

Two new stygobiont freshwater snail species from Hungary (Mollusca: Gastropoda: Truncatelloidea)

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Abstract – Two new snail species are described, namely *Paladilhiopsis pallgergyeli* sp. n. from the valley of the River Dráva, and *Alzoniella katagabriellae* sp. n. from the Börzsöny Mountains. This is the first record of the genus *Alzoniella* Giusti & Bodon, 1984 from Hungary. An interesting dwarf form of *Bythinella austriaca* (Fraunfeld, 1856) is also recorded from the Börzsöny Mountains.

Key words – Gastropoda, Moitesseriidae, *Paladilhiopsis*, Hydrobiidae, *Alzoniella*, Hungary

INTRODUCTION

Four stygobiont freshwater snail species have been reported so far from Hungary. SOÓS (1927) described *Lartetia hungarica*, whereas WAGNER (1931) introduced *Lartetia gebhardti* from the caves of Abaliget and Mánfa, respectively (both Mecsek Mountains, Southern Hungary, county Baranya). Based on conchological characters, the latter was considered a junior synonym of the former by PINTÉR (1968a). However, both morphometric and molecular genetic differences were found in a recent paper (ANGYAL *et al.* 2018), suggesting that they might be distinct species or subspecies. Both are treated as species and are currently classified in *Paladilhiopsis* Pavlović, 1913 (MOLLUSCABASE 2021). PINTÉR (1968b) described *Paladilhia oshanovae* from the debris of the river Danube from Esztergom, the current status is *Bythiospeum oshanovae* (FEHÉR *et al.* 2006). This species was later found alive in the Szigetköz Region in northwestern Hungary (MAJOROS 2010). The fourth species, *Hauffenia kissdalmae*, was found in a spring in the Börzsöny Mts in northern Hungary ERŐSS & PETRÓ (2008).

I monitored the mollusc species in the Natura 2000 areas of the Danube-Drava National Park (DDNP) between 2008 and 2020. In 2018, I found shells of a hitherto unknown species of Moitesseriidae. I visited the very site multiple times during the following years, and I succeeded in finding additional shells.

Similarly to my work for the Danube-Ipoly National Park (DINP) in 2002, I was assigned to conduct research on the Natura 2000 mollusc species. During this work, I found tiny shells of a hydrobiid species in the mud of a spring. Occurrence of unknown stygobiont species was surprising in both cases (Figs 1–2).

Classification of subterranean freshwater species is challenging based on conchological characters alone, because their shells have contain too few useful characters (HERSLER & PONDER 1998, SZAROWSKA 2006; FALNIOWSKI 2018). However, in most cases it is very hard or even impossible to find living specimens for anatomical and molecular genetic analyses. In the present case, the shell shape and the sculpture of the protoconch and the teleoconch gave some support (FALNIOWSKI 1989, 1990, SZAROWSKA 2006, HOFMAN *et al.* 2018), and hence this provided enough ground to describe them as species new to science.

MATERIALS AND METHODS

Shell whorls were counted according to KERNEY & CAMERON (1979). Scanning electron microscope images were made with Hitachi TM4000 Plus SEM by Barna Páll-Gergely.

Abbreviations for collections – JG = Private collections of Jozef Grego, Baňská Bystrica (Slovakia), HNHM = Hungarian Natural History Museum, Budapest (Hungary), VA = Private collections of András Varga, Gyöngyös (Hungary).

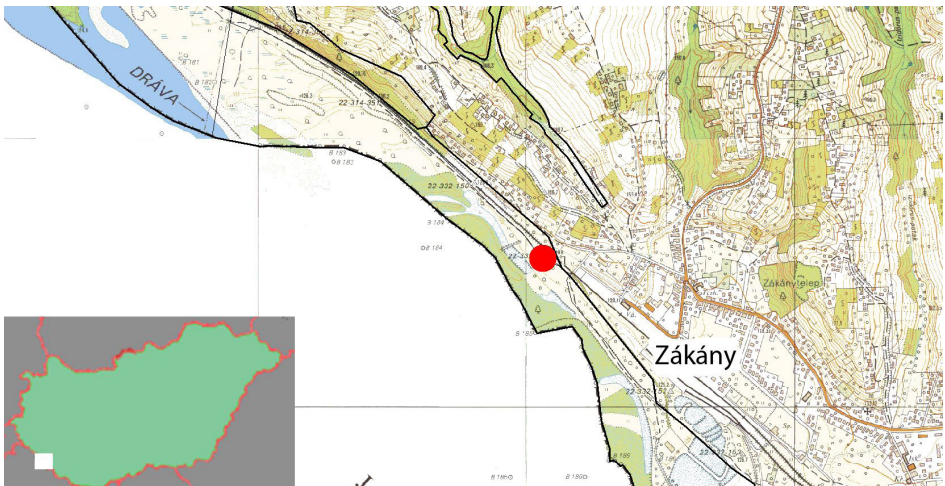


Figure 1. Geographical location of *Paladilhiopsis pallgergelyi* sp. n. locus typicus in the Drava River valley (County Somogy, Hungary)

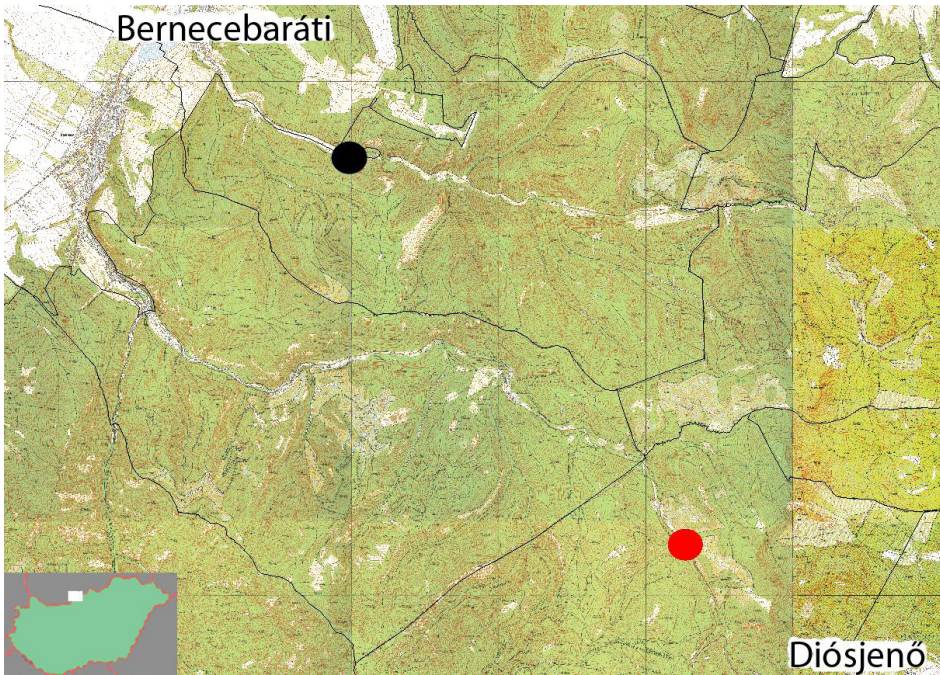


Figure 2. Geographical location of *Alzoniella katagabriellae* sp. n. locus typicus (red circle and occurrence of *Bythinella austriaca* (Frauenfeld, 1856) “dwarf form” (black circle) in Börzsöny Mountains (Counties Nógrád and Pest, Hungary)

RESULTS

Superfamily TRUNCATELLOIDEA J. E. Gray, 1840

Family MOITESSIERIIDAE Bourguignat, 1863

Genus *Paladilhiopsis* Pavlović, 1913

Type species: *Paladilhia robiciana* Clessin, 1882; SD (Wagner 1928: 291, 292).

Paladilhiopsis pallgergelyi sp. n.
(Figs 3–7, 10–11, 17–20, 21–22)

Type material – Holotype: Hungary, Somogy county, southeast of Zákány, base of Látó-hegy [mountain], unnamed stream, 46°15.378'N, 16°56.013'E, 121 m a.s.l., leg. A. Varga 03.10.2019. (HNHM-MOL-100000). Paratypes (n = 4): one shell, same data as for holotype, coll. JG; two shells, same data as for holotype, leg. A. Varga, 08.11.2018., coll. VA; one shell, same data as for holotype, leg. A. Varga, 08.11.2018., HNHM 105276.

Holotype measurements – Shell height: 2.14 mm; shell width: 1.21 mm; aperture height: 0.77 mm; aperture width: 0.61 mm.

Diagnosis – A *Paladilhiopsis* species with cylindrical shell, wide middle whorls and fine surface sculpture.

Description – Holotype: Shell elongate, nearly cylindrical; whorls 4.25, bulging, suture deep; aperture oval, leans slightly right from shell axis; aperture height larger than height of penultimate whorl from apertural view; peristome not expanded, sharp; umbilical area broad, and gradually becomes narrower (Fig. 10); protoconch sculpture with tiny pits (Figs 19–20); teleoconch sculpture overall extremely fine, with fine growth lines and dense spiral striate (Figs 17–18). Paratype (Fig. 11) slightly deformed, with higher spire, whorls 4.75; protoconch sculpture stronger than that of holotype, with conspicuous wrinkles (Figs 21–22).

Operculum and soft anatomy unknown.

Distribution – This new species is known only from the type locality, which is situated based on the geo-coordinates, the site is ca. 100 m far from (in the Hungarian side) the Croatian-Hungarian border (Figs. 3–7).

Etymology – The new species is named in honour of Barna Páll-Gergely, a dedicated malacologist and friend of the author.

Remarks on identification – *Paladilhiopsis pallgergelyi* sp.n. is clearly distinct from *Paladilhiopsis* species of Austria, Balkans and northern Italy based on the cylindrical shell, the wider middle and apical whorls, and the fewer number of whorls.

The species *Paladilhiopsis grobbeni grobbeni* Kuščer, 1928, *P. grobbeni anzeiana* (Slapnik, 1995), *P. robiciana robiciana* (Clessin, 1882), *P. robiciana illustris* (Schütt, 1970), *P. robiciana kostanjevicae* (Schütt, 1970), *P. robiciana trebnikana* (Slapnik, 1995), all possess shells that are conical, wide at their base, have large apertures and reticulated sculpture (CLESSIN 1882, SCHÜTT 1970, RADOMAN 1983, SLAPNIK 1995, HOFMAN *et al.* 2018).

The species of *Paladilhiopsis* from Croatia and Slovenia, *P. absoloni* (A. J. Wagner, 1914); *P. insularis* Cindrić & Slapnik, 2019; *P. pretneri* (Bole & Velkovrh, 1987), are more slender than the new species, and their apex is more pointed (WAGNER 1914, CINDRIĆ 2015, CINDRIĆ & SLAPNIK 2019). In contrast, the shell of *P. pallgergelyi* sp. n. is more cylindrical and its apex is blunt.

The apex of *Paladilhiopsis* species from Bosnia and Herzegovina, *P. blihensis* (Glöer & Grego, 2015), *P. bosniaca* (Clessin, 1910), *P. maroskoi* (Glöer & Grego, 2015), *P. solida* (Kuščer, 1933), is more pointed and slender (KUŠČER 1933, SCHÜTT 1970; GLÖER & GREGO 2015; HOFMAN *et al.* 2018). The last whorl of *P. brandisi* (Clessin, 1911) is similar to that of the new species, but the apical part is wider, and the aperture is proportionally larger (WAGNER 1928). The aperture of *P. serbica* (Pavlović, 1913) is similar to that of the new species, but the apical whorls are more slender, not bulging (SCHÜTT 1970).

The *Paladilhiopsis* species from Montenegro, Kosovo and Albania are all slender, in a few species the base of the shell is wide. Thus, those can be easily distinguished from *P. pallgergelyi* sp. n. (REISCHÜTZ & REISCHÜTZ 2008, GREGO *et al.* 2017, 2019, HOFMAN *et al.* 2018).

The species *Paladilhiopsis carpathica* (Soós, 1940) from Transylvania and *P. hungarica* (Soós, 1927) from Hungary are more slender than *P. pallgergelyi* sp. n., and the formation of the aperture is also different (Soós 1927, ROTARIDES 1943).



Figures 3–9. Stygobiont snail habitats in Hungary. 3–7 = *Paladilhiopsis pallgergelyi* sp. n., unnamed stream, Látó-hegy, Zákány, County Somogy; 8 = *Alzoniella katagabriellae* sp. n.; Vas-kút, Diósjenő, County Nógrád; 9 = “dwarf form” of *Bythinella austriaca* (Frauenfeld, 1856), Hosszúpásti-kút, Bernecebaráti, County Pest

The species *Paladilhiopsis virei* (Locard, 1903) from northern Italy has bulging whorls similar to those of the new species, but its aperture is comparatively larger and its spire is more slender.

While the teleoconch is ribbed in several *Paladilhiopsis* species, the microsculpture of this new species is extremely fine.

Family HYDROBIIDAE Stimpson, 1865

Genus *Alzoniella* Giusti & Bodon, 1984

Type species: *Alzoniella finalina* Giusti & Bodon, 1984; OD.

***Alzoniella (Alzoniella) katagabriellae* sp. n.**

(Figs 8, 12, 14, 24)

Type material – Holotype: Hungary, Börzsöny Mts, Diósjenő, Vas-kút [well], 47°58.132'N, 19°00.092'E, andesite bedrock, leg. A. Varga 03.10.2020, HNHM 97436. Paratypes (n = 5): one shell, same data as for holotype, HNHM 97437; two shells, same data as for holotype, coll. VA; two shells, same data as for holotype, leg. A. Varga, 24.10.2020, JG.

Holotype measurements – Shell height: 1.4 mm; shell width: 0.77 mm; aperture height: 0.58 mm; aperture width: 0.46 mm.

Diagnosis – An *Alzoniella* species with cylindrical shell, bulging whorls and high spire-aperture ratio.

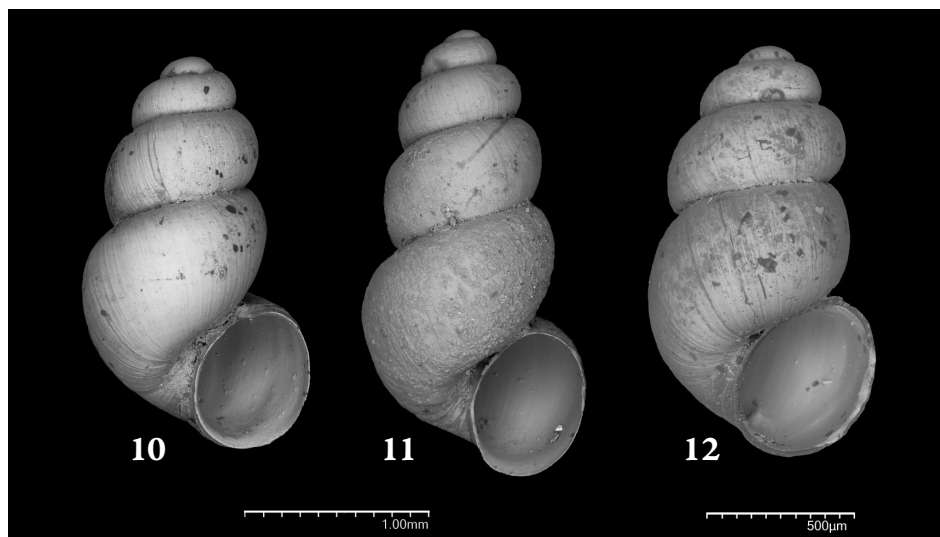
Description – Shell minute, elongated, cylindrical, with pointed apex; whorls 4, bulging, suture deep (Figs 12, 14). Teleoconch sculpture with fine growth lines and very faint spiral striation (Fig. 24) (sculpture of *Bythinella austriaca* is similar, but stronger, Figs 23, 25). Spire 1.5 times as high as aperture; aperture small, oblique, higher than penultimate whorl from apertural view; peristome slightly expanded; umbilicus oblique, slit-like. Operculum and soft anatomy unknown.

Distribution – This new species is known only from the type locality.

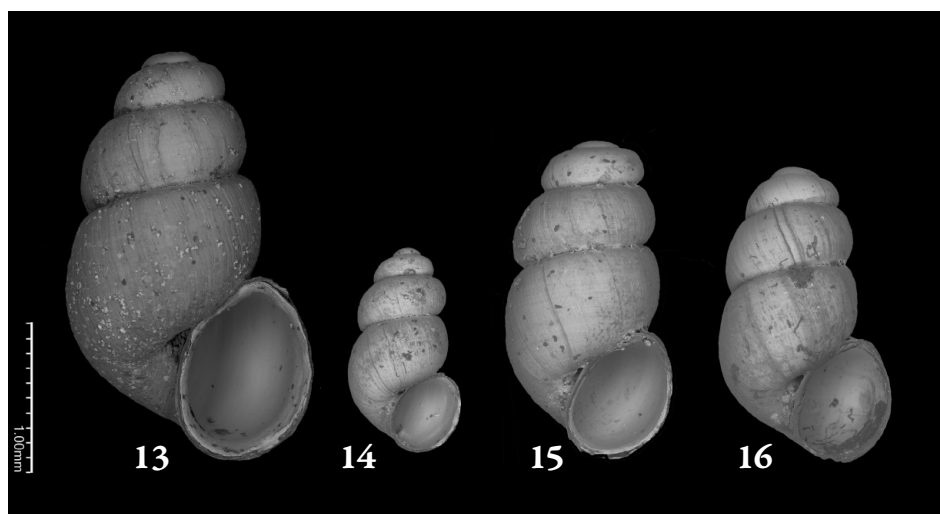
Etymology – I name this new species after my daughters, Katalin Varga and Gabriella Varga.

Remarks on identification – As characteristic for the genus, its shell is small, whitish-translucent, conical or conical-cylindrical, with 3–4 bulging whorls and blunt apex. Aperture simple, umbilicus slightly open, slit-like.

The shell of *Alzoniella (Alzoniella) hartwigschuetzi* (P. L. Reischütz, 1983) is dominated by the last two whorls (REISCHÜTZ 1983), robust, but *A. katagabriellae* sp. n. is more slender. The species *A. (Alzoniella) slovenica* (Ložek & Brtek, 1964) is also similar to the new species, but it is more robust, cylindrical, has deeper suture and more bulging whorls, and possesses a comparatively larger aperture (BERAN & HORSÁK 2001; SZAROWSKA *et al.* 2011).



Figures 10–12. New stygobiont snail species type material. **10** = *Paladilhiopsis pallgergelyi* sp. n. holotype, HHNM-MOL-100000; **11** = *ditto*, paratype, HHNM 105276; **12** = *Alzoniella katagabriellae* sp. n. holotype, HHNM 97436



Figures 13–16. Hyrobiidae shells from the Börzsöny Mountains (County Nógrád, Hungary). **13** = *Bythinella austriaca* (Frauenfeld, 1856), Bernecebaráti, Hosszúpásti-kút; **14** = *Alzoniella katagabriellae* sp. n. holotype, Diósjenő, Vas-kút; **15–16** = *Bythinella austriaca* (Frauenfeld, 1856) “dwarf form”, Bernecebaráti, Hosszúpásti-kút

Bythinella austriaca (Frauenfeld, 1856) “dwarf form”
(Figs 9, 15, 16)

From the mud of a spring in the northern Börzsöny Mts, I collected empty shells reminiscent of unusually small *Bythinella austriaca* (Bernecebaráti, Hosszúvölgy [valley], Hosszúpásti-kút [well], 48°01.041'N, 18°56.278'E, 29.10.2020 and 07.11.2020).

Most probably the water that usually flows out of the fountain could have drifted the shells out. The snail *Bythinella austriaca* is a common species of springs in the Börzsöny Mts, and the shell surface of the shells is almost always coated with a manganese layer. Such layer was absent on the shell surface of “dwarf” shells collected at the Hosszúpásti-kút. In contrast, those shells are translucent or opaque, without any external layer.

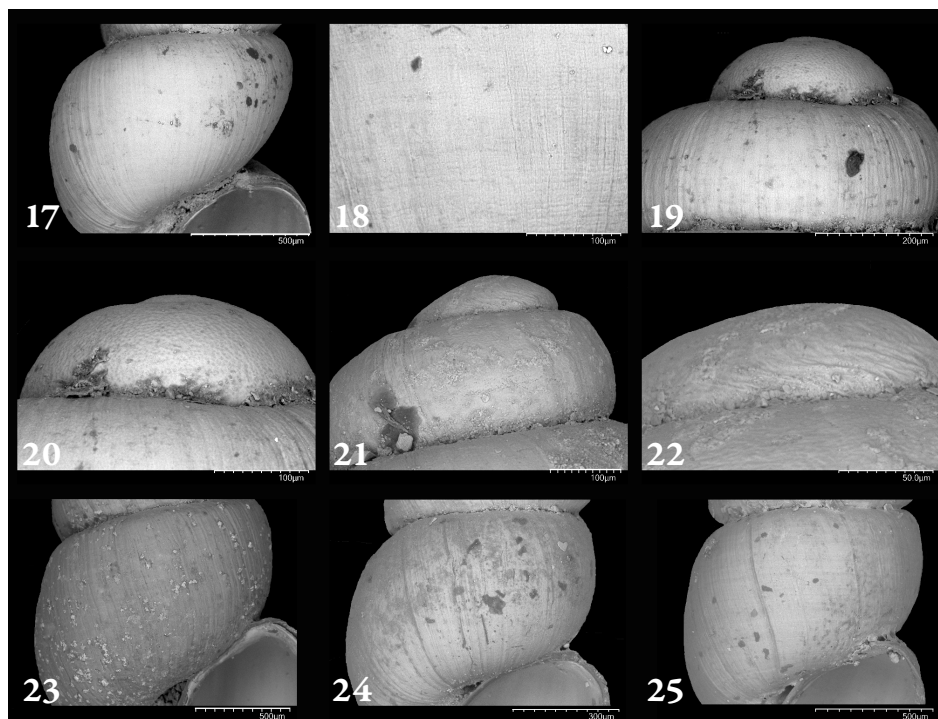
I found most shells in the mud of the spring's inner space, indicating that these were stygobiont animals. I also examined the flotsam and mud material collected after the outfall, which only contained *Bythinella austriaca* shells of normal size.

The genus *Bythinella* inhabits mostly springs and upper stream sections, and thus, may give birth to endemic species (FALNIOWSKI *et al.* 2012, GLÖER 2013, OSIKOWSKI *et al.* 2015).

Thus, the “dwarf form” of *Bythinella austriaca* may also represent an ecological or biological species, which would await further examinations.

DISCUSSION

Stygobiont snails are found less frequently in the soil layers of the Dráva valley and the rock crevices of the volcanic bedrock-dominated Börzsöny Mts compared to karstic areas. Therefore, it is probable that the number of populations, and the number of individuals within populations are also smaller. Thus, besides systematic search of suitable habitat, numerous visits are suggested to increase chance of success. The stygobiont gastropod species in Hungary live in a great geographical distance between one another, which suggests that the subterranean water bodies they are associated to, are also isolated, and this would enhance birth of endemic species. The river Dráva fluctuates ca. 1 m daily, which results in a fluctuation of the groundwater as well. This “pumping” movement of the groundwater might have helped to flush the shells of *Paladilhopsis pallgergelyi* sp. n. to the surface. The stream of the type locality (Figs 6–7) revealed a gravel/sand layer at the border of the Pleistocene and Holocene deposits. The shells are probably originated from there, because I have not found any shells elsewhere in the stream bed.



Figures 17–25. Sculpture of shells. 17–20 = *Paladilhiopsis pallgergyi* sp. n. holotype; 21–22 = ditto, paratype; 23 = *Bythinella austriaca* (Frauenfeld, 1856); 24 = *Alzoniella katagabriellae* sp. n. holotype; 25 = *B. austriaca* “dwarf form”

I examined several springs of the Börzsöny Mts, but did not find shells of *Alzoniella katagabriellae* sp. n. elsewhere. The shells of the latter species have been only found in the mud of the inner spring bay, which indicates that this is a stygobiont species occurring only in underground waters. Hungary is situated at the edge of the geographical range of the genus *Alzoniella* (Slovakia, Austria, northern Italy, southern France, northern part of the Iberian Peninsula, Balearic Islands (ARCONDA *et al.* 2007). The species *A. katagabriellae* sp. n. is found between the type localities of *A. slovenica* and *A. hartwigschuetzi*.

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Két új szubterrán édesvízi Gastropoda faj Magyarországról (Mollusca: Gastropoda: Truncatelloidea)

VARGA ANDRÁS

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Összefoglalás – A szerző 1998 és 2020 között a Duna-Dráva Nemzeti Park és a Duna-Ipoly Nemzeti Park területén végzett kutatásai során két, tudományra új szubterrán csigafajt fedezett fel. Az első faj a *Paladilhiopsis pallgergelyi* sp. n., Zákány település közelében a Dráva-völgyében él, mintegy száz méterre a horvát-magyar határtól. A második faj az *Alzoniella katagabriellae* sp. n., amelyet Diósjenő községhatárában a Börzsöny-hegység egyik forrásában talált meg. A földalatti életmódú fajok különleges és ritka értékei a hazai faunának. A Dráva kavics-hordalékkúpjának talajfelszín alatti vizeiben elszigetelten élő *P. pallgergelyi* sp. n. és a Börzsöny-hegység andezit kőzetrepedéseiben, közettörmelékének vizeireiben előforduló *A. katagabriellae* sp. n. egy-egy újabb bennszülött faja a hazai Mollusca faunának. A *Paladilhiopsis* nemzetség Magyarországon a Mecsek-hegységben fordul elő. Az *Alzoniella* nemzetség új előfordulási adat Magyarország területéről, fajai legközelebb a szomszédos Szlovákia és Ausztria karsztos területein élnek. A szerző még a *Bythinella austriaca* (Frauenfeld, 1856) érdekes törpe alakját jelzi a Börzsöny-hegységből.

Kulcsszavak – Gastropoda, Moitessieriidae, *Paladilhiopsis*, Hydrobiidae, *Alzoniella*, Magyarország

ÁBRAALÁÍRÁSOK

1. ábra: A *Paladilhiopsis pallgergelyi* sp. n. típuslelőhelyének földrajzi elhelyezkedése a Dráva-völgyben (Somogy megye, Magyarország)

2. ábra: Magyarországi édesvízi csigalelőhelyek. Az *Alzoniella katagabriellae* sp. n. típusanyagának (piros kör) (Nógrád megye) és a *Bythinella austriaca* (Frauenfeld, 1856) „törpe forma” lelőhelyének (fekete kör) (Pest megye) földrajzi elhelyezkedése

3–9. ábra: Édesvízi csigafajok élőhelyei Magyarországon. 3–7 = *Paladilhiopsis pallgergelyi* sp. n.: Somogy megye, Zákány, Látó-hegy, névtelen vízfolyás; 8 = *Alzoniella katagabriellae* sp. n.: Nógrád megye, Diósjenő, Vas-kút; 9 = *Bythinella austriaca* (Frauenfeld, 1856) „törpe forma”: Pest megye, Bernecebaráti, Hosszúpásti-kút

10–12. ábra: Édesvízi csigafajok típusanyagai. **10** = *Paladilhiopsis pallgergelyi* sp. n. holotípus, HNHM-MOL-100000; **11** = u. a., paratípus, HNHM 105276; **12** = *Alzoniella katagabriellae* sp. n. holotípus HNHM 97436

13–16. ábra: Börzsöny-hegységi Hyrobiidae fajok házai. **13** = *Bythinella austriaca* (Frauenfeld, 1856), Bernecebaráti, Hosszúpásti-kút; **14** = *Alzoniella katagabriellae* sp. n. holotípus, Diósjenő, Vas-kút; **15–16** = *Bythinella austriaca* (Frauenfeld, 1856) „törpe forma”, Bernecebaráti, Hosszúpásti-kút

17–25. ábra: Hyrobiidae fajok házainak skulpturája. **17–20** = *Paladilhiopsis pallgergelyi* sp. n. holotípus; **21–22** = u. a., paratípus; **23** = *Bythinella austriaca* (Frauenfeld, 1856); **24** = *Alzoniella katagabriellae* sp. n. holotípus; **25** = *Bythinella austriaca* (Frauenfeld, 1856) „törpe forma”