B. viseuiana*

BYTHINELLA SPECIES DISTINGUISHED IN ROMANIA

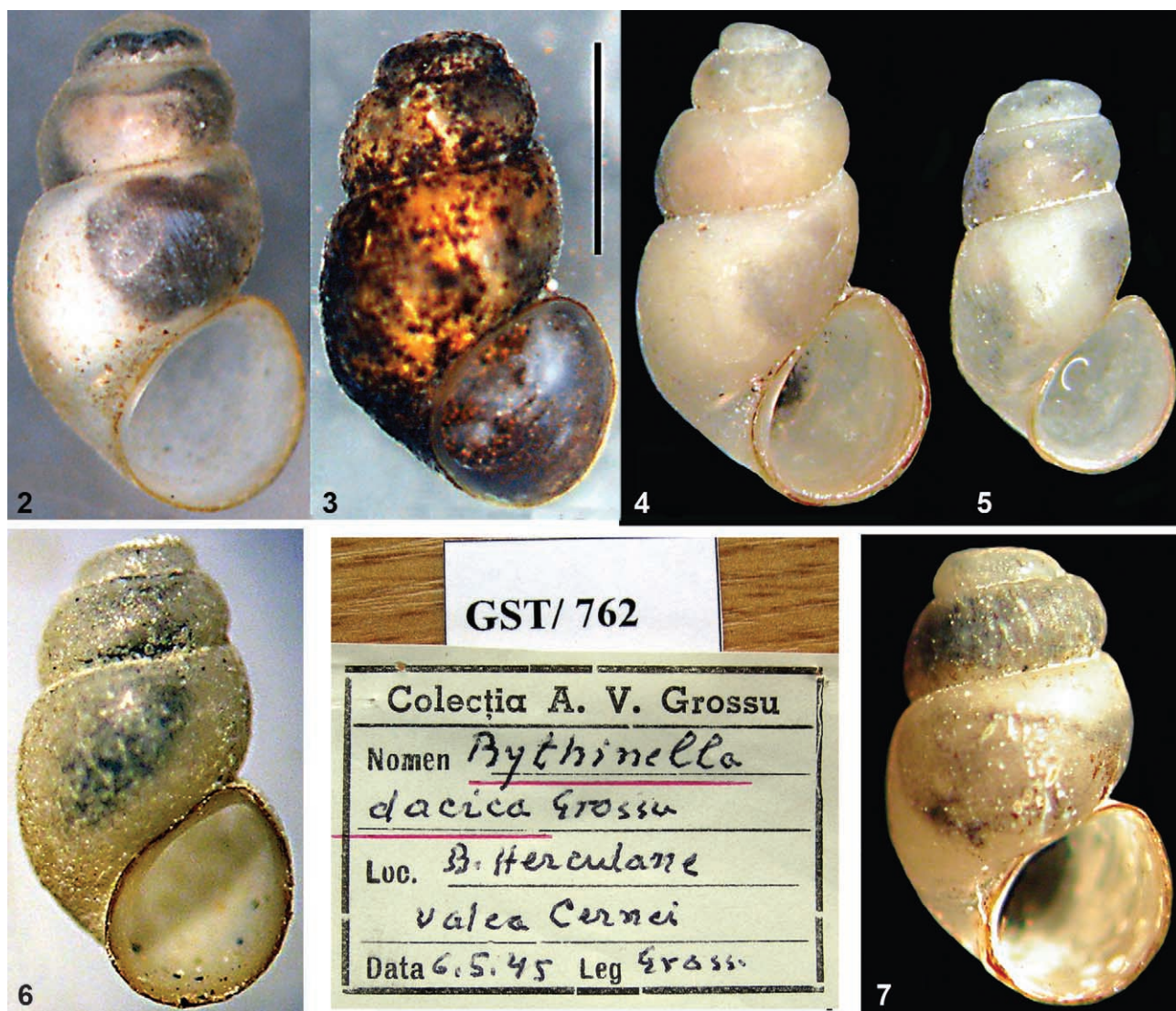
1. *Bythinella dacica* Grossu, 1946

Figs 1–9, 12–15, 30–31.

GROSSU (1946: 205–206) gives the following description: “*B. dacica* has the following specific characters: cylindric-ovale shell, the last whorl being not wider then the precedent; spire made by 4 well convexe whorls, the body one without a periferal carena, but very tall, 1 to 1.5 times taller than the rest of the spire; vertical aperture, the peristome area very little tangent to the spire, not stepping outside, simple and fluffy, less protruded; a small ombilical scratch. Shell uncoloured or a glassy green, less or not transparent, fragile; frequently covered by green algae (being always of small dimensions), rarely covered with detri-

tus, being then of a grey-brownish colour. *Dimensions*: height 2.3–2.6 mm, width 1–1.2 mm, aperture 1:1 mm”.

Unfortunately, his type material could not be obtained, but we were able to examine specimens of *B. dacica* from his collection deposited in Grigore Antipa Museum in Bucharest, labelled by him (Fig. 6). The specimens resembled the one figured in his description (GROSSU 1946: fig. 2 on p. 204). His specimens are similar to the shell of *B. dacica* from our materials (Figs 2–5, 7), although the variation we found was somewhat wider. Interestingly, our specimens from the locality least distant from Grossu’s type locality (Figs 4–5) are less similar to the shells described and figured by him than our shells from another locality



Figs 2–7. Shells of *Bythinella dacica*: 2–3 – specimen from locality R09 (in FALNIOWSKI et al. submitted), 4–5 – specimen from locality R10, 6 – specimen from Grossu’s collection, sampled in 1945, with the original hand-written label on the right (Grigore Antipa Museum in Bucharest, photographed by Dr. Dumitru Murariu, Ms. Gabriela Andrei, Mrs. Oana Popa and Ms. Elena Iorgu), 7 – specimen from locality R08; scale bar 1 mm

(Figs 2–3). It must be noted, however, that the shell characters in *Bythinella* are in most cases not sufficient for species discrimination.

Penis of *B. dacica* (Figs 8, 12–14), when not contracted (as in Fig. 13), with slender arms, its left arm (with the vas deferens inside) shorter and often much slenderer than the right one.

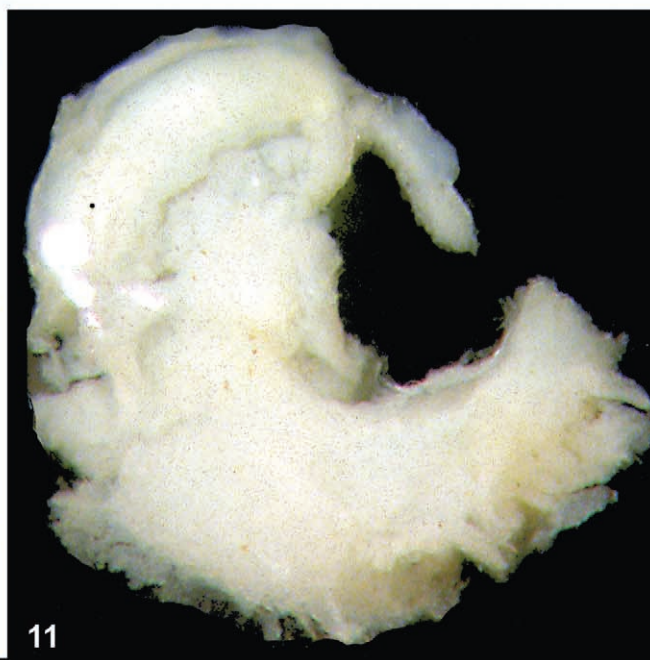
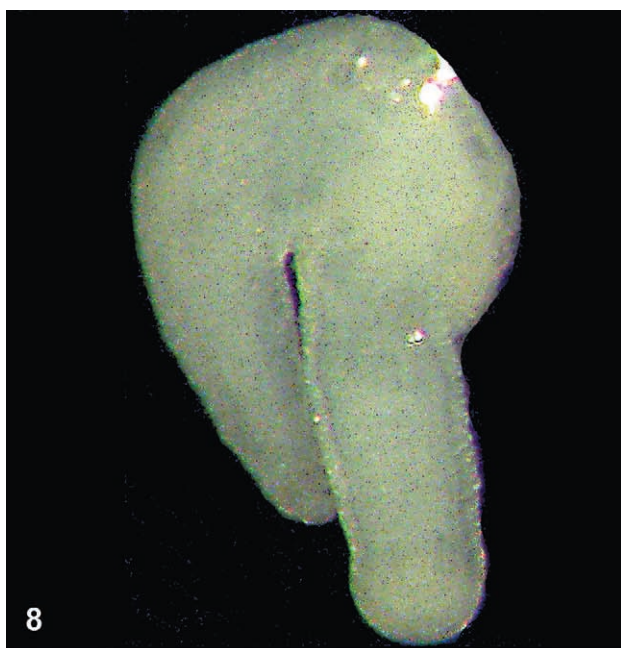
Female reproductive organs (Figs 9, 30–31) with a J-shaped, moderately big bursa copulatrix whose duct leaves the bursa smoothly, without a sharply marked border between the two structures.

Differential diagnosis: *B. dacica* differs from the other Romanian *Bythinella* in its slender penis with

the left arm rather long, but still much shorter and slenderer than the right one, and in its J-shaped bursa with a smooth (without a sharp border) transition to the duct.

[Reference sequences' names/GenBank accession numbers: COI – R10F9/FJ545031, R10F10/FJ545032, R10FX/FJ545033, R10H12/FJ545034, R10HX/FJ545035, R10O9/FJ545036; ITS-1 – R10F9/FJ544985, R10F10/FJ544986, R10H12/FJ544987]

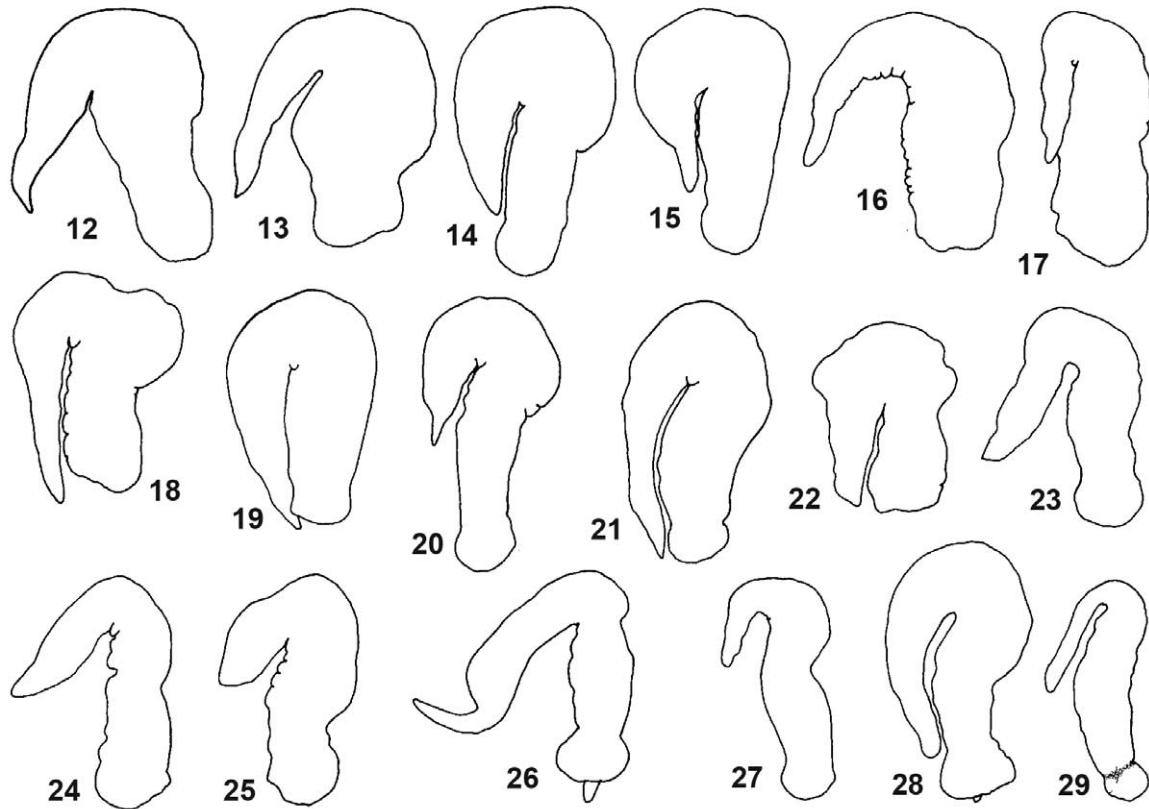
GROSSU (1946: 205) characterised his material of *B. dacica* in the following way “I found this gastropod for the first time in a brook, tributary from the left side to the Cerna (River), close to “Crucea Ghizelei”



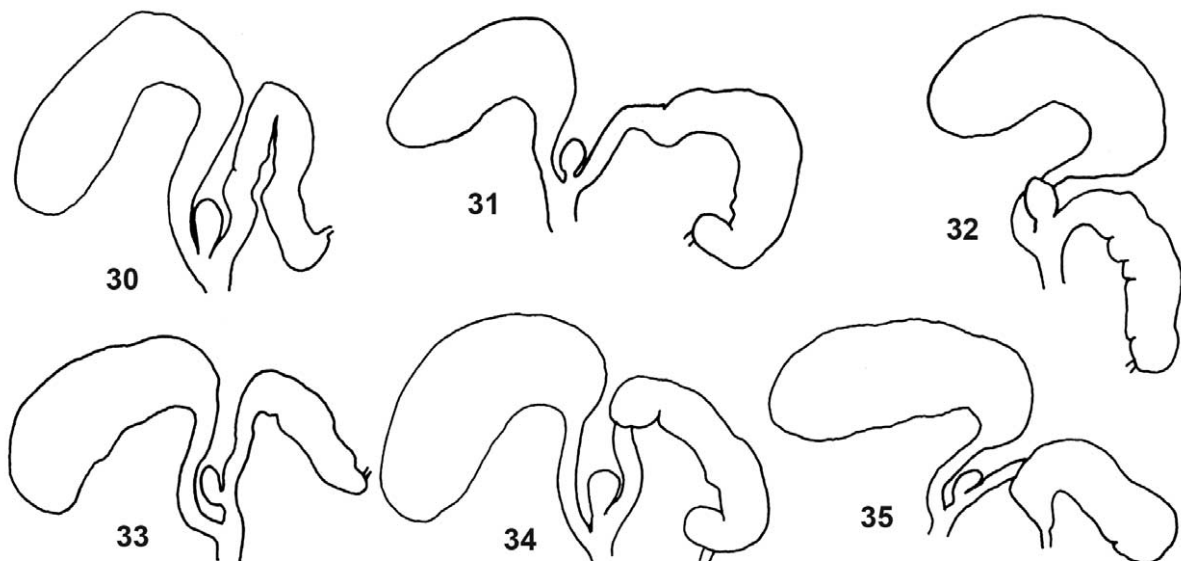
Figs 8–11. Reproductive organs of *Bythinella*: 8 – penis of *B. dacica*, 9–11 – renal and pallial section of female reproductive organs: 9 – *B. dacica*, 10 – *B. molcsanyi*, 11 – *Bythinella grossui* n. sp.

(The Cross of Ghizela), about 5–6 km east of Băile Herculane in 23 May 1942. I also received many individuals belonging to this species from Prof. Radu Codreanu, which were sampled from Herculane Baths, like the the “Elisabeta spring”, on the right slope of

Cerna (Valley) (in 1.V.1943, water temperature +7 deg. C), “Pecinişca spring”, left tributary of the Cerna, in the place named “Izvorul dintre Pietre” (“The spring among stones”) (water temperature +11 deg. C) and finally from “7 Izvoare Reci” (“Seven Cold



Figs 12–29. Penes of Romanian *Bythinella*: 12–15 – *B. dacica*, 16–18 – *B. molcsanyi*, 19–21 – *Bythinella grossui* n. sp., 22–25 – *Bythinella radomanii* n. sp., 26 – *Bythinella calimanica* n. sp., 27–29 – *Bythinella viseuiana* n. sp.



Figs 30–35. Female reproductive organs of Romanian *Bythinella* (bursa copulatrix, seminal receptacle and coil of oviduct): 30–31 – *B. dacica*, 32 – *B. molcsanyi*, 33 – *Bythinella grossui* n. sp., 34 – *Bythinella radomanii* n. sp., 35 – *Bythinella calimanica* n. sp., for *Bythinella viseuiana* see: Fig. 78–79

Springs”), left slope of the Cerna (in 26.IV.1943, water temperature +10 deg. C). I also sampled many individuals from brooks in Muntele Mic (Caransebeş), at 1,600–1,700 m a.s.l., in the frame of a geological trip realized with Prof. Otto Protescu between 25–27 June 1943”.

Then (1946: 206) he described the distribution of this species: “In Herculane Baths *B. dacica* appears in a typical biotope, namely in waters flowing on limestone substratum. Contrary in Muntele Mic and Țarcu it lives in springs and brooks in crystalline areas, very poor in limestone. Presumably its range within the Dacic province could be broader, but it was not identified up to the present except for the mentioned localities”.

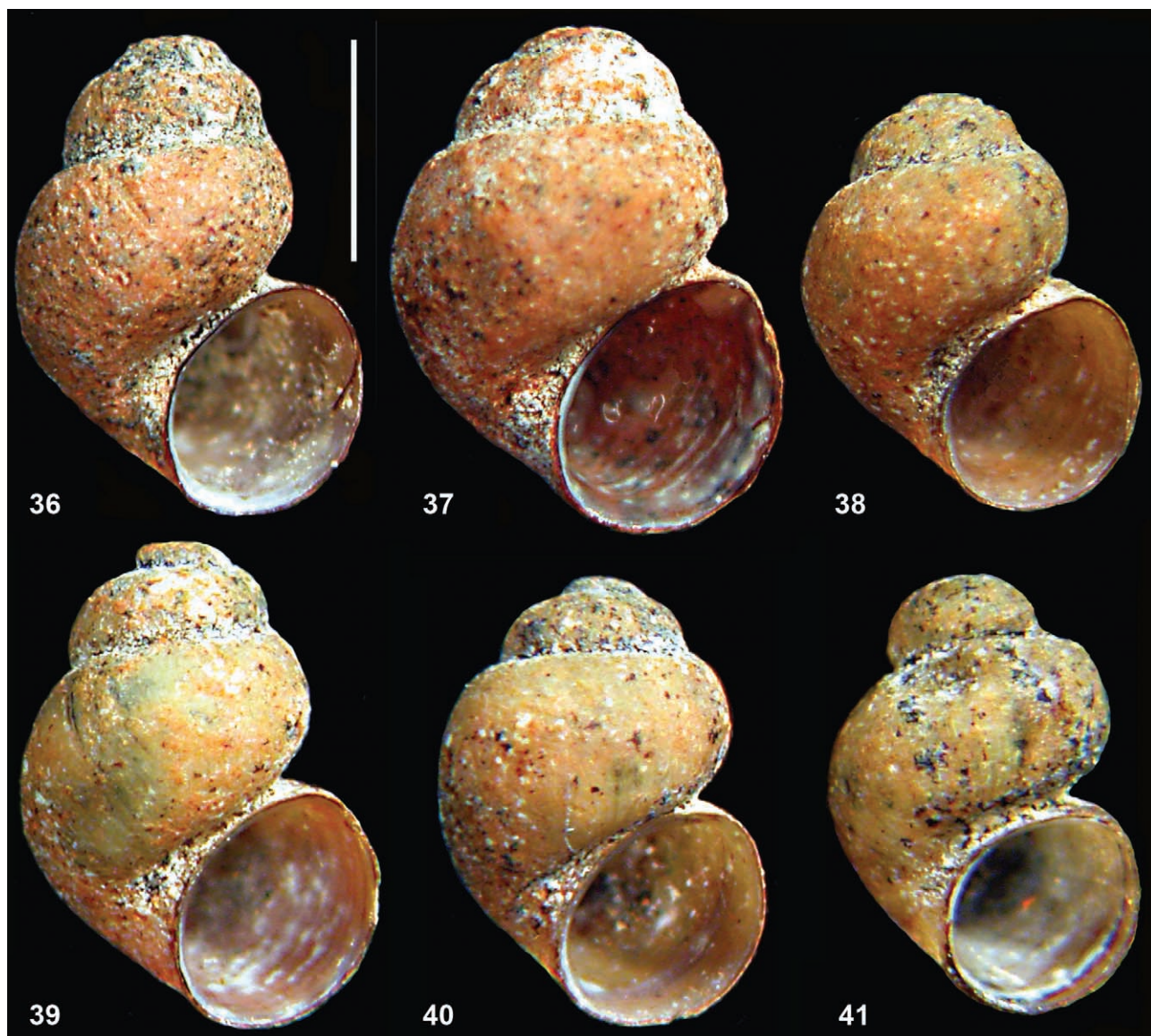
Known distribution: all our materials are from the same range, within the Transylvanian Alps (Retezat Mountains National Park, Valea Cernei National Park; Fig. 1).

2. *Bythinella molcsanyi* H. Wagner, 1941

Figs 1, 10, 16–18, 32, 36–41.

WAGNER (1941) described this species from “Rozsály-tömb [Munții Igriș], Izvora-fennsík [Stațiunea Izvoare], springs near Molcsány-tanya (forester’s hut) (ca. 1,000 m)”. To our knowledge, the species was not known from any other locality so far, although WAGNER (1941) mentioned the occurrence of “*Bythinella austriaca* (Frauenfeld, 1857)” at several localities around the locus typicus of *B. molcsanyi*. The shells of *B. molcsanyi* were characterised by him as small, bulky, low-spired, with a relatively big aperture. The description was rather imprecise.

Within the same region, Igriș Mountains, we found *Bythinella* at four localities (Fig. 1). One of them corresponded to Wagner’s type locality [in the Izvoare Resort (Igriș Mountains), rivulets springing



Figs 36–41. Shells of *Bythinella molcsanyi*; scale bar 0.5 mm

from an oligotrophic marsh (helocrenic brooks), Mara River Basin; 47°44'50.8"N, 23°43'02.7"E, 909 m a.s.l.; the locality R05 in FALNIOWSKI et al. (submitted)]. As mentioned in FALNIOWSKI et al. (submitted), in this population two distinct shell forms were found: one of them smaller, lower, with fewer whorls (Figs 36–41), the other larger, higher and more slender, with more whorls (Figs 42–46). The sequences of the two forms differ markedly (FALNIOWSKI et al. submitted) confirming their species distinctness. However, both molecularly distinct taxa occurred in three other populations inhabiting the Igniș Mountains, but in those populations the shells of the two species were not as markedly different as in population R05. Thus, some specimens of *B. molcsanyi* can only be determined based on molecular data. The description below is based solely on the morphologically distinct "small form" from locality R05.

Shell (Figs 36–41) small, broadly oval, low-spined. About 3.5–4 whorls increasing rapidly. Apex wide and blunt. Body whorl high, its height approaching 4/5 of shell height, broad, the aperture distended and oval. Shell height 2.16–2.26 mm, shell breadth 1.45–1.74 mm, aperture height 0.94–1.13 mm (some of Wagner's specimens were somewhat bigger).

Penis of *B. molcsanyi* (Figs 16–18) with a broad and massive right arm, much broader and usually much longer than the left one (Fig. 18).

Female reproductive organs (Figs 10, 32) with a U-shaped and relatively broad bursa copulatrix, the border between the bursa and its duct rather sharply marked; seminal receptacle relatively big.

Differential diagnosis: *B. molcsanyi* differs from the other Romanian *Bythinella* in its small, low-spined, bulky shell, the massive right arm of the penis, and the U-shaped bursa copulatrix with a sharp transition to its duct.

[Reference sequences' names/GenBank accession numbers: COI – R05A2M/FJ545061, R05B7M/FJ545062, R05E11M/FJ545063, R05J9M/FJ545064, R05M1M/FJ545065, R05M2M/FJ545066, R05XB7M/FJ545067, R05XB9M/FJ545068; ITS-1 – R05E11M/FJ544993, R05I17M/FJ544994]

Known distribution: at present, all the known localities of *B. molcsanyi* are situated in the Igniș Mountains (Fig. 1).

3. *Bythinella grossui* n. sp.

Figs 1, 11, 19–21, 33, 42–46. It is *Bythinella* sp. 6 in FALNIOWSKI et al. (submitted).

Shell (Figs 42–46) relatively big, cylindrical, high-spined. About 4.5 convex whorls growing regularly. Apex rather narrow (Figs 42, 45), but may be wider and blunt (Figs 43–44, 46). The body whorl relatively low, its height approaching 0.7 of the shell height, not much broader than the penultimate whorl, the aperture narrow, not prominent, slightly

swollen, the lip slightly marked. The shell brownish-greenish, slightly translucent. Shell height 2.30–2.56 mm, shell breadth 1.27–1.47 mm, aperture height 0.91–1.06 mm. Shell variability very restricted.

Penis (Figs 19–21), when not contracted (as in Fig. 20), with the left arm usually longer but not much slenderer than the not massive right arm.

Female reproductive organs (Figs 11, 33) with a straight (slightly arched) bursa copulatrix with a sharp transition to the duct, and a small seminal receptacle.

Differential diagnosis: it differs from the other Romanian *Bythinella* in its cylindrical shell with convex and slightly translucent whorls, the penis with its left arm longer than the relatively narrow right arm, its straight bursa copulatrix whose duct's proximal end is sharply marked, and its small seminal receptacle.

[Reference sequences' names/GenBank accession numbers: COI – R05A8D/FJ545118, R05A9D/FJ545119, R05A10D/FJ545120, R05D1D/FJ545121, R05D2D/FJ545122, R05E12D/FJ545123, R05EX2D/FJ545124, R05EX4D/FJ545125, R05I17D/FJ545126, R05I18D/FJ545127, R05J11D/FJ545128, R05P5D/FJ545129; ITS-1 – R05I16D/FJ545009, R05I18D/FJ545010]

Locus typicus: in the Izvoare Resort (Igniș Mountains), rivulets springing from an oligotrophic marsh (helocrenic brooks), Mara River Basin; 47°44'50.8"N, 23°43'02.7"E, 909 m a.s.l.; this is locality R05 of FALNIOWSKI et al. (submitted).

Derivatio nominis: named for the Romanian malacologist Alexandru Grossu, whose belief in some yet unknown *Bythinella* species inhabiting Romania (see the Introduction) proved justified.

Type material: holotype (Fig. 42), as well as paratypes are deposited at the Museum of Natural History, Wrocław University.

Known distribution (Fig. 1): apart from the type locality, the species is known from three localities in the Igniș Mountains. The species occurs sympatrically with *B. molcsanyi*.

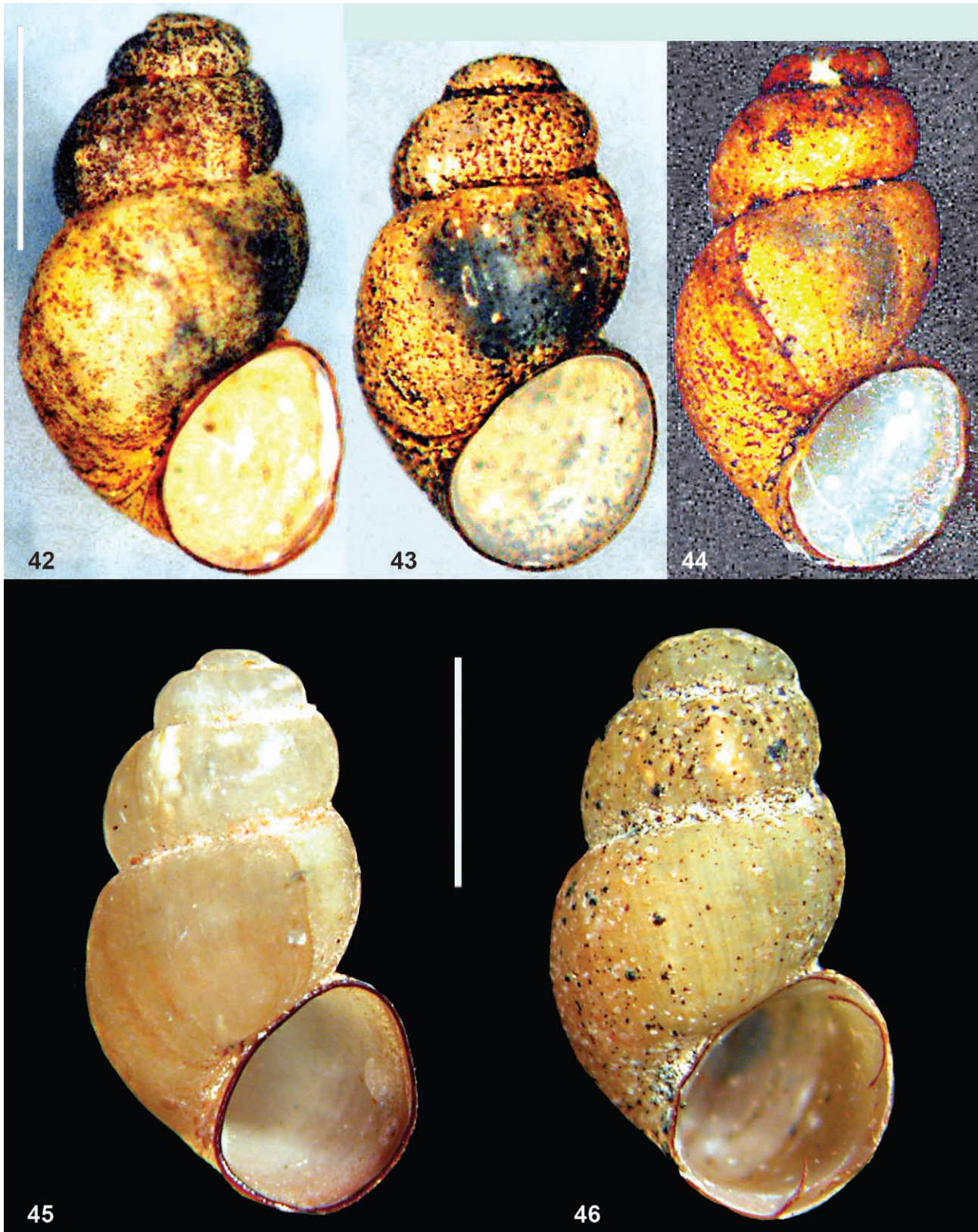
4. *Bythinella radomanii* n. sp.

Figs 1, 22–25, 34, 47–52. It is *Bythinella* sp. 1 in FALNIOWSKI et al. (submitted).

The shell (Figs 47–52) relatively big, cylindrical, high-spined. About 4.5 somewhat flattened whorls growing regularly. Apex usually rather narrow (Figs 47–48, 50, 52), but may be wider and blunt (Figs 49, 51). Body whorl relatively low, its height approaching 0.7 of shell height, not much broader than the penultimate whorl, aperture narrow, not prominent, slightly swollen, lip usually slightly marked (but may be prominent: Fig. 49). Shell whitish, translucent. Shell height 2.0–2.86 mm, shell breadth 1.25–1.64 mm, aperture height 0.93–1.21 mm. Shell variability restricted.

Penis (Figs 22–25), when not contracted (as in Fig. 22) with its left arm moderately long, shorter than the right arm which is slightly thicker than the left one.

Female reproductive organs (Fig. 34) with a J-shaped bursa with a sharp transition to the duct, and a big seminal receptacle.



Figs 42–46. Shells of *Bythinella grossui* n. sp.; 17 – holotype; scale bar 1 mm

Differential diagnosis: it differs from the other Romanian *Bythinella* in its cylindrical shell, with slightly flattened whorls and translucent walls, the penis with its left arm shorter and not much narrower than the right one, its J-shaped bursa copulatrix with a sharp transition to the duct, and its big seminal receptacle.

[Reference sequences' names/GenBank accession numbers: COI – R06B19/FJ545069, R06B20/FJ545070, R06G9/FJ545071, R06G10/FJ545072, R06H5/FJ545073, R06H6/FJ545074, R06H7/FJ545075, R06H8/FJ545076; ITS-1 – R06G9/FJ544995,

R06H5/FJ544996, R06H6/FJ544997, R06H7/FJ544998, R06H8/FJ544999]

Locus typicus: Bihor Mountains (at the edge of the Apuseni Mountains Natural Park), close to the Vârtop Pass, a small brooklet in the Crișul Băița River Basin (tributary to the Crișul Negru River), in a spruce forest, near the main road; 46°31'25.3"N, 22°37'25.2"E, 1,142 m a.s.l. (locality R06 of FALNIOWSKI et al. submitted).

Derivatio nominis: named for Pavle Radoman, the outstanding expert on the Risssoidea, whose extensive, long-lasting research on the Balkan Risssoidea is



Figs 47–52. Shells of *Bythinella radomanii* n. sp.; 47 – holotype, scale bar 1 mm

still the most important source of our knowledge of the group in this part of Europe.

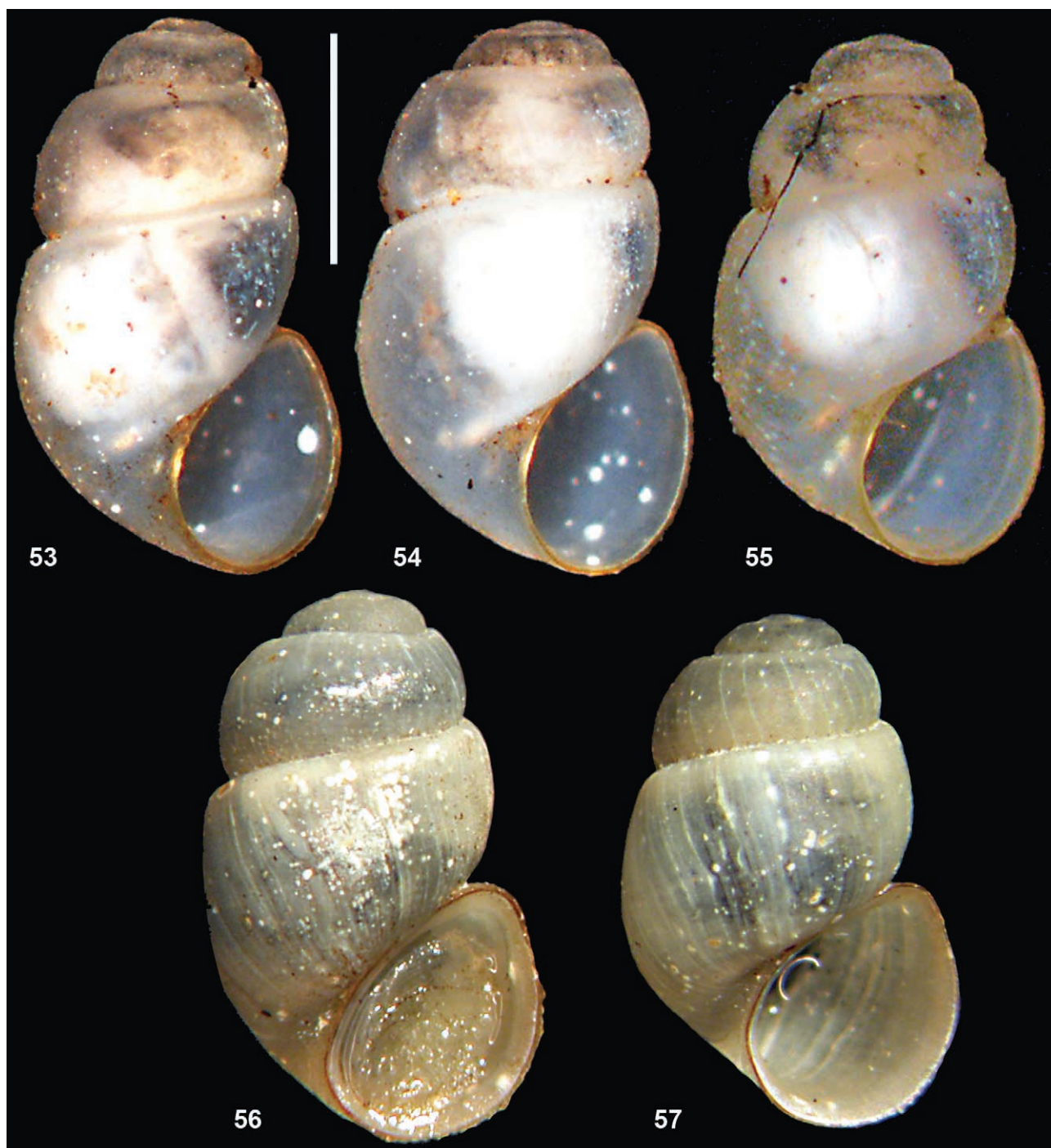
Type material: holotype (Fig. 47), as well as paratypes are deposited at the Museum of Natural History, Wrocław University.

Known distribution (Fig. 1): the species was found at yet another locality in the Bihor Mountains (FALNIOWSKI et al. submitted).

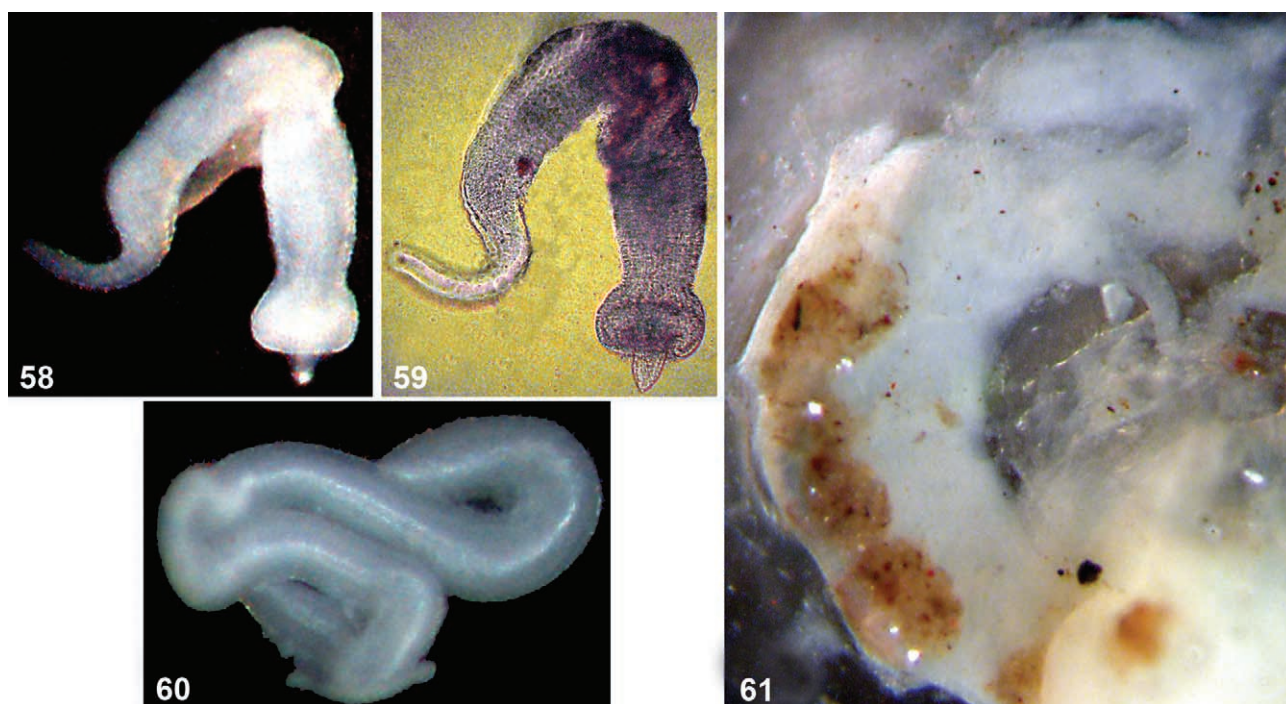
5. *Bythinella calimanica* n. sp.

Figs 1, 26, 35, 53–61. It is *Bythinella* sp. 2 in FALNIOWSKI et al. (submitted).

Shell (Figs 53–57) relatively small, barrel-shaped, moderately high-spired. About 4 convex whorls growing rapidly. Apex broad and blunt. Body whorl relatively low, its height approaching 0.7 of the shell height, its breadth nearly identical with the breadth of the penultimate whorl, aperture very narrow, not



Figs 53–57. Shells of *Bythinella calimanica* n. sp.; 53 – holotype; scale bar 1 mm



Figs 58–61. Reproductive organs of *Bythinella calimanica* n. sp.: 58–59 – penis, 60 – flagellum, 61 – renal and pallial section of female reproductive organs

prominent, with a well marked angle at its top, slightly swollen, lip poorly or very poorly marked. Shell white or brown-greenish, translucent or slightly translucent. Shell height 2.19–2.41 mm, shell breadth 1.41–1.44 mm, aperture height 1.03–1.09 mm. Shell variability (of both shape and dimensions) if any at all, extremely restricted.

Penis (Figs 26, 58, 59) with its left arm much longer and slightly thinner than its right arm. Flagellum (Fig. 60) thick and massive, its diameter almost constant on its whole length.

Female reproductive organs (Figs 35, 61) with a J-shaped bursa with a sharp transition to the duct, distal end of the bursa narrow, seminal receptacle small.

Differential diagnosis: it differs from the other Romanian *Bythinella* in its small, barrel-shaped shell, its penis with a very long left and a narrow right arm, its J-shaped, distally narrow bursa whose duct leaves the bursa sharply, and its small seminal receptacle.

[Reference sequences' names/GenBank accession numbers: COI – R12I4/FJ545084, R12I5/FJ545085, R12I6/FJ545086, R12J5/FJ545087, R12J6/FJ545088, R12J7A/FJ545089, R12J7B/FJ545090, R12J7C/FJ545091, R12J7D/FJ545092, R12M8/FJ545093, R12M10/FJ545094, R12XC2/FJ545095, R12XC5/FJ545096]

Locus typicus: Călimani Mountains, near Sălard Village, in the Toplița-Deda Gorges of the Mureș River, a small brooklet on the southern mountain slope, near the main road. 46°57'10" N, 25°04'07" E, 620 m a.s.l. (locality R12 of FALNIOWSKI et al. submitted).

Derivatio nominis: named for the Călimani Mountains, where the species occurs.

Type material: holotype (Fig. 53), as well as paratypes are deposited at the Museum of Natural History, Wrocław University.

Known distribution (Fig. 1): at present, known only from the type locality.

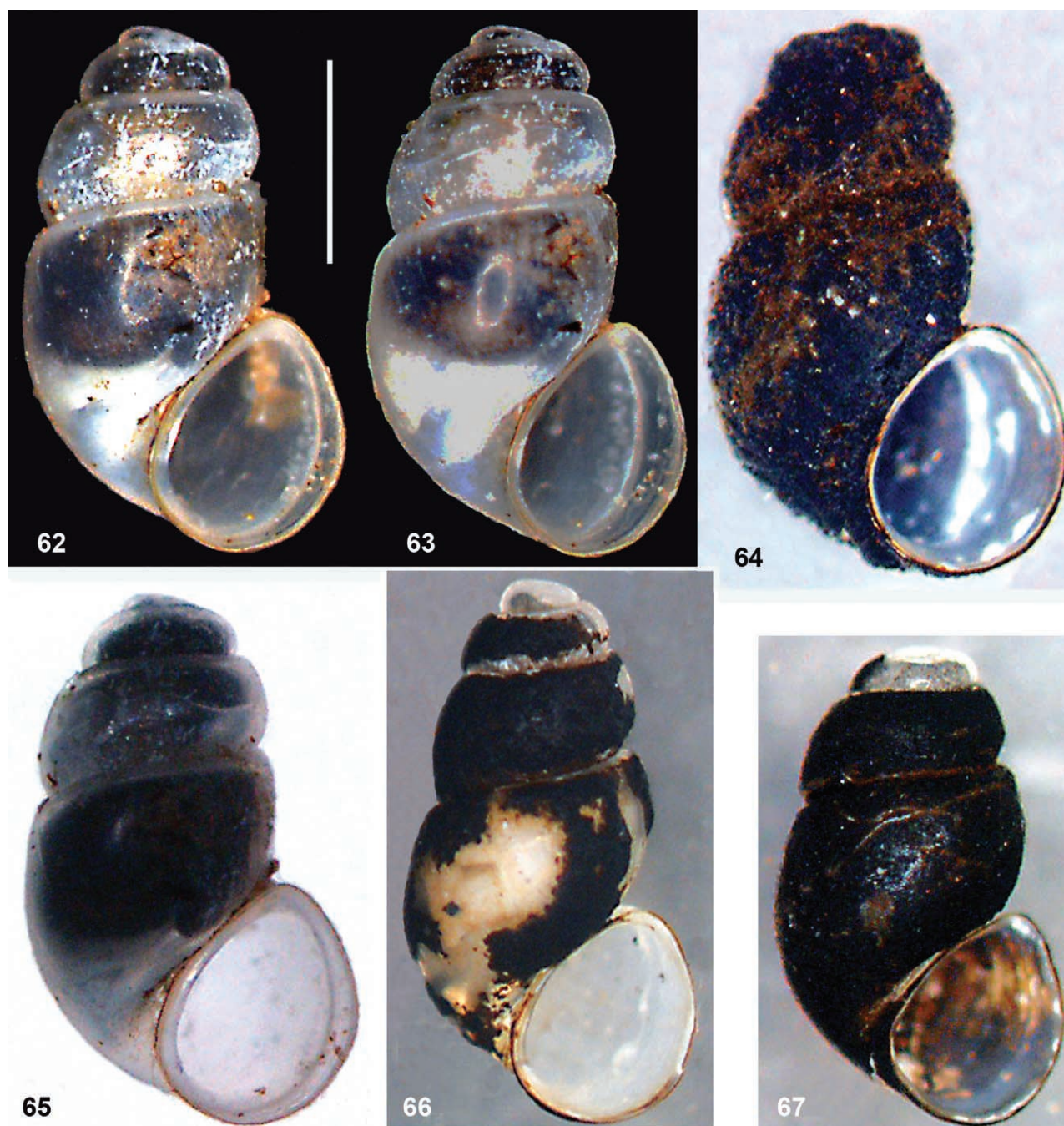
6. *Bythinella viseuiana* n. sp.

Figs 1, 27–29, 62–79. It is *Bythinella* sp. 4 in FALNIOWSKI et al. (submitted).

Shell (Figs 62–67) relatively big, cylindrical, high-spired. About 4.5–5 somewhat flattened whorls growing regularly. Apex narrow (Figs 62, 63, 65, 66), rarely it may be somewhat wider (Figs 64, 67). Body whorl relatively low, its height approaching 0.65 of the shell height, not much broader than the penultimate whorl, aperture narrow, not prominent, slightly swollen, lip often well marked. Shell whitish, translucent. Shell variability relatively wide, including also nearly turreted forms (Fig. 66). Shell height 2.32–2.68 mm, breadth 1.39–1.75 mm, aperture height 1.04–1.21 mm.

Penis (Figs 27–29, 73–77) with its left arm shorter than the right arm, narrow and often filamentous, and its right arm long and slender. Flagellum (Fig. 72) proximally broad and massive, its diameter markedly decreases distally.

Female reproductive organs (Figs 68–71, 78, 79) with a J-shaped, bulky bursa copulatrix with a sharp transition to the duct, and a big, long seminal receptacle.



Figs 62–67. Shells of *Bythinella viseuiana* n. sp.; 62 – holotype; bar equals 1 mm

Differential diagnosis: it differs from the other Romanian *Bythinella* in its cylindrical shell with somewhat flattened whorls, a translucent wall, and often prominent lip, its penis with a narrow, often filamentous, short left arm and a long and slender right arm, its J-shaped bulky bursa copulatrix and its long seminal receptacle.

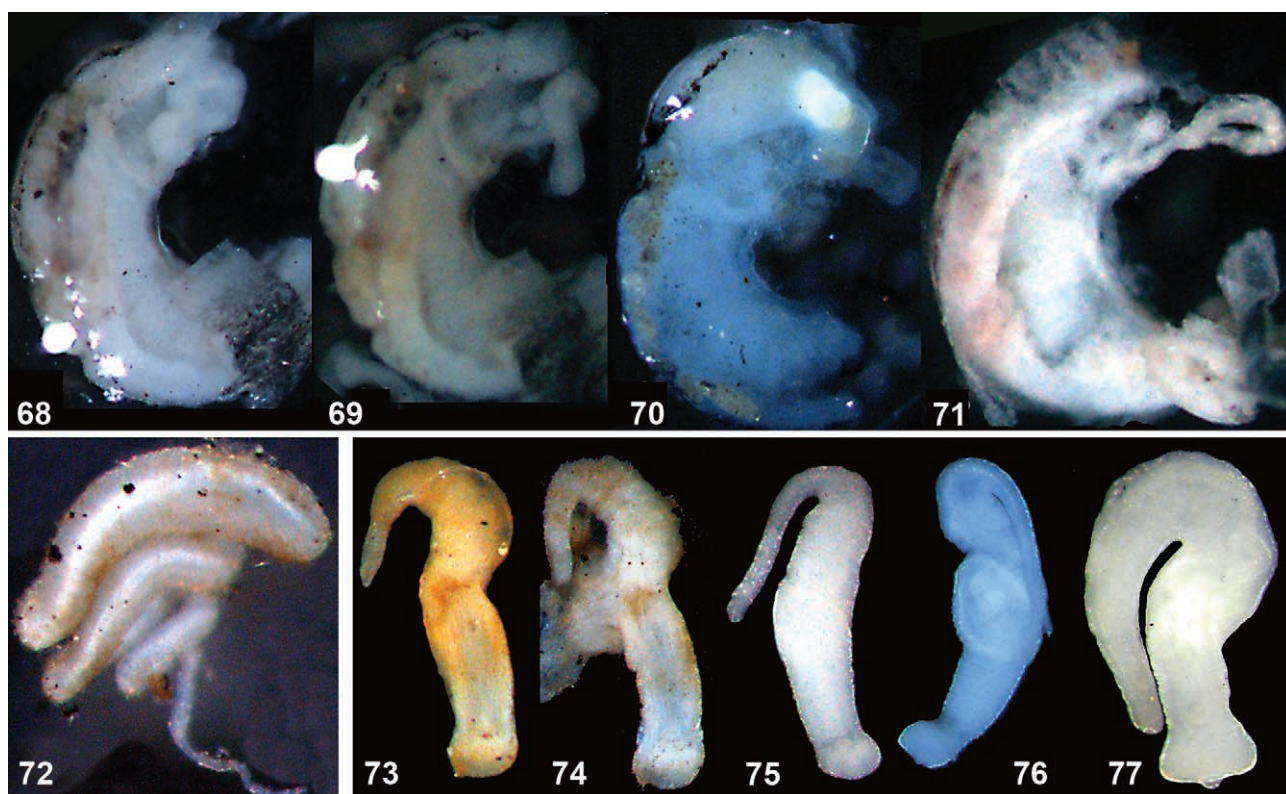
[Reference sequences' names/GenBank accession numbers: COI – R01A1/FJ545097, R01A2/FJ545098, R01G6/FJ545099, R01G7/FJ545100, R01G8/FJ545101, R01I1/FJ545102, R01I2/FJ545103, R01I3/FJ545104, R01IX/FJ545105; ITS-1 – R01I1/FJ545003, R01I3/FJ545004]

Locus typicus: Vișeu River Valley, downstream from the village of Bistra, a helocrenic brooklet close to the main road, a tributary of the Vișeu; 47°52'14" N, 24°11'23" E, 362 m a.s.l.; the northernmost distribution point in Romania (R01 locality of FALNIOWSKI et al. submitted).

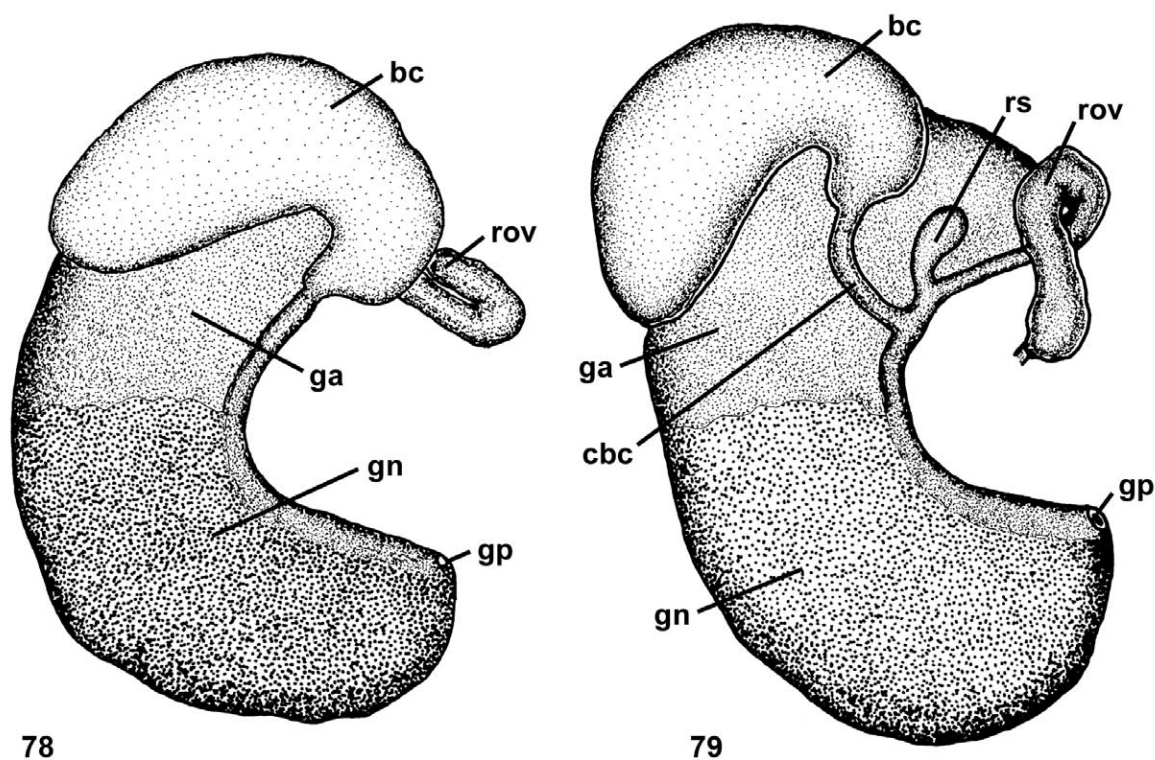
Derivatio nominis: named for the Vișeu River Valley the species comes from.

Type material: holotype (Fig. 62), as well as paratypes are deposited at the Museum of Natural History, Wrocław University.

Known distribution (Fig. 1): at present, known only from the type locality.



Figs 68–77. Reproductive organs of *Bythinella viseuiana* n. sp.: 68–71 – renal and pallial section of female reproductive organs, 72 – flagellum, 73–77 – penis (51 – ventrally)



Figs 78–79. Renal and pallial section of female reproductive organs of *Bythinella viseuiana* n. sp.: 78 – bursa and coil of oviduct in natural position, 79 – bursa and coil bent, to show seminal receptacle (bc – bursa copulatrix, cbc – duct of bursa copulatrix, ga – albumen gland, gn – capsule gland, gp – gonoporus, rov – coil of oviduct, renal oviduct, rs – seminal receptacle)

DISCUSSION

Most often, *Bythinella austriaca* (Frauenfeld, 1857) is reported as the only *Bythinella* species that occurs in Romania. Our phylogenetic analysis showed that there, in fact, is no *B. austriaca* in Romania. The small, low-spired form from the Igriş Mountains corresponds in shell morphology to the description of *B. molcsanyi* H. Wagner, 1941 from this area ("Rozsály-tömb [Munții Igriş], Izvoara-fennsík [Stațiunea Izvoare], springs near Molcsány-tanya [forester's hut]" (WAGNER 1941). One of our localities is very close to WAGNER's (1941) type locality. Thus, the proper name for this taxon is *Bythinella molcsanyi*.

GROSSU (1946) described *B. dacica* Grossu, 1946. In his book (GROSSU 1986) he writes [p. 244]: "In Romania [*B. dacica*] was sampled from brooks and cold springs at Herculan Baths, northwards from "7 izvoare [seven springs]" area, on crystalline substratum, than in the Muntele Mic and Tarcu (about 1,700–2,000 m) in Retezat Mts. As well as from Semen Mountain (in Banat region) from the springs of the Timis River at 1,400 m a. s. l. Always in crystalline geological substratum, mostly fixed on stones from springs and torrents. In his paper RADOMAN (1976) [...] indicates its presence from Herculan Baths and considers it as a good species". The type locality of *B. dacica* is Herculan Baths (Cerna River Valley): cold springs and rivulets. This is one of our localities, thus we can assign this molecularly distinct group to *B. dacica*.

Another species of *Bythinella*, *B. melanostoma* (Brancsik, 1889), recently considered to be a subspecies of *B. austriaca* (BANK 2004), was listed from Romania by some authors who most probably followed GROSSU (1956) citing CLESSIN (1887). The latter author writes about the distribution of *Bythinella austriaca* var. *melanostoma* Brancsik, 1889: "spring in the Vratna Valley and on the Vapecz Mountain, Trencsin District, Hungary". This locality is now in Slovakia. Thus, it does not seem appropriate to extend the distribution of this taxon to Romania. It was mentioned by GROSSU (1956) to occur in the Aries Valley, Apuseni Mountains, close to two of our localities. Nevertheless, we consider it unjustified to use this name for the molecularly distinct taxon inhabiting those localities. Sometimes *B. austriaca ehrmanni*

Pax, 1938 was mentioned from Romania, especially the region of Herculan Baths, to distinguish the snails with large, high-spired shells. However, the subspecies described from Żelazno in the Polish Sudety Mountains (FALNIOWSKI 1987) cannot be identified with those Romanian forms.

The species-level taxonomy in *Bythinella* was primarily based on shell characters alone (see FALNIOWSKI 1987 for literature review). Later, numerous efforts were made to seek anatomical characters to discriminate the species of the genus (e.g. JUNGBLUTH & BOETERS 1977, FALNIOWSKI 1987, 1992, BOETERS 1998, BERNASCONI 2000, GLÖER 2002, GLÖER & PEŠIĆ 2006). FALNIOWSKI et al. (1998, 1999), MAZAN (2000) and MAZAN & SZAROWSKA (2000a, b) in their allozyme studies on the Polish and Slovakian *Bythinella* found, however, only slight differences among morphologically distinguishable species. Recently, BICHAIN et al. (2007) and HAASE et al. (2007) found well marked molecular differences (of a range corresponding to other rissooid species), advocating discrimination of several "good" species. However, in *Bythinella* molecular differences are usually not well reflected in morphology, which confirms the morphostatic (DAVIS 1992) model of evolution, with numerous cryptic species within the genus. The same seems to hold for the Romanian *Bythinella*. The six species distinguished in the present paper are molecularly distinct, but their morphology does not provide characters that would allow for undoubtful determination, to say nothing about taxonomic decision as to their species distinctness. Despite all the practical consequences, one must consider that there are no morphological characters sufficient for taxonomy within the Rissooidea (SZAROWSKA & FALNIOWSKI 2008) at the species level as well, and *Bythinella* is such a case.

ACKNOWLEDGEMENTS

The study was supported by a grant from the Institute of Zoology, Jagiellonian University (BW/IZ/2008). We would like to express our gratitude to MONICA SÎRBU and ANA MARIA BENEDEK for their fastidious help in the fieldwork.

REFERENCES

- BANK R. A. 2004. Fauna Europaea: Mollusca, Gastropoda. Fauna Europaea version 1.1, <http://www.faunaeur.org>.
 BERNASCONI R. 2000. Révision du Genre *Bythinella* (Moquin-Tandon, 1855) (Gastropoda Prosobranchia Hydrobiidae: Amnicolidae Bythinellini) de la France du Centre-Ouest, du Midi et des Pyrénées. Doc. Malacol. 1: 1–126.
 BICHAIN J.-M., GAUBERT P., SAMADI S., BOISSELIER-DUBAYLE M.-C. 2007. A gleam in the dark: Phylogenetic species delimitation in the confusing spring-snail genus *Bythinella* Moquin-Tandon, 1856 (Gastropoda: Rissooidea: Amnicolidae). Mol. Phyl. Evol. 45: 927–941.

- BOETERS H. D. 1998. Mollusca: Gastropoda: Superfamilie Risssooidea). In: SCHWOERBEL J., ZWICK P. (eds). Süßwasserfauna von Mitteleuropa. Begründet von A. BRAUER, 5/1–2, Gustav Fischer Verlag, Jena–Lübeck–Ulm.
- CLESSIN S. 1887. Molluskenfauna Oesterreich-Ungarns und der Schweiz. Verlag von Bauer & Raspe, E. Küster, Nürnberg.
- DAVIS H. M. 1992. Evolution of prosobranch snails transmitting Asian *Schistosoma*: coevolution with *Schistosoma*: a review. *Progr. Clin. Parasitol.* 3: 145–204.
- FALNIOWSKI A. 1987. Hydrobioidea of Poland (Prosobranchia: Gastropoda). *Folia Malacol.* 1: 1–122.
- FALNIOWSKI A. 1992. Genus *Bythinella* Moquin-Tandon, 1855, in Poland (Gastropoda, Prosobranchia, Hydrobiidae). In: GITTENBERGER E., GOUD J. (eds). Proceedings of the Ninth International Malacological Congress, Edinburgh, 31 August–6 September 1986. *Unitas Malacologica and National Museum of Natural History, Leiden*, pp. 135–138.
- FALNIOWSKI A., MAZAN K., SZAROWSKA M. 1999. Homozygote excess and gene flow in the spring snail *Bythinella* (Gastropoda: Prosobranchia). *J. Zool. Sys. Evol. Res.* 37: 165–175.
- FALNIOWSKI A., SZAROWSKA M. 2009. Letter to the Editor: Comments to the paper of Bichain et al. (2007) A gleam in the dark: Phylogenetic species delimitation in the confusing spring-snail genus *Bythinella* Moquin-Tandon, 1856 (Gastropoda: Risssooidea: Amnicolidae), published in *Molecular Phylogenetics and Evolution*, 45 (3): 927–941 (2007). *Mol. Phyl. Evol.* 50: 405–406.
- FALNIOWSKI A., SZAROWSKA M., FIAŁKOWSKI W., MAZAN K. 1998. Unusual geographic pattern of interpopulation variation in a spring snail *Bythinella* (Gastropoda, Prosobranchia). *J. Nat. Hist.* 32: 605–616.
- FALNIOWSKI A., SZAROWSKA M., SIRBU I. (submitted). *Bythinella* Moquin-Tandon, 1856 (Gastropoda: Risssooidea: Bythinellidae) in Romania: species richness in a glacial refugium.
- GIUSTI F., PEZZOLI E. 1977. Primo contributo alla revisione del genere *Bythinella* in Italia. *Natura Bresciana. Ann. Mus. Civ. St. Nat. Brescia* 14: 3–80.
- GIUSTI F., PEZZOLI E. 1980. *Gasteropodi*, 2 (Gastropoda: Prosobranchia; Hydrobioidea, Pyrguloidea). Consiglio Nazionale delle Ricerche AQ/1/47. Guide per il riconoscimento delle specie animali delle acque interne Italiane, 8, Verona.
- GLÖER P. 2002. Die Süßwassergastropoden Nord- und Mitteleuropas, Bestimmungsschlüssel, Lebensweise, Verbreitung. 2. neuarbeitete Auflage. In: *Die Tierwelt Deutschlands*, 73, ConchBooks, Hackenheim.
- GLÖER P., PEŠIĆ V. 2006. *Bythinella hansboetersi* n. sp., a new species from Bulgaria. *Heldia* 6: 11–15.
- GROSSU A. V. 1942. Katalog der im Rumänischen Faunagebiet lebenden Gastropoden. *Acad. Rom. Mem. Sec. Știi. III*, 18, 10: 1–53.
- GROSSU A. V. 1946. Contributions á la Faune malacologique de Roumanie: sur deux espèces nouvelles de Hydrobiidae: *Paladilhioopsis codreanui* n. sp., *Bythinella dacica* n. sp. *Acad. Rom. Bull. Sec. Știi.* 29: 203–206.
- GROSSU A. V. 1956. Mollusca; Gastropoda Prosobranchia i Opisthobranchia. In: *Fauna R.P.R.*, 3 (2), Ed. Acad. R.P.R., București.
- GROSSU A. V. 1974. Caracteristica și asociațiile de gastropode din Banat în diferite ecosisteme. *Tibiscus – Centenar Muzeul Bănățean Timișoara*: 95–106.
- GROSSU A. V. 1986. *Gastropoda Romaniae*, vol. 1; I. Caracterele generale, istoricul și biologia gastropodelor; II. Subclasa Prosobranchia și Opisthobranchia. Ed. Litera, București.
- GROSSU A. V. 1999. A scientific collection of Romanian molluscs (shells only) – Prof. dr. A. V. Grossu's donation to “Grigore Antipa” National Museum of Natural History from Bucharest. *Trav. Mus. Hist. Nat. “Grigore Antipa”* 41: 7–35.
- GROSSU A. V., NEGREA A. 1963. Contribuții la cunoașterea moluștelor din peșterile R.P.R. *Lucrările Inst. Speologie “E. Racoviță”* 2: 503–508.
- HAASE M., WILKE T., MILDNER P. 2007. Identifying species of *Bythinella* (Caenogastropoda: Risssooidea): A plea for an integrative approach. *Zootaxa* 1563: 1–16.
- JUNGBLUTH J. H., BOETERS H. D. 1977. Zur Artabgrenzung bei *Bythinella dunkeri* und *bavarica* (Prosobranchia). *Malacologia* 16: 143–147.
- KABAT A. R., HERSHLER R. 1993. The prosobranch snail family Hydrobiidae (Gastropoda: Risssooidea): Review of classification and supraspecific Taxa. *Smithsonian Contrib. Zool.* 547: 1–94.
- MAZAN K. 2000. Morphological and allozymic variation within and between populations of *Bythinella* Moquin-Tandon, 1855 (Gastropoda: Prosobranchia), I. Morphological characters. *Folia Malacol.* 8: 107–139.
- MAZAN K., SZAROWSKA M. 2000a. Morphological and allozymic variation within and between populations of *Bythinella* Moquin-Tandon, 1855 (Gastropoda: Prosobranchia), II. Phenetic analysis. *Folia Malacol.* 8: 189–213.
- MAZAN K., SZAROWSKA M. 2000b. Morphological and allozymic variation within and between populations of *Bythinella* Moquin-Tandon, 1855 (Gastropoda: Prosobranchia), III. Phylogenetic analysis. *Folia Malacol.* 8: 257–269.
- RADOMAN P. 1976. Speciation within the family Bythinellidae on the Balkans and Asia Minor. *Zeitschr. zool. Syst. Evolutionsforsch.* 14: 130–152.
- RADOMAN P. 1983. Hydrobioidea a superfamily of Prosobranchia (Gastropoda). I. Systematics. *Monographs Serbian Academy of Sciences and Arts, DXLVII, Department Sciences* 57: 1–256.
- RADOMAN P. 1985. Hydrobioidea, a superfamily of prosobranchia (Gastropoda). II. Origin, zoogeography, evolution in the Balkans and Asia Minor. *Faculty of Science – Department of Biology Monographs*, 1, Institute of Zoology Beograd 1: 1–173.
- REES W. J. 1965. The aerial dispersal of Mollusca. *Proc. Malac. Soc. London* 36: 269–282.
- SÁRKÁNY-KISS A. 1983. Contribuții la cunoașterea populațiilor și asociațiilor de gastropode acvatice din valea râului Mureș, sectorul Izvorul Mureșului – Tg. Mureș. *Marisia Stud. Scient. Nat.* 11–12: 105–113.
- SIRBU I., BENEDEK A. M. 2004. Distribution of *Bythinella austriaca* (v. Frauenfeld 1857) in Romania (Mollusca; Gastropoda; Prosobranchia). *Anal. t. I.D.D. Tulcea* 10: 53–56.



- SOÓS L. 1943. A Kárpát-medence Molluska faunája. Magyar Tudományos Akadémia, Budapest.
- SZAROWSKA M. 1996. The egg capsules of *Bythinella austriaca* (Frauenfeld, 1856) with observations on the veliger and embryonic shell. J. Moll. Stud. 62: 546–549.
- SZAROWSKA M. 2000. Environmental stress and stability of *Bythinella* populations in South Poland (Gastropoda: Prosobranchia: Hydrobioidea). Malak. Abh. 20: 93–98.
- SZAROWSKA M. 2006. Molecular phylogeny, systematics and morphological character evolution in the Balkan Rissoidea (Caenogastropoda). Folia Malacol. 14: 99–168.
- SZAROWSKA M., FALNIOWSKI A. 2008. There is no philosopher's stone: *coup de grace* to the morphology-based systematics in the rissooidean gastropods? 5th Congress of the European Malacological Societies, Ponta Delgada: 28.
- SZAROWSKA M., WILKE T. 2004. *Sadleriana pannonica* (Frauenfeld, 1865): a lithoglyphid, hydrobiid or amnicolid taxon? J. Moll. Stud. 70: 49–57.
- WAGNER J. 1941. A Gutin-hegység Mollusca faunájának alapvetése [Die Grundlage der Weichtierfauna des Gutin-Gebirges]. Állattani Közlemények 38: 197–210.

Received: April 25th, 2009

Accepted: May 20th, 2009

