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Middle Miocene Rissooidea (Gastropoda) assemblages in the Mecsek Mts (Hungary)

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Abstract – Two newly collected Middle Miocene Rissooidea assemblages are described and illustrated from the Hungarian part of the Pannonian Basin (Mecsek Mts: Mecsekpölöske, Tekeres). The autochthonous shallow water fauna of Mecsekpölöske is characterized by high alpha diversity (20 species), the small Tekeres material contains shallow- and deep-water taxa. Eight species are recorded for the first time in Hungary, and two new species are introduced: *Alvania nemethi* n. sp. and *A. viciani* n. sp. *Alvania baluki* nom. nov. is proposed as replacement name for *Alvania (Alvania) tenuicostata* Bałuk, 1975. With 99 figures.

Keywords – Badenian, Börzsöny Mts, Mecsek Mts, Pannonian Basin system, Rissooidea

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INTRODUCTION

The aim of the present study is to describe and illustrate two Badenian (Langhian, Middle Miocene) Rissooidea (Gastropoda) assemblages from the Mecsek Mts (SW Hungary): the rissooideans of the Kopasz Hill locality at Tekeres and those of the Nagy Hill locality at Mecsekpölöske (Fig. 1). Beside this presentation, the Rissooidea fauna of Letkés (Börzsöny Mts, N Hungary) discussed by us (Kovács & Stein 2023) is completed with a newly collected species.

The Mecsek Mts is an isolated mountainous range in SW Hungary built up of different Permian and Mesozoic rocks. During the Miocene this range was an island surrounded by a largely shallow sea. The diverse lagoonal, coastal, nearshore and offshore Badenian facies (Baden, Budafa, Hidas, Lajta Formations) of the region were recently discussed by Sebe *et al.* (2015) and Selmeczi *et al.* (2024).

The geology and stratigraphy of the Orfű-Tekeres region were examined by Chikán (1991) and Báldi *et al.* (2002). The lower Badenian deposits in the area represent the Pécsszabolcs Member of the Lajta Limestone Fm. and the Tekeres Schlier Member of the Baden Fm. (Selmeczi *et al.* 2024). The locality under study is located 100 m east of the Herman Ottó Lake coastline at the south-western foot of the Kopasz Hill (46.17449° N, 18.13063° E) (Szabó *et al.* 2022, text-fig. 1), this area was first mentioned in the literature by Strausz (1942, locality 19). Clayey silt and sand of 180 cm thickness was excavated by an artificial trench, the deposit belongs to the Tekeres Schlier. The macrofauna is very rich in early Badenian gastropod, bivalve, scaphopod, scleractinian coral and fish fossils (Szabó *et al.* 2022; Dávid *et al.* 2023). The mollusc assemblage is characterized by the dominance of relatively deep-water (circalittoral – upper bathyal) taxa (own data), however, species typical of shallow water are also present with worn or fragmentary shells, indicating that numerous specimens in the assemblage were transported from coastal setting into deeper-water environments (Szabó *et al.* 2022).

Research of the gastropod assemblage of the Kopasz Hill locality is still in progress. More than 20,000 specimens representing approximately 160 species have been investigated. So far two families, the Muricidae (Kovács 2020) and the Cancellariidae (Kovács & Vicián 2021) have been published. The Rissooidea material forms a small proportion of the entire assemblage (277 specimens, ~0.01%). Seven species are present: *Alvania* cf. *alexandrae* Boettger, 1902, *A. productilis* Boettger, 1907, *A. schwartzi* (Hörnes, 1856), *A. transiens* Sacco, 1895, *Obtusella communis* (Boettger, 1907), *Rissoina podolica* Cossmann, 1921, *Zebinella* cf. *eleonorae* (Boettger, 1902). "*Alvania curta cristatocosta* Sacco" recorded by Bohn-Havas (1973) from borehole material of the area is unknown in the study fauna. *Alvania schwartzi* (123 specimens, 44%) and *A.* cf. *alexandrae* (97 specimens, 35%) predominate the material, *Zebinella* cf. *eleonorae* is also common (47 specimens), while *A. productilis*, *A. transiens*, *Obtusella communis* and *Rissoina podolica* are represented by a few (probably allochthonous) specimens. *Alvania* cf. *alexandrae*, *A. productilis* and *Zebinella* cf. *eleonorae* are recorded for the first time in the Pannonian Basin system.

The geology and stratigraphy of the Mecsekpölöske region were examined by Chikán (1991). The upper part of the lower Badenian deposits represents the Pécsszabolcs Member of the Lajta Limestone Fm. The locality studied herein is located 1 km east of the village, in a ravine on the western side of the Nagy Hill (46.22311° N, 18.22904° E) (Dulai 2025, text-fig. 2). The section contains alternating layers of mollusc-bearing limestone and dark yellow sandy clay of approx. 3 m thickness. The mollusc shells are well-preserved in the clay, while the limestone benches contain poorly preserved internal moulds.

Badenian gastropods from the Mecsekpölöske area were not studied in detail in the earlier literature. Fauna lists were offered by Strausz (1923, 1928), and a few specimens were illustrated by Strausz (1966) from the area without exact localities – these assemblages are typical of shallow marine (sublittoral to circalittoral) palaeoenvironments. New collecting works by the staff of the HNHM and private fossil collectors (T. Németh, L. Sövér) at the Nagy Hill locality provided a large material during the last decade; the assemblage is predominated by microgastropod shells. This fauna differs from those described in previous studies in terms of both quantity and and faunal composition. Two families were recently analyzed from the assemblage: the Muricidae (Kovács 2020) and the Cancellariidae (Kovács & Vicián 2021).

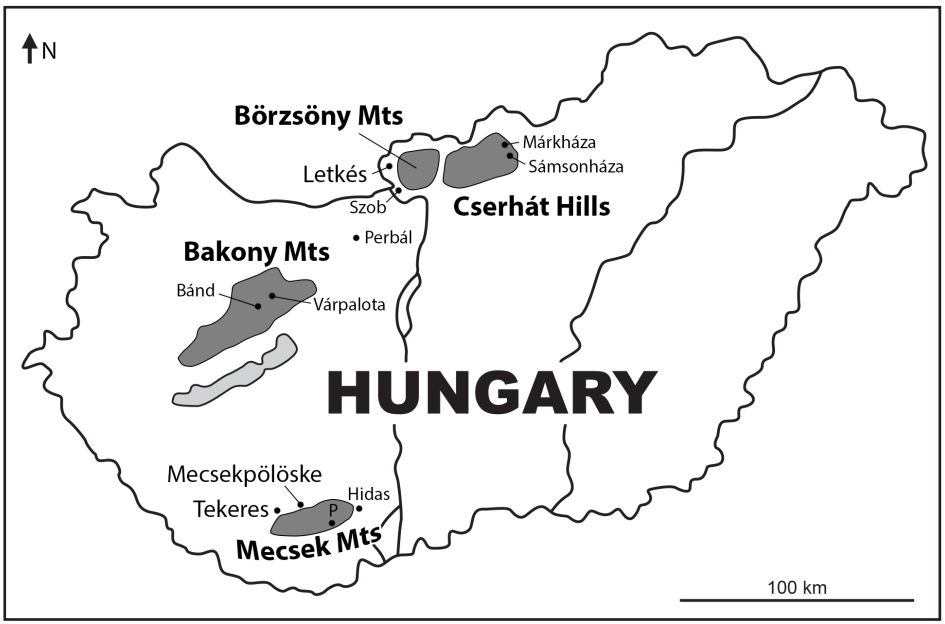


Fig. 1. Badenian (Middle Miocene) fossiliferous localities in Hungary mentioned in the text (P – Pécsvárad)

The study gastropod material consists of more than 108,000 specimens representing about 195 species. Most of the gastropods are typical of fully marine conditions, and species of nearshore, shallow, infralittoral environments predominate the assemblage. The vertebrate and invertebrate fauna indicate a palaeo-seagrass environment (Dulai 2025). The relatively high proportion (28.57%) of the Rissooidea specimens (except *Mohrensternia*) in the whole gastropod assemblage, and the absence of deeper-water rissooideans (e.g., *Alvania schwartzi*) support this supposition (see Mandic *et al.* 2002; Reich *et al.* 2015;

Pavia *et al.* 2022). The Rissooidea material contains more than 37,680 specimens of which 35,690 were identified at species level representing 20 species. About 60% of the species are endemic to the Central Paratethys, while *Alvania hispidula* (Monterosato, 1884), *A. transiens* Sacco, 1895, *Manzonia miocrassicosta* Sacco, 1895, *M. scalaris* (Du Bois de Montpéreux, 1831), *Rissoina vindobonensis* Sacco, 1895, *Zebinella extranea* (Eichwald, 1830), *Z.* aff. *decussata* (Montagu, 1803) and *Stosicia multicingulata* Boettger, 1887 are also known from the Mediterranean region. The rich assemblage allowed us to introduce two new species for science: *Alvania nemethi* n. sp. and *Alvania viciani* n. sp.

Letkés is an early Badenian site in the W Börzsöny Mts (N Pannonian Basin). The study locality (Bagoly Hill A) is located 400 m eastward of the village on the Bagoly Hill, and is characterized by resedimented beds of limonitic marly sand with andesite fragments, andesitic tuff, and eroded colonial coral blocks (Pécsszabolcs Mb of the Lajta Limestone Fm). The taphocoenosis contains specimens from shallow- to deeper-water palaeoenvironments. The Rissooidea fauna was dealt with by Kovács & Stein (2023) describing and illustrating 19 species. New field works yielded a fragmentary *Zebinella* specimen that differs from its congeners, and probably represents a new species.

MATERIAL AND METHOD

The Rissooidea materials investigated herein were collected by the staff of the Hungarian Natural History Museum (Budapest) and by private fossil collectors (Tamás Németh, László Sövér) at the Nagy Hill locality of Mecsekpölöske and the Kopasz Hill locality at Tekeres. The specimens are stored in the collection of the HNHM, and in private collections of the collectors and the authors. As several Badenian Rissooidea taxa were previously described by us from the Pannonian Basin (Kovács & Stein 2023), only the newly recorded species are treated in detail in this paper.
Abbreviations: SL = shell length, SW = shell width.

SYSTEMATIC PALAEONTOLOGY

Phylum Mollusca Linnaeus, 1758
Class Gastropoda Cuvier, 1795
Subclass Caenogastropoda Cox, 1960
Order Littorinimorpha Golikov et Starobogatov, 1975
Superfamily Rissooidea Gray, 1847
Family Rissoidae Gray, 1847
Genus *Alvania* Risso, 1826

Type species: *Alvania europea* Risso, 1826 (= *Turbo cimex* Linnaeus, 1758) (type by subsequent designation)

Alvania cf. *alexandrae* Boettger, 1902
(Figs 2–5)

cf. 1902 *Alvania* (*Actonia*) *alexandrae* n. sp. – Boettger, p. 142.
cf. 1934 *Alvania* (*Actonia*) *alexandrae* Boettger – Zilch, p. 213, pl. 5, fig. 90.

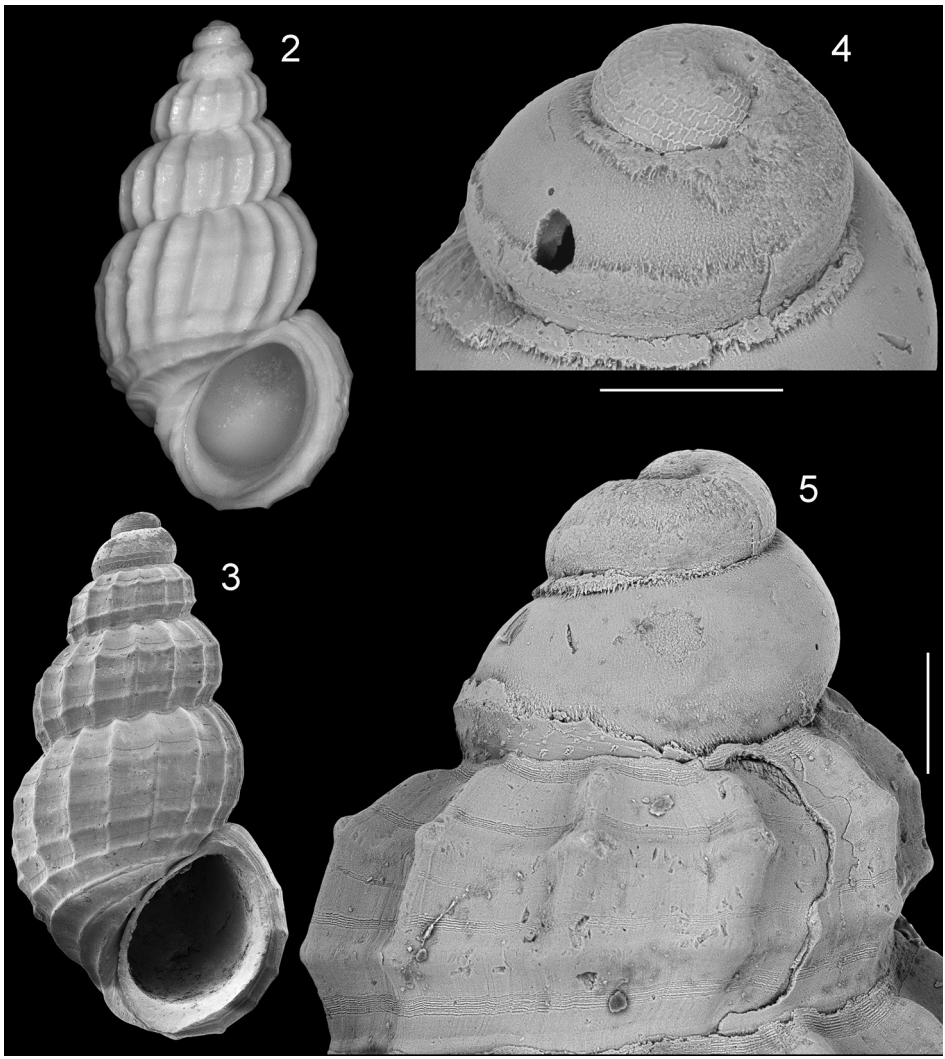
Material – HNHM INV 2025.357., 97 specimens (Tekeres).

Description – Small shell with moderately high spire. Protoconch of 2½ rounded whorls, bearing grains and 2 fine spiral threads abapically, nucleus with reticulate pattern (Fig. 4). Teleoconch of 4 convex whorls, suture shallow, wide subsutural slope. Suboval aperture, thickened outer lip, smooth within. Axial sculpture of moderately widely spaced, slightly opisthocline, narrow, projected ribs (15 on last whorl) with concave interspaces, spiral sculpture of strong cords (2 on first, 3–3 on second and third teleoconch whorls, 7 on last whorl) and 5 narrow bands of fine threads (Fig. 5).

Remarks – The specimens figured herein from Tekeres are close to the holotype of *Alvania alexandrae* in overall teleoconch morphology but differ by their slightly more convex whorls, and somewhat more closely spaced, less sharp axial ribs. Our material also differs from the material presented by Bałuk (1975, pl. 8, figs 17–18) from the Korytnica Basin (Poland) as those specimens have two smooth protoconch whorls.

Alvania cf. *alexandrae* is abundant at Tekeres and is represented by well-preserved shells. As it is not present in the Mecsekpölöske assemblage, the species (together with *A. schwartzi*) is thought to be typical of circalittoral palaeoenvironments.

Considering the *Alvania alexandrae* records in the Central Paratethys, although the illustration of the holotype in Zilch (1934) is very good, the subsequent representations in Bałuk (1975) and Švagrovský (1981, pl. 37, figs 3–6) are quite poor in quality, making it difficult to interpret their specimens which exhibit much finer sculpture. In the Korytnica Basin, the type of *Alvania kowalewskii* Bałuk, 1975 (see Bałuk 1975, pl. 8, fig. 16) seems to be more similar in teleoconch morphology to Boettger's species than the *A. alexandrae* material (l.c., pl. 8, figs 17–18) but their protoconch morphologies are described as being different. According to Bałuk (l.c.) the very finely sculptured *Manzonia zetlandica* var. *korytnicensis* Friedberg, 1928 (see Friedberg 1928, text-fig. 87) is a junior synonym of *Alvania alexandrae*, the two taxa, however, do not appear to be closely allied forms.

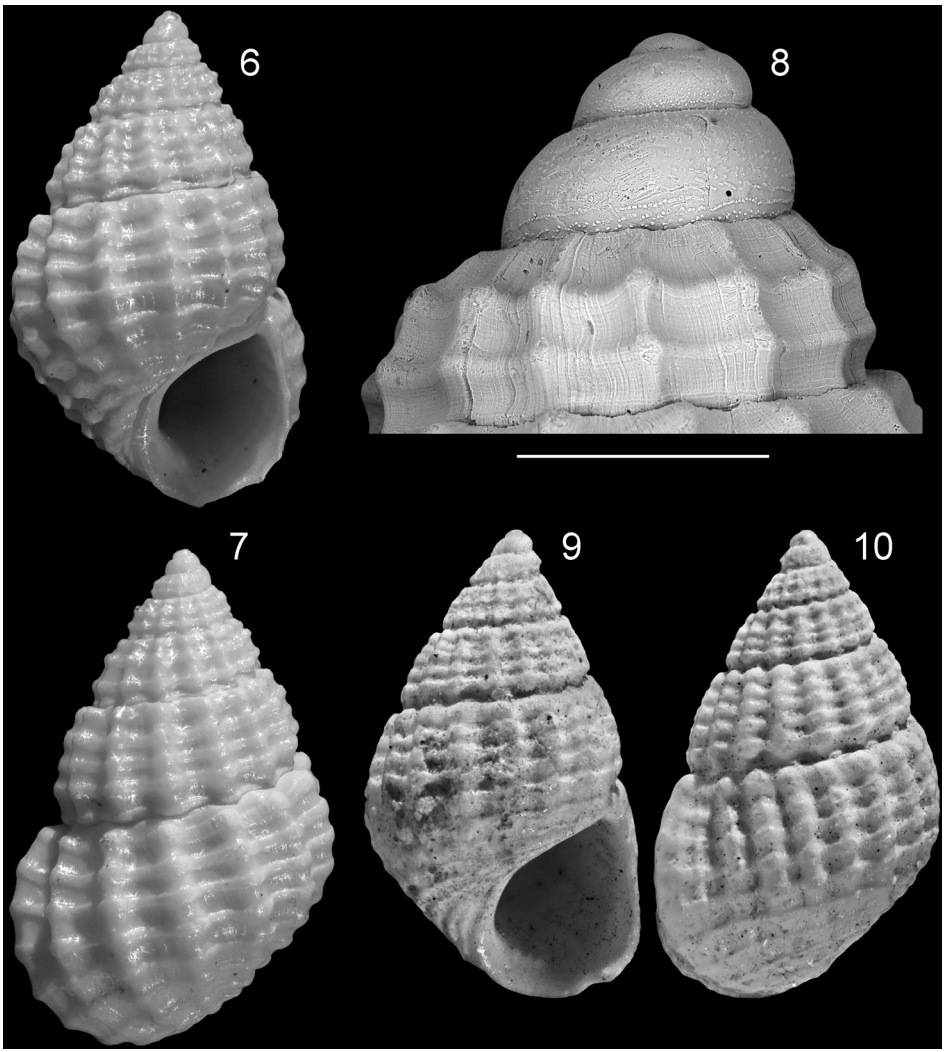


Figs 2–5. *Alvania* cf. *alexandrae* Boettger. – **Fig. 2.** HNHM INV 2025.357A., SL 2.6 mm, apertural view (25×). – **Fig. 3.** INV 2025.357B., SL 2.8 mm, apertural view (25×). – **Figs 4–5.** INV 2025.357C. Two views of the protoconch (scale bars 100 μm) (Tekeres)

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, ?Poland, Romania, and ?Slovakia. Hungarian part of the Pannonian Basin: Mecsek Mts: Tekeres (this paper).

Alvania ampulla (Eichwald, 1830)
(Figs 6–10)

1830 *Rissoa ampulla* m. – Eichwald, p. 218.
1853 *Rissoa ampulla* m. – Eichwald, p. 274, pl. 10, figs 16a–c.
1856 *Rissoa montagui* – Hörnes, p. 569, pl. 48, fig. 13 (*non* Payraudeau, 1826).
1895 *Alvania* (*Alvania*) *montagui* var. *miocenica* – Sacco, p. 23.



Figs 6–10. *Alvania ampulla* (Eichwald). – **Figs 6–8.** HNHM INV 2025.336A., SL 3.9 mm, apertural and abapertural views (17×), protoconch (scale bar 300 μm) (Mecsekpölöske). – **Figs 9–10.** HNHM M.61.4304A. Topotype of *Alvania montagui trochiformis* Csepreghy-Meznerics, SL 3.1 mm, apertural and abapertural views (20×) (Szob)

1923 *Alvania montagui* – Friedberg, p. 375, pl. 22, fig 11 (*non* Payraudeau, 1826).
1933 *Alvania miocaenica* Sacco – Meznerics, p. 330, pl. 13, fig. 2.
? 1950 *Alvania montaguy* [sic] *miocaenica* Sacco – Csepreghy-Meznerics, p. 20.
1956 *Alvania montagui miocaenica* Sacco – Csepreghy-Meznerics, pl. 2, figs 1–4.
1956 *Alvania montagui trochiformis* n. ssp. – Csepreghy-Meznerics, p. 379, pl. 2, figs 7–10.
? 1960 *Alvania* (*Alvania*) *montagui* var. *miocaenica* Sacco – Kojumdgieva, p. 101, pl. 30, fig. 17.
1963 *Alvania* (*Alvania*) *montagui ampulla* Eichwald – Steininger, p. 44, pl. 13, fig. 2.
1966 *Rissoa* (*Alvania*) *montagui miocaenica* Sacco – Strausz, p. 74, pl. 46, figs 19–20.
1966 *Rissoa* (*Alvania*) *montagui trochiformis* Csepreghy-Meznerics – Strausz, p. 75, pl. 46, figs 21–22.
1966 *Alvania montaguy* [sic] *miocaenica* Sacco – Kókay, p. 36.
1971 *Alvania* (*Alvania*) *montagui ampulla* Eichwald – Rado, pl. 4, fig. 70 (?), fig. 86.
1981 *Alvania* (*Alvania*) *montagui miocaenica* Sacco – Švagrovský, p. 114, pl. 35, figs 5–7.
1981 *Alvania* (*Alvania*) *montagui trochiformis* Csepreghy-Meznerics – Švagrovský, p. 115, pl. 35, fig. 8.
1982 *Alvania* (*Alvania*) *helenae latior* n. ssp. – Švagrovský, p. 11, pl. 3, fig. 2.
? 1996 *Alvania montaguy* [sic] *miocaenica* Sacco – Kókay, p. 461.
? 2000 *Alvania* (*Alvania*) *montagui ampulla* (Eichwald) – Popa & Ianoliu, p. 84, pl. 2, fig. 5.
2002 *Alvania montagui trochiformis* Csepreghy-Meznerics – Harzhauser, p. 81, pl. 4, figs 4–5.
2013 *Alvania* (*Alvania*) *ampulla* (Eichwald) – Tămaș A. *et al.*, p. 60, fig. 2g.
? 2013 *Alvania miocenica* Sacco – Landau *et al.*, p. 71, pl. 6, fig. 5, pl. 57, fig. 6, pl. 58, figs 1, 2.
2018 *Alvania ampulla* (Eichwald) – Harzhauser *et al.*, pl. 3, fig. 9.
2021 *Alvania ampulla* (Eichwald) – Chirli & Forli, p. 88 (pars), pl. 62, fig. D3 (only), pl. 63, figs A1–5.

non 1923 *Alvania montagui* var. *ampulla* Eichwald – Friedberg, p. 377, pl. 22, fig 12 (= *Alvania helenae* Boettger, 1902).
non 1950 *Alvania montagui* var. *ampulla* Eichwald – Krach, p. 303, pl. 1, fig. 7 (= *Alvania helenae* Boettger, 1902).
non 1960 *Alvania* (*Alvania*) *montagui* var. *ampulla* (Eichwald) – Kojumdgieva, p. 101, pl. 30, fig. 18 (= *Alvania helenae* Boettger, 1902).
non 1963 *Alvania* (*Alvania*) *montagui trochiformis* Meznerics – Venzo & Pelosio, p. 64, pl. 33, figs 18–19, 24.
non 1970 *Alvania* (*Alvania*) *montagui ampulla* Eichwald – Rado & Muțiu, pl. 4, figs 6–7 (= *Alvania helenae* Boettger, 1902).
non 1975 *Alvania* (*Alvania*) *montagui ampulla* (Eichwald) – Bałuk, p. 79, pl. 9, fig. 9 (= *Alvania helenae* Boettger, 1902).
non 1981 *Alvania montagui ampulla* (Eichwald) – Krach, p. 49, pl. 15, figs 13–16 (= *Alvania helenae* Boettger, 1902).
non 1982 *Alvania* (*Alvania*) *montagui miocaenica* Sacco – Švagrovský, p. 11, pl. 3, figs 3–4 (= *Alvania helenae* Boettger, 1902).
non 2004 *Alvania* (*Alvania*) *ampulla* (Eichwald) – Kowalke & Harzhauser, p. 119, fig. 6D (= *Alvania helenae* Boettger, 1902).

Material – HNHM INV 2025.336., ~9700 specimens (max. SL 4.2 mm) (Mecsekpölöske).

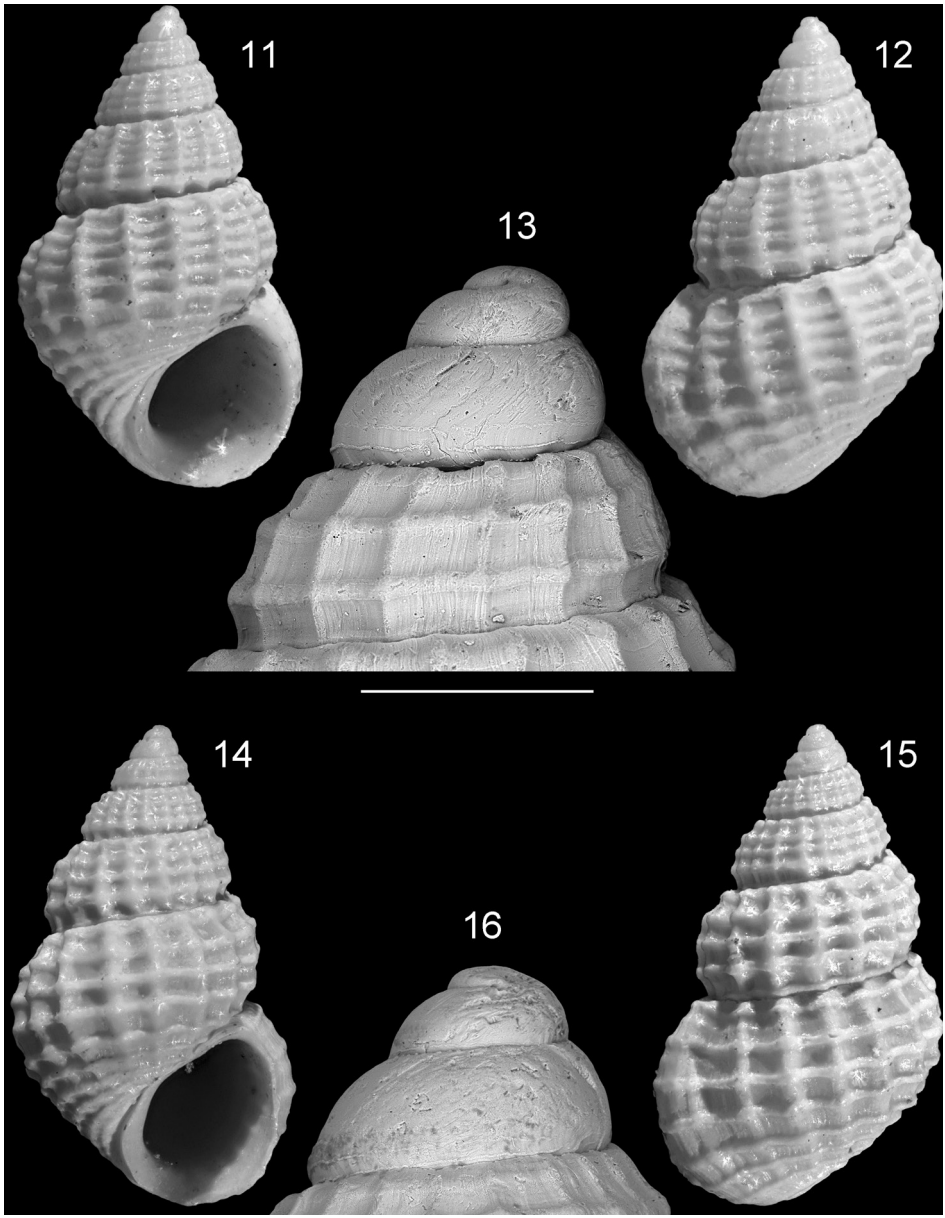
Description – Small, robust shell with conical spire and protoconch of about 2¼ rounded whorls, bearing fine grains and remains of fine spiral threads

abapically. Teleoconch of 3 almost flattened spire whorls with incised suture, and convex last whorl. Wide, suboval aperture, outer lip thickened, lirate within. Axial sculpture of widely spaced, projected, gently prosocline ribs (12 on last whorl). Spiral sculpture of strong cords (2 on 1st teleoconch whorl, 3 on 2nd whorl, 4–5 on penultimate whorl, 10–12 on last whorl).

Remarks – The availability of *Alvania ampulla* has been discussed in the literature. Eichwald's (1853, pl. 10, fig. 16a–c) figure is an inaccurate drawing, but Hörnes (1856: 569–570), describing his „*Rissoa montagui*" material from the Vienna Basin, emphasized: „Eichwald sendete vor längerer Zeit Exemplare von Shukowze in Volhynien unter der Bezeichnung *Rissoa ampullacea* ein, die so vollkommen mit den Wiener Exemplaren übereinstimmen, dass ich auch diesen Fundort hier anzuführen mich genöthigt sehe." Consequently, Hörnes' (1856, pl. 48, fig. 19) illustration is considered as a proper representation of *Alvania ampulla* (Eichwald), and we follow Bałuk (1975) herein who regarded *Alvania miocaenica* Sacco, 1895 as a junior synonym of *A. ampulla*. However, several specimens were illustrated in the literature – based on Friedberg's (1923, pl. 22, fig. 12) inadequate revision of the taxon under the name *Alvania miocaenica* – which differ from the figure of Hörnes (l.c.) in morphology by having more convex spire whorls. These materials are listed above, and are considered in this paper as representatives of other *Alvania* species. *Alvania ampulla* with more than 9700 specimens is the most abundant *Alvania* species in the gastropod assemblage of the Nagy Hill locality at Mecsekpölöske.

Alvania montagui trochiformis was described by Csepreghy-Meznerics (1956) from the Badenian deposits of Szob (Börzsöny Mts). Although it has slightly denser ribbing, its size and morphology otherwise correspond to *Alvania ampulla*, so Csepreghy-Meznerics's taxon is regarded herein as a junior synonym of Eichwald's species. For comparison, one „topotype" (Collection of the HNHM, M.61.4304.A) is illustrated herein from the type locality (Szob, Malom-kert) (Figs 9–10). The *Alvania trochiformis* material presented by Venzo & Pelosio (1963, pl. 33, figs 18–19, 24) from the Tortonian of Italy seems to contain specimens of different morphology, so this material needs to be revised.

Distribution – Early Miocene: Central Paratethys (Eggenburgian, Karpatian): Austria. Middle Miocene: Central Paratethys (Badenian): Austria, Bosnia, Hungary, Poland, Romania, Slovakia, and Ukraine. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), ?Hidas (Csepreghy-Meznerics 1950), Bakony Mts: Bánd (Kókay 1966), Börzsöny Mts: Szob (Csepreghy-Meznerics 1956), Cserhát Hills: Márkháza (own data).



Figs 11–13. *Alvania giselae* Boettger. HNHM INV 2025.337., SL 3.2 mm, apertural and abapertural views (20×), protoconch (scale bar 300 μm) (Mecsekpölöske). – **Figs 14–16.** *Alvania helenae* Boettger. HNHM INV 2025.338., SL 3.2 mm, apertural and abapertural views (20×), protoconch (scale bar 200 μm) (Mecsekpölöske)

Alvania giselae Boettger, 1902
(Figs 11–13)

1902 *Alvania* (*Acinus*) *giselae* n. sp. – Boettger, p. 141.
1923 *Alvania oceani* – Friedberg, p. 378, pl. 22, fig. 13 (*non* d'Orbigny, 1852).
1934 *Alvania* (*Turbona*) *giselae* (Boettger) – Zilch, p. 212, pl. 5, fig. 84.
1982 *Alvania* (*Alvania*) *montagui miocaenica* – Švagrovský, pl. 3, fig. 3 (*only*) (*non* Sacco, 1895).
2013 *Alvania giselae* Boettger – Landau *et al.*, p. 70.
2021 *Alvania giselae* Boettger – Chirli & Forli, p. 126.

Material – HNHM INV 2025.337., 131 specimens (max. SL 3.2 mm) (Mecsekpölöske).

Description – Small shell with conical spire, worn protoconch of about 2¼ rounded whorls, bearing remains of fine spiral threads abapically. Teleoconch of 3 slightly convex spire whorls, deeply incised suture, slightly depressed, convex last whorl. Suboval aperture, outer lip thickened, lirate within. Axial sculpture of moderately widely spaced, orthocline, narrow, projected ribs (16 on last whorl) with concave interspaces. Spiral sculpture of closely spaced, strong cords (5–6 on penultimate, 13 on last whorl), slightly beaded intersections.

Remarks – The material at Mecsekpölöske is closely allied in size and morphology to the type (Zilch 1934, pl. 5, fig. 84) but slightly differs by bearing somewhat less axial ribs (16), while 19–21 ribs were described by Boettger (1902: 141). *Alvania helenae* is a similar form but is distinguished by its fewer, more widely spaced spiral cords. The specimen figured by Friedberg (1923, pl. 22, fig. 13) as *Alvania oceani* is distinguishable both from d'Orbigny's species (see Cossmann & Peyrot 1919, pl. 16, figs 111–112) and the „*Rissoa moulinsi*" specimen in Hörnes (1856, pl. 48, fig. 14) by its higher spire, broader aperture and sculpture with more spiral cords and narrower, sharper axial ribs, while its morphology corresponds to that of *Alvania giselae*.

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Romania, Slovakia, and Ukraine. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper).

Alvania helenae Boettger, 1902
(Figs 14–16)

1902 *Alvania* (*Alvania*) *helenae* n. sp. – Boettger, p. 140.
1923 *Alvania montagui* var. *ampulla* – Friedberg, p. 377, pl. 22, fig. 12 (*non* Eichwald, 1830).
1934 *Alvania* (*Alvania*) *helenae* Boettger – Zilch, p. 211, pl. 5, fig. 81.
1950 *Alvania montagui* var. *ampulla* – Krach, p. 303, pl. 1, fig. 7 (*non* Eichwald, 1830).
1960 *Alvania* (*Alvania*) *montagui* var. *ampulla* – Kojumdgieva, p. 101, pl. 30, fig. 18 (*non* Eichwald, 1830).
1970 *Alvania* (*Alvania*) *montagui ampulla* – Rado & Muțiu, pl. 4, figs 6–7 (*non* Eichwald, 1830).
1975 *Alvania* (*Alvania*) *montagui ampulla* – Bałuk, p. 79, pl. 9, fig. 9 (*non* Eichwald, 1830).

1975 *Alvania* (*Alvania*) *helenae* Boettger – Bałuk, p. 81, pl. 9, fig. 10.
1981 *Alvania montagui ampulla* – Krach, p. 49, pl. 15, figs 13–16 (*non* Eichwald, 1830).
1982 *Alvania* (*Alvania*) *montagui miocaenica* – Švagrovský, p. 11, pl. 3, figs 3–4 (*non* Sacco, 1895).
1998 *Alvania* (*Alvania*) *helenae* Boettger – Tomašových, p. 374, pl. 3, figs 4–5, 8–9.
2004 *Alvania* (*Alvania*) *ampulla* – Kowalke & Harzhauser, p. 119, fig. 6D (*non* Eichwald, 1830).
? 2013 *Alvania* (*Alvania*) *helenae* Boettger – Tămaş A. *et al.*, p. 61, fig. 2h.
2021 *Alvania helenae* Boettger – Chirli & Forli, p. 129, pl. 101, fig. E1–2 (*only*), *non* pl. 102, fig. A1–9.

non 1982 *Alvania* (*Alvania*) *helenae latior* n. ssp. – Švagrovský, p. 11, pl. 3, fig. 2 [= *Alvania ampulla* (Eichwald, 1830)].

Material – HNHM INV 2025.338., 7756 specimens (max. SL 3.2 mm) (Mecsekpölöske).

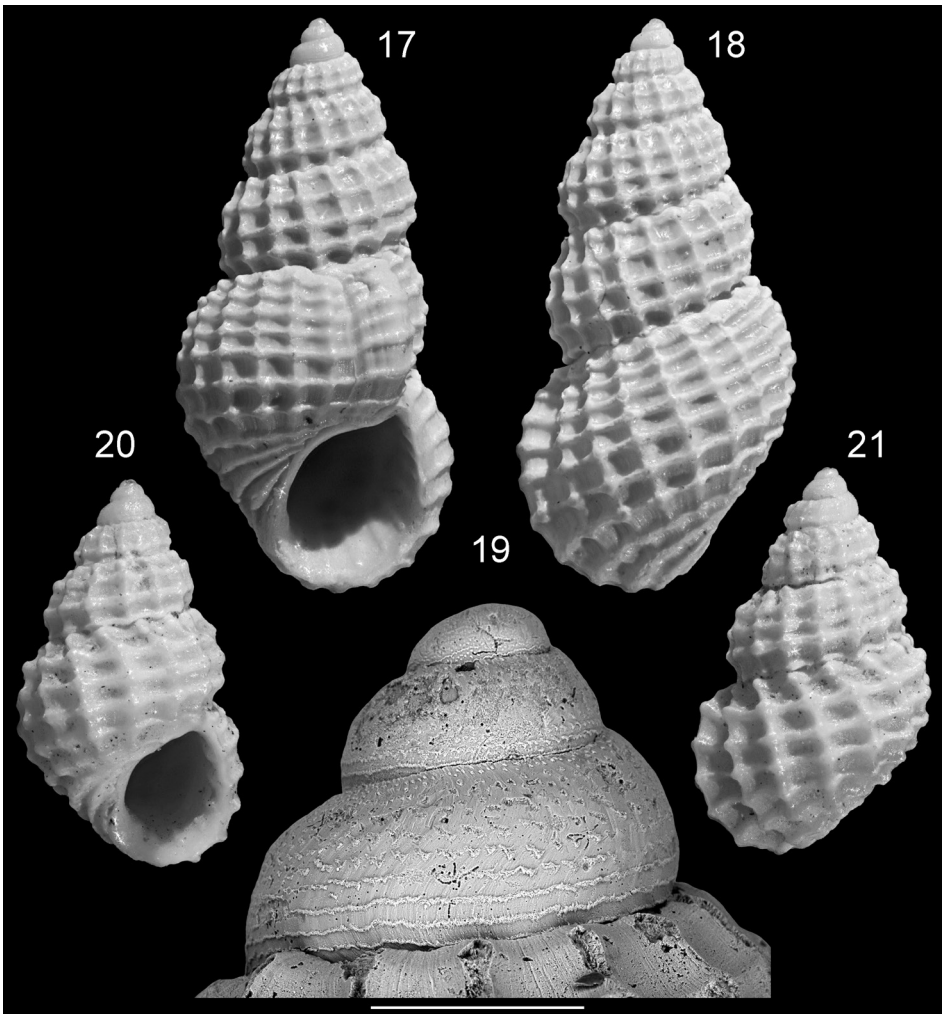
Description – Small shell with moderately high spire, worn protoconch of about 2½ rounded whorls, bearing remains of fine spiral threads abapically. Teleoconch of about 4½ whorls. Convex spire whorls, deeply incised suture, convex last whorl. Suboval aperture, thickened outer lip, lirate within. Axial sculpture of widely spaced, slightly prosocline, narrow, projected ribs (13 on last whorl) with concave interspaces. Spiral sculpture of widely spaced, strong cords (4 on penultimate, 10 on last whorl).

Remarks – The species differs from the similar *Alvania giselae* in morphology by its regularly rounded last whorl and by fewer spiral cords. Several Paratethyan *Alvania* specimens illustrated in the literature under the name *ampulla* or *miocaenica* (see chresonymy above) correspond to the morphology of *A. helenae*, so the palaeogeographic distribution of the species is wider than previously thought. The late Badenian specimen described by Švagrovský (1982) as *Alvania (Alvania) helenae latior* differs from *A. helenae* by its stout shell, conical spire of flattened whorls and broad axial ribs, this taxon is regarded herein as a junior synonym of *A. ampulla*. *Alvania helenae*, with more than 7700 specimens, is the second most abundant *Alvania* species in the studied gastropod assemblage.

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, ?Bosnia, Hungary, Poland, Romania, and Slovakia. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper).

Alvania hispidula (Monterosato, 1884)
(Figs 17–21)

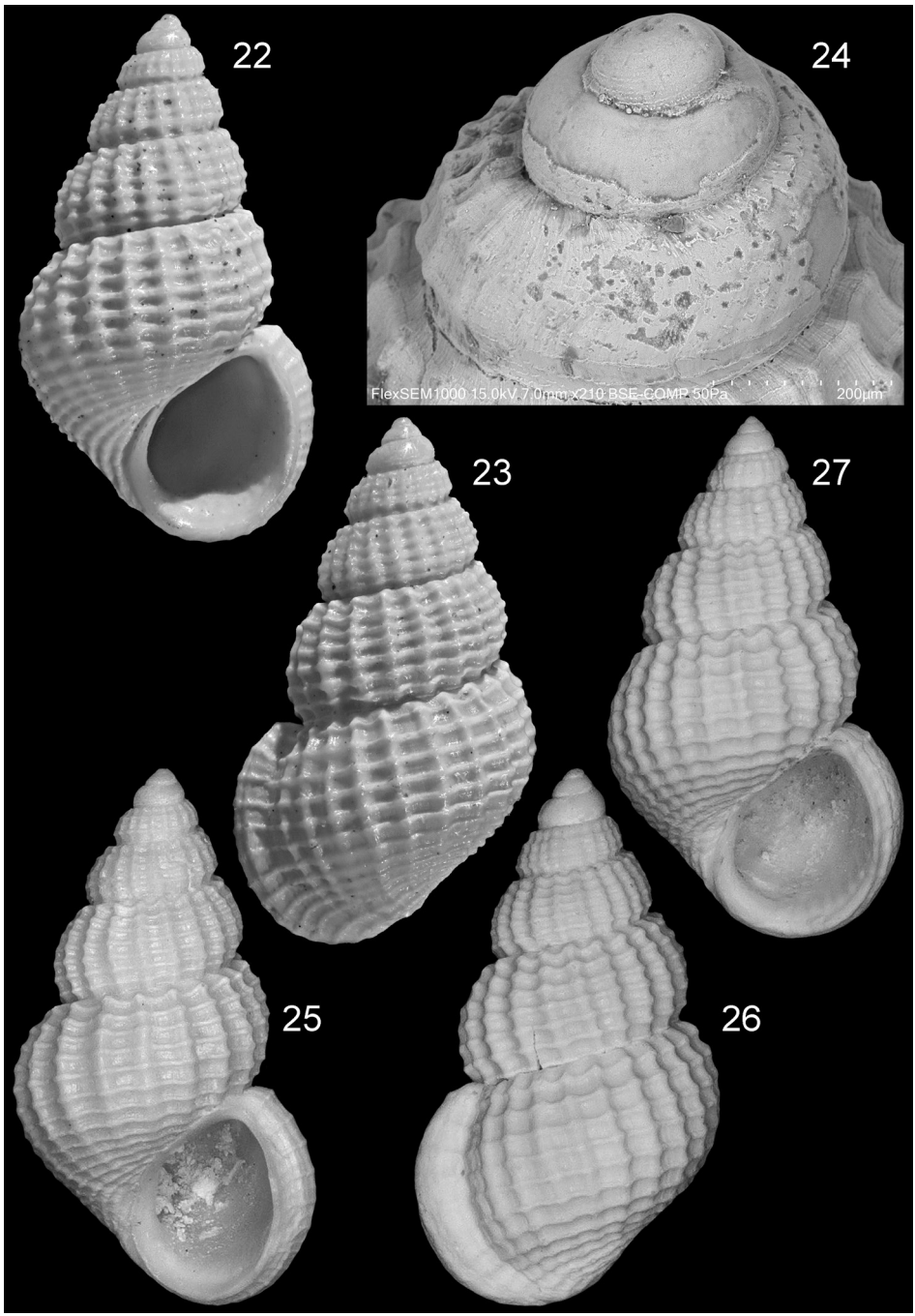
1884 *Acinus hispidulus* – Monterosato, p. 63.
2006 *Alvania hispidula* (Monterosato) – Chirli, p. 22, pl. 10, figs 1–8 (*cum syn.*).
2021 *Alvania hispidula* (Monterosato) – Chirli & Forli, p. 131, pl. 103, fig. B1–6, pl. 104, fig. A1–16 (*cum syn.*).



Figs 17–21. *Alvania hispidula* (Monterosato). – **Figs 17–19.** HNHM INV 2025.339A., SL 4.3 mm, apertural and abapertural views (18×), protoconch (scale bar 200 μm). – **Figs 20–21.** INV 2025.339B., SL 2.6 mm, apertural and abapertural views (20×) (Mecsekpölöske)

Material – HNHM INV 2025.339., 75 specimens (max. SL 4.3 mm) (Mecsekpölöske).

Description – Small, elongated shell with high spire. Protoconch of 2 rounded whorls, bearing grains and 2–3 fine spiral threads abapically. Teleoconch of 4½ convex whorls, suture incised. Suboval aperture, thickened outer lip, lirate within. Cancellate sculpture on entire teleoconch consisting of moderately widely spaced, orthocline to slightly prosocline, narrow, projected axial ribs (14–15 on


22
24
FlexSEM1000 15.0kV 7.0mm x210 BSE-COMP 50Pa
200µm
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25
26

last whorl) and strong spiral cords (4 on penultimate, 11 on last whorl). Concave interspaces between axials, tuberculate intersections. Ribs sligthly projected at subsutural part, forming coronate appearance of whorls. Protovarix can be present on last whorl.

Remarks – The study material agrees well in size and morphology with the Mediterranean Pliocene *Alvania hispidula* specimens illustrated by Chirli (2006). The new record presented herein extends the stratigraphical and palaeobiogeographical distributions of the species.

Distributions – Middle Miocene: Central Paratethys (Badenian): Hungary. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper). Pliocene–Recent: Mediterranean Sea: Italy.

Alvania nemethi n. sp.
(Figs 22–27)

Holotype – HNHM PAL 2025.59.1., SL 3.8 mm, SW 2.1 mm (Figs 22–24).

Paratype 1 – HNHM PAL 2025.60.1., SL 3.9 mm, SW 2.2 mm (Figs 25–26).

Paratype 2 – HNHM PAL 2025.61.1., SL 3.7 mm, SW 2.1 mm (Fig. 27).

Type strata and locality – Badenian clayey sand (Pécsszabolcs Mb. of the Lajta Limestone Fm.), Nagy Hill, Mecsekpölöske, Hungary.

Derivation of name – In honor of Tamás Németh (Hungary), who collected and prepared most of the studied Rissooidea material from Mecsekpölöske.

Material – Holotype, paratypes and ~70 specimens in private collections of T. Németh and the authors (Mecsekpölöske).

Diagnosis – *Alvania* species with small shell, conical spire, multispiral protoconch, teleoconch of 4½ whorls, early whorls almost flattened, penultimate and last whorls convex, outer lip thickened, lirate within. Sculpture of narrow, sharp axial ribs, strong spiral cords, tuberculate intersections.

Description – Small shell (max. SL 4.3 mm) with conical spire. Worn protoconch of 2½ rounded whorls (H 0.4 mm, W 0.45 mm, nucleus D 0.1 mm), bearing fine threads and granules. Teleoconch of 4½ whorls, suture deeply incised. First and second spire whorls almost flattened, penultimate whorl slightly convex, last whorl 62% of total height, convex. Aperture suboval, outer lip thickened, lirate within. Axial sculpture of moderately widely spaced, slightly prosocline, narrow, sharp ribs (20 on penultimate, 18 on last whorls), deeply

← **Figs 22–27.** *Alvania nemethi* n. sp. – **Figs 22–24.** Holotype, HNHM PAL 2025.59.1., SL 3.8 mm, apertural and abapertural views (20×), protoconch (scale bar 200 μm). – **Figs 25–26.** Paratype 1, PAL 2025.60.1., SL 3.9 mm, apertural and abapertural views (20×). – **Fig. 27.** Paratype 2, PAL 2025.61.1., SL 3.7 mm, apertural view (20×) (Mecsekpölöske)

concave interspaces, ribs fading away on last whorl toward base. Spiral sculpture of strong cords (7 on penultimate, 15 on last whorls), tuberculate intersections.

Remarks – The new species is characterized by its relatively large size for genus and its dense and strong, tuberculate sculpture. Similar species in the Badenian Central Paratethys are *Alvania tenuicostata* Bałuk, 1975 (see Bałuk 1975, pl. 9, figs 7–8) and *A. punctura* (?) recorded by Bałuk (l.c., pl. 9, figs 4–5) in the Korytnica Basin (Poland). Both forms are distinguished by smaller shells, and much denser axial ribs and spiral cords. Presence of the Pliocene–Recent NW European–Mediterranean *Alvania punctura* (Montagu, 1803) in the Middle Miocene Central Paratethys requires further research as the poor illustration in Bałuk (1975) does not allow this question to be resolved (for *Alvania punctura* see e.g., Chirli & Forli 2021; Landau *et al.* 2025). *Alvania alta* Bałuk, 1975 (see Bałuk 1975, pl. 9, figs 20–21) is similar in size, but its whorls are less convex, and its sculpture is finer.

Taxonomical note – *Alvania tenuicostata* Bałuk, 1975 [originally: *Alvania (Alvania) tenuicostata*] is an unavailable taxon name, being a junior secondary homonym of *Alvania tenuicostata* (Seguenza, 1876) (= *Rissoa tenuicostata* Seguenza, 1876) (for Seguenza's species see Amati & Smriglio 2016), therefore a new replacement name is introduced herein for Bałuk's species: *Alvania baluki* nom. nov.

Alvania productilis Boettger, 1907
(Figs 28–29)

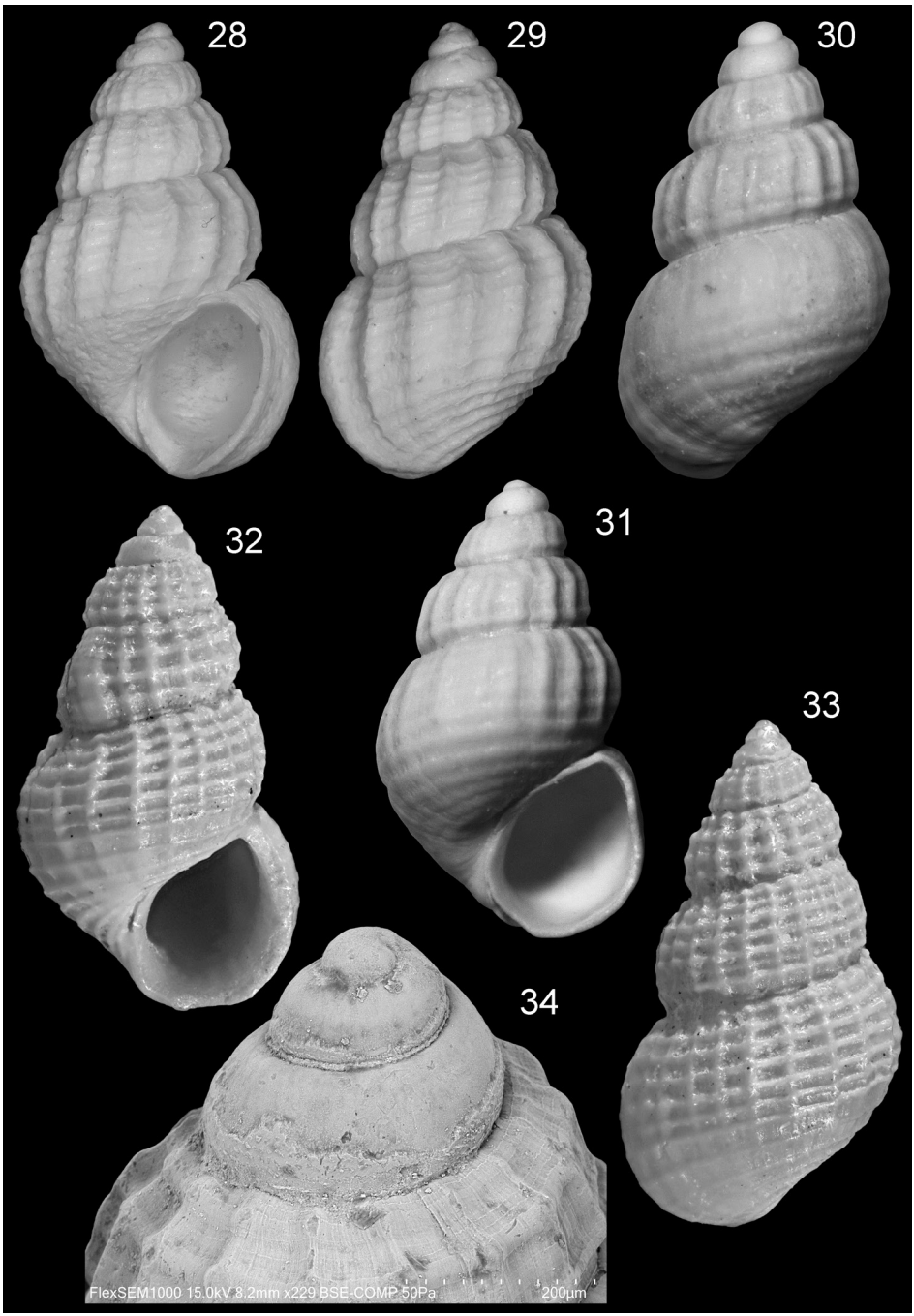
1907 *Alvania* (*Alvania*) *productilis* n. sp. – Boettger, p. 156.
1934 *Alvania* (*Alvania*) *productilis* Boettger – Zilch, p. 212, pl. 5, fig. 83.
1975 *Alvania* (*Alvania*) *productilis* Boettger – Bałuk, p. 81, pl. 9, fig. 6.
1981 *Alvania* (*Alvania*) *productilis* Boettger – Švagrovský, p. 117, pl. 36, figs 6–7.
2013 *Alvania productilis* Boettger – Landau *et al.*, p. 73, pl. 6, fig. 7, pl. 58, fig. 3.
2013 *Alvania* (*Alvania*) *productilis* Boettger – Tămaş A. *et al.*, p. 60, fig. 2e.
2021 *Alvania productilis* Boettger – Chirli & Forli, p. 161, pl. 127, figs B1–4.

non 1960 *Alvania* (*Alvania*) *productilis minor* n. ssp. – Švagrovský, p. 66, pl. 5, fig. 20.

Material – HNHM INV 2025.340., 4 specimens (Tekeres).

Description – Small, stout shell with moderately high spire and worn, multispiral protoconch. Teleoconch of 3½ convex whorls, suture narrow. Suboval aperture, thickened outer lip, smooth within. Axial sculpture of widely spaced,

→ **Figs 28–29.** *Alvania productilis* Boettger. HNHM INV 2025.340., SL 2.1 mm, apertural and abapertural views (30×) (Tekeres). – **Figs 30–31.** *Alvania minor* Švagrovský. NHM Z3280, holotype, SL 2.1 mm, abapertural and apertural views (30×) (Kuzmice, Slovakia). – **Figs 32–34.** *Alvania* cf. *productilis* Boettger. HNHM INV 2025.341., SL 2.8 mm, apertural and abapertural views (25×), protoconch (scale bar 200 μm) (Mecsekpölöske)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200µm

narrow, opisthocline ribs (12 on last whorl) with concave interspaces, spiral sculpture of closely spaced, narrow cords (6 on penultimate, 13 on last whorl).

Remarks – *Alvania productilis* is recorded for the first time in the Pannonian Basin system. The *Alvania productilis* specimen figured by Nicorici (1978, pl. 7, fig. 2) from the early Badenian of Romania differs from Boettger's type by its elongated shell, but the accurate interpretation of the material is difficult due to the poor quality illustrations.

Alvania productilis minor was introduced by Švagrovský (1960) from the late Badenian of E Slovakia. For comparison we illustrate the holotype (Z3280) by courtesy of Barbara Zahradníková (Natural History Museum of the Slovak National Museum, Bratislava) and Radoslav Biskupič (Figs 30–31). The specimen differs from the type of *Alvania productilis* (see Zilch 1934, pl. 5, fig. 83) by its smaller shell, broader protoconch, angulate spire whorls, more deeply incised, wider suture, and sculpture of stronger spiral cords and axial ribs. Moreover, it is typical of brackish water, while *Alvania productilis* occurred in fully marine environments. The taxon is recognized herein at species rank: *Alvania minor* Švagrovský, 1960.

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Poland, Romania, and Slovakia; Proto-Mediterranean Sea (Serravallian): Türkiye. Hungarian part of the Pannonian Basin: Mecsek Mts: Tekeres (this paper).

Alvania cf. *productilis* Boettger, 1907
(Figs 32–34)

cf. 1907 *Alvania* (*Alvania*) *productilis* n. sp. – Boettger, p. 156.

Material – HNHM INV 2025.341., 249 specimens (max. SL 2.9 mm) (Mecsekpölöske).

Description – Small shell with high spire. Protoconch of 2¼ rounded whorls (H 0.35 mm, W 0.4 mm, nucleus D 0.12 mm). Teleoconch of 4 whorls, suture narrow, incised. First and second spire whorls slightly angulated, penultimate and last whorls convex. Suboval aperture, thickened outer lip, lirate within. Cancellate sculpture on entire teleoconch consisting of moderately widely spaced, narrow, orthocline to slightly opisthocline, straight to slightly sigmoid axial ribs (16–17 on last whorl) and closely spaced, strong primary spiral cords (4–5 on penultimate, 12–13 on last whorl) with irregular, finer secondaries in interspaces. Protovarix can be present on penultimate whorl.

Remarks – The study material is close in size and morphology to *Alvania productilis* Boettger, 1907, but differs by its somewhat higher spire and less opisthocline axial ribbing, so we use open nomenclature. Specimens of identical

morphology were recently collected from the lower Badenian deposits of Márkháza (Cserhát Hills).

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Mecsek Mts: Mecsekpölöske, Cserhát Hills: Márkháza (this paper).

Alvania schwartzi (Hörnes, 1856)
(Fig. 35)

1856 *Rissoa schwartzi* – Hörnes, p. 573, pl. 48, fig. 18.
1902 *Alvania schwartzi* (M. Hörnes) – Boettger, p. 142.
1933 *Alvania schwartzi* Hörnes – Meznerics, p. 329.
1956 *Alvania schwartzi* M. Hörnes – Csepreghy-Meznerics, p. 380, pl. 1, fig. 18.
1966 *Rissoa* (*Alvania*) *schwartzi* Hörnes – Strausz, p. 75, pl. 46, figs 14–16.
1975 *Alvania* (*?Galeodinopsis*) *schwartzi* (Hörnes) – Bałuk, p. 89, pl. 9, fig. 3.
2004 *Alvania* (*Alvania*) *schwartzi* (Hörnes) – Kowalke & Harzhauser, p. 122, fig. 7D.
2006 *Alvania* (*Alvania*) *schwartzi* (Hörnes) – Bałuk, p. 189.
2021 *Alvania schwartzi* (Hörnes) – Chirli & Forli, p. 168, p. 135, fig. B1–8.

Material – HNHM INV 2025.342., 123 specimens (Tekeres).

Description – Small, stout shell with protoconch of 2¾ rounded whorls sculptured by fine spiral and axial threads. Teleoconch of 3 convex whorls, aperture ovate, outer lip moderately thickened, smooth within. Axial sculpture of numerous low, broad, rounded, closely spaced, orthocline ribs; spiral sculpture of narrow grooves, the two closely spaced subsutural, the medial and the basal grooves deepest.

Remarks – The abundance of *Alvania schwartzi* in the Tekeres material and its absence in the shallow marine Mecsekpölöske assemblage correspond to the fact that the species is typical of circalittoral habitats (Kowalke & Harzhauser 2004; Bałuk 2006).

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, Hungary, Poland, and Romania. Hungarian part of the Pannonian Basin: Mecsek Mts: Hidas (Strausz 1966; Bohn-Havas 1973), Tekeres (this paper), Börzsöny Mts: Szob (Csepreghy-Meznerics 1956), Letkés (new excavation, own data).

Alvania sublaevigata Boettger, 1907
(Figs 36–37)

1907 *Alvania* (*Massotia*) *sublaevigata* n. sp. – Boettger, p. 160.
1934 *Alvania* (*Massotia*) *sublaevigata* Boettger – Zilch, p. 212, pl. 5, fig. 87.
1956 *Alvania* (*Massotia*) *sublaevigata* Boettger – Csepreghy-Meznerics, p. 380.
1966 *Alvania* (*Massotia*) *sublaevigata* Boettger var. – Kókay, p. 36, pl. 2, fig. 19.
1966 *Rissoa* (*Alvania*) *sublaevigata* Boettger – Strausz, p. 74, pl. 46, figs 10–11.

1975 *Alvania* (*Alvania*) *sublaevigata* Boettger – Bałuk, p. 84, pl. 9, figs 1–2.
2021 *Alvania sublaevigata* Boettger – Chirli & Forli, p. 177, pl. 142, figs B1–3.

non 1966 *Rissoa* (*Alvania*) *sublaevigata* Boettger – Strausz, p. 74, pl. 46, figs 10–11.

Material – HNHM INV 2025.343., 2 specimens (max. SL 2.7 mm) (Mecsekpölöske).

Description – Small shell with protoconch of about 2½ smooth, rounded whorls. Teleoconch of 2½ almost flattened spire whorls with incised suture, last whorl convex. Wide, suboval aperture, outer lip thickened, lirate within. Axial sculpture of numerous closely spaced, weakly developed, slightly prosocline ribs. Spiral sculpture of fine cords (7 on penultimate whorl, 17 on last whorl), subsutural and suprasutural cords on spire whorls stronger than others, first and second subsutural cords sligthly more widely spaced. In the middle of last whorl, the 8th cord (= suprasutural cord on spire whorls) slightly broader and more projected. Intersections of axials and spirals gently beaded.

Remarks – The rare species is distinguished from the Badenian congeners by its very fine sculpture. The specimen recorded by Kókay (1966) bears somewhat more developed subsutural spiral grooves. The material illustrated by Strausz (1966, pl. 46, figs 10–11) has a more elongated, slenderer shell with more convex whorls, the specimen represents another species.

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Poland, and Romania. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), Bakony Mts: Bánd, Várpalota (Kókay 1966; Strausz 1966), Börzsöny Mts: Szob (Csepreghy-Meznerics 1956).

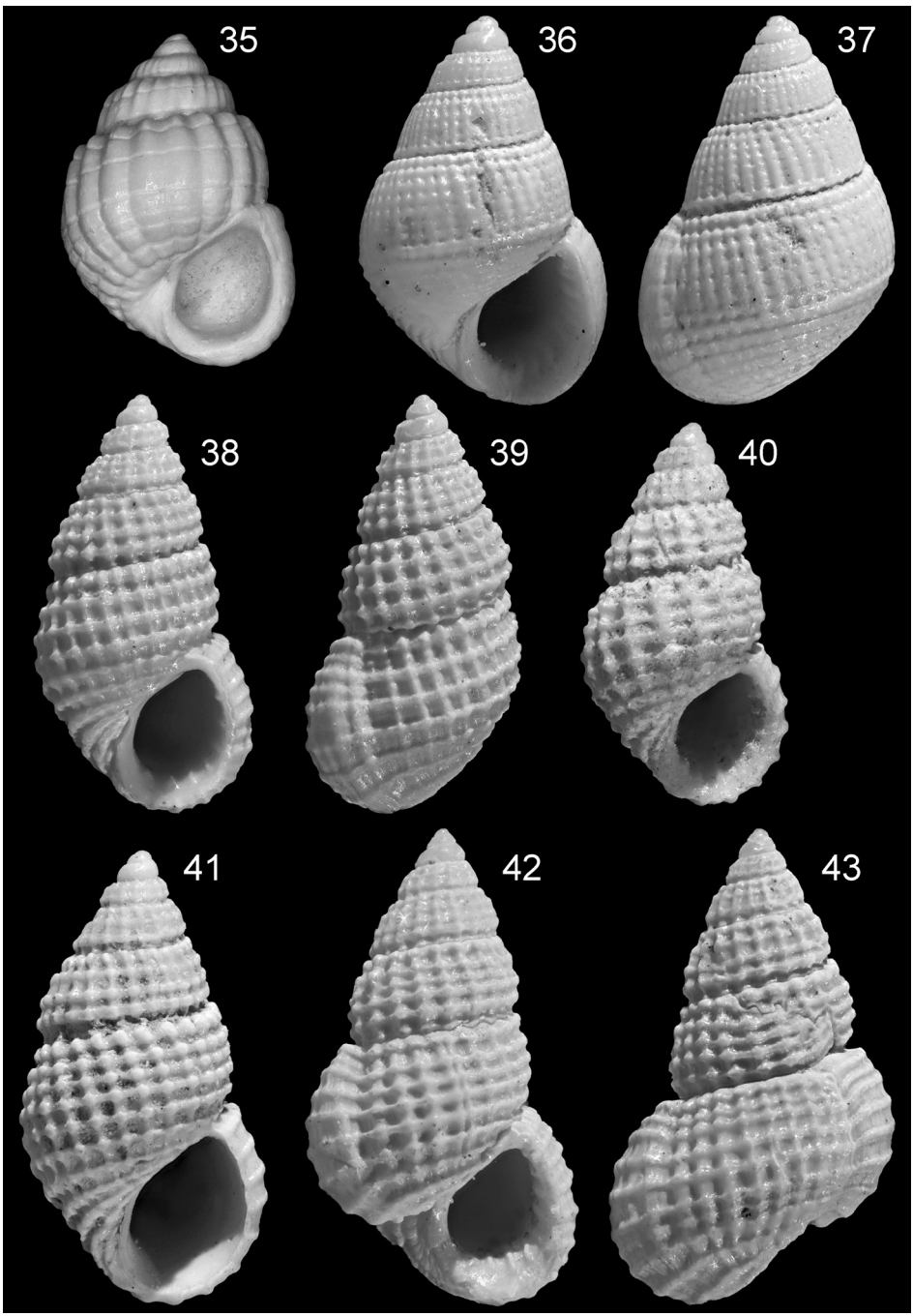
Alvania transiens Sacco, 1895
(Figs 38–43)

1895 *Alvania* (*Acinopsis*) *sculpta* ? var. *transiens* – Sacco, p. 27.
2023 *Alvania transiens* Sacco – Kovács & Stein, p. 21, pl. 1, figs 13–14, pl. 2, figs 1–5 (*cum syn.*).

Material – HNHM INV 2025.344., 1002 specimens (max. SL 3.9 mm) (Mecsekpölöske), 1 specimen (Tekeres).

Description – Elongated, egg-shaped shell of 6 whorls separated by deep sutures. Protoconch of 2¾ rounded whorls bearing trace of fine spiral threads

→ **Fig. 35.** *Alvania schwartzi* (Hörnes). HNHM INV 2025.342., SL 2.3 mm, apertural view (20×) (Tekeres). – **Figs 36–37.** *Alvania sublaevigata* Boettger. HNHM INV 2025.343., SL 2.7 mm, apertural and abapertural views (20×) (Mecsekpölöske). – **Figs 38–43.** *Alvania transiens* Sacco. – **Figs 38–39.** HNHM INV 2025.344A., SL 3.4 mm, apertural and abapertural views (17×). – **Fig. 40.** INV 2025.344B., SL 3.1 mm, apertural view (17×). – **Fig. 41.** INV 2025.344C., SL 3.7 mm, apertural view (17×). – **Figs 42–43.** INV 2025.344D., SL 3.9 mm, apertural and abapertural views (17×) (Mecsekpölöske)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abapically. Teleoconch whorls slightly rounded. Drop-shaped aperture, outer lip thickened by labral varix, denticulate within. Teleoconch sculpture of well-developed spiral cords (4–5 on penultimate, 6 on last whorl), and axial ribs with equal strength (16–18 on last whorl) forming a regular reticulate pattern. Protovarix can appear on adult specimens.

Remarks – *Alvania transiens* is characterized by moderate intraspecific variability in the number of spiral cords. Specimens with 4 spiral cords on the penultimate whorl are considered herein as typical representatives of the species, while specimens bearing 5 spirals on this whorl can be interpreted as transitional morphs between *Alvania transiens* and the closely allied *A. perregularis* Sacco, 1895 which is characterized by similar shell but 6 spiral cords on the penultimate whorl (Kovács & Stein 2023).

Distribution – Early Miocene: Central Paratethys (Eggenburgian): Austria; Proto-Mediterranean Sea (Aquitanian): Greece, (Burdigalian): N Italy. Middle Miocene: Central Paratethys (Badenian): Austria, Bulgaria, Hungary, Poland, Romania, and Slovakia. Hungarian part of the Pannonian Basin: Mecsek Mts: Pécsvárad, Szilágy (Bohn-Havas 1973), Mecsekpölöske, Tekeres (this paper), Bakony Mts: Bánd, Várpalota (Kókay 1966; Strausz 1966), Börzsöny Mts: Letkés, Szob (Csepreghy-Meznerics 1956; Kovács & Stein 2023), Cserhát Hills: Márkháza (own data). Proto-Mediterranean Sea (Serravallian): Türkiye. Late Miocene: Proto-Mediterranean Sea (Tortonian): N Italy. Pliocene: Central Mediterranean Sea: Italy.

Alvania viciani n. sp.
(Figs 44–47)

Holotype – HNHM PAL 2025.62.1., SL 5.1 mm, SW 2.8 mm (Figs 44–46).

Paratype 1 – HNHM PAL 2025.63.1., SL 4.5, SW 2.6 (Fig. 47).

Paratypes 2–28 – HNHM PAL 2025.64.1-27.

Type strata and locality – Badenian clayey sand (Pécsszabolcs Mb. of the Lajta Limestone Fm.), Nagy Hill, Mecsekpölöske, Hungary.

Derivation of name – In honor of Zoltán Vicián, Hungarian fossil shell collector.

Material – Holotype, paratypes and ~520 specimens in private collections of T. Németh and the authors (Mecsekpölöske).

Diagnosis – *Alvania* species with small shell, paucispiral protoconch and 5 angulate teleoconch whorls, subcircular aperture, simple outer lip, sculpture of broad, rounded axial ribs and widely spaced, strong spiral cords, 3rd cord strongest, forming a keel on whorls.

Description – Small shell with protoconch of about 1½ whorls (H 0.38 mm, W 0.4 mm; nucleus D 0.15 mm). Transition to teleoconch not clearly marked, interpreted as beginning of a keel on lower third of 1st teleoconch whorl. Teleoconch of 5 angulated whorls with narrow subsutural band, suture shallow. Last whorl 62% of total height, aperture subcircular, slightly teardrop-shaped, outer lip not thickened, smooth within, columellar callus very narrow, not expanded, umbilicus missing. Axial sculpture of 8–9 prominent, broad, rounded ribs per whorl, ribs somewhat pointed in the middle, flatten towards the adapical and abapical sutures. Spiral sculpture of 5 widely spaced primary cords, 3rd strongest, forming a keel on lower third of spire whorls and in the middle of convex part of last whorl. Subsutural band on penultimate and last whorl bearing 2 fine secondary cords; 3 strong basal cords on base.

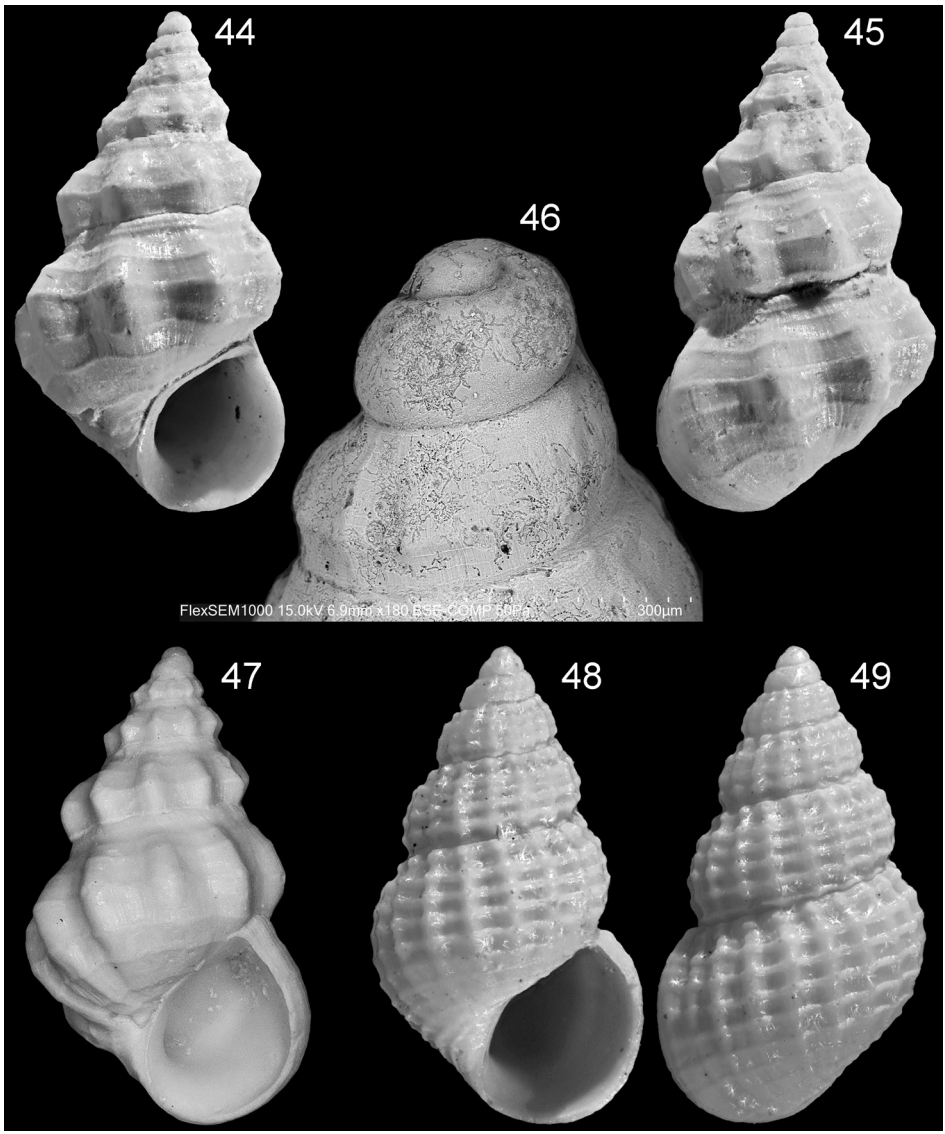
Remarks – *Alvania viciani* n. sp. is characterized by its distinctive angulate whorls which feature is unknown on its Badenian congeners. The new species displays very low level of intraspecific variability. *Alvania viciani* n. sp. is similar to the Tortonian *A. munita* Palazzi, 1996 (see Palazzi 1996, pl. 1, figs 1–4), the Pliocene *A. maurizioi* Chirli, 2006 (see Chirli 2006, pl. 13, figs 1–10), and the Pleistocene *A. leopardiana* Brunetti & Vecchi, 2012 (see Brunetti & Vecchi 2012, fig. 2a–c), all from the Mediterranean region. These three species differ from *Alvania viciani* n. sp. by having significantly narrower and more numerous axial ribs.

Alvania sp.
(Figs 48–49)

Material – 1 specimen (SL 2.7 mm) (Mecsekpölöske).

Description – Small shell with moderately high spire, worn protoconch of about 2½ rounded whorls. Teleoconch of about 4 whorls. Convex spire whorls, deeply incised suture, convex last whorl. Suboval aperture, non-thickened outer lip, smooth within. Axial sculpture of widely spaced, slightly prosocline, narrow, projected ribs (16 on last whorl) with concave interspaces. Spiral sculpture of strong cords (5 on penultimate, 11 on last whorl).

Remarks – The study material is probably a juvenile specimen. It differs from *Alvania anabaptizata* Boettger, 1906 by its less broad shell, bearing more spiral ribs (see Zilch 1934, pl. 5, fig. 86). *Alvania helenae* is somewhat similar in shell shape but differs by having less ribs and lirate outer lip. The study specimen might be interpreted as a transitional form between *Alvania helenae* and *A. giselae*.



Figs 44–47. *Alvania viciani* n. sp. – **Figs 44–46.** Holotype, HNHM PAL 2025.62.1., SL 5.1 mm, apertural and abapertural views (13×), protoconch (scale bar 300 µm). – **Fig. 47.** Paratype 1, HNHM PAL 2025.63.1., SL 4.5 mm, apertural view (14×) (Mecsekpölöske). – **Figs 48–49.** *Alvania* sp., SL 2.7 mm, apertural and abapertural views (24×) (Mecsekpölöske)

Genus *Manzonia* Brusina, 1870
Type species: *Turbo costatus* J. Adams, 1797 (type by monotypy) (= *Turbo crassus* Kanmacher, 1798)

Manzonia miocrassicosta Sacco, 1895
(Figs 50–55)

1856 *Rissoa zetlandica* – Hörnes, p. 566, pl. 48, fig. 11 (*non* Montagu, 1816).
1895 *Manzonia* (*Flemingia*) *zetlandica* var. *miocrassicosta* – Sacco, p. 30.
1923 *Manzonia zetlandica* var. *miocrassicosta* Sacco – Friedberg, p. 383, pl. 23, fig. 3.
1933 *Manzonia* (*Taramellia*) *zetlandica* – Meznerics, p. 332 (*non* Montagu, 1816).
1950 *Manzonia zetlandica* var. *miocrassicosta* Sacco – Krach, p. 303, pl. 1, fig. 15.
? 1966 *Rissoa* (*Manzonia*) *costata* – Strausz, p. 76, pl. 46, fig. 24 (*non* Kanmacher, 1798).
1968 *Manzonia zetlandica miocrassicosta* Sacco – Zelinskaya *et al.*, p. 139, pl. 35, figs 16–17.
1984 *Flemingia zetlandica* var. *miocrassicosta* Sacco – Ferrero Mortara *et al.*, p. 218, pl. 39, fig. 6.
2004 *Manzonia* (*Alvinia*) *miocrassicosta* (Sacco) – Kowalke & Harzhauser, fig. 8A.
2021 *Alvania miocrassicosta* (Sacco) – Chirli & Forli, p. 147, pl. 118, figs A1–2, 5–7 (*only*).
? 2021 *Alvania miocrassicosta* (Sacco) – Gardella *et al.*, fig. 5.

Material – HNHM INV 2025.345., 1378 specimens (max. SL 4.6 mm) (Mecsekpölöske).

Description – Shell with protoconch of about 2 rounded, worn whorls, traces of netted ornamentation detectable. Teleoconch of 4 rounded whorls, incised suture, ovate aperture, outer lip thickened, smooth within. Axial sculpture of narrow, slightly opisthocline, prominent axial ribs (13 on last whorl) overriding by strong, sharp spiral cords (5 on convex part of last whorl) with pitted microsculpture, 3 well-developed spiral cords on base, subtle spiral threads between cords on entire shell, protovarix on last whorl frequently present.

Remarks – The genus rank arrangement of the species is discussed in the literature. Based on netted protoconch ornamentation and teleoconch spiral cords with pitted microsculpture (for this pattern see Garilli & Parrinello 2014, fig. 3), we follow Landau *et al.* (2025), and assign the species to *Manzonia*. *Manzonia subzetlandica* (Boettger, 1906) is a similar form but differs from *M. miocrassicosta* by its smaller size and somewhat slenderer shell (Boettger 1906: 161; Bałuk 1975; see Zilch 1934, pl. 5, fig. 88). The specimen illustrated as "*Manzonia costata*" by Strausz (1966) from the Badenian of Várpalota (Bakony Mts), differs from *M. crassa* (Kanmacher, 1798) in morphology by its stout shell bearing more closely spaced, finer axial ribs (see Strausz 1966, pl. 46, figs 24 and 25–26), it probably represents *M. miocrassicosta*. Gardella *et al.* (2021, fig. 5) illustrated a specimen from the Tortonian of Montegibbio (Italy) as *Manzonia miocrassicosta*, however, the material differs from the lectotype (see Ferrero Mortara *et al.* 1984, pl. 39, fig. 6) by its broader shell with higher protoconch and sculpture of 2 prominent spiral cords (instead of 3) on penultimate whorl.

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, Hungary, Poland, Romania, and Slovakia. Late Miocene: Proto-Mediterranean Sea (Tortonian): Italy. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), ?Bakony Mts: Várpalota (Strausz 1966).

Manzonia scalaris (Du Bois de Montpéreux, 1831)
(Figs 56–58)

1831 *Cyclostoma scalare* nov. – Du Bois de Montpéreux, p. 37, pl. 3, figs 40–41.
2023 *Manzonia scalaris* (du Bois de Montpéreux) – Kovács & Stein, p. 22, pl. 2, figs 6–8 (*cum syn.*).

Material – HNHM INV 2025.346., 3 specimens (max. SL 2.6 mm) (Mecsekpölöske).

Description – Shell with protoconch of about 2 worn, convex whorls, remained ornamentation consists of irregularly spaced, small grains. Teleoconch of 3.5 convex whorls, slightly angulated at shoulder, aperture thickened, smooth within. Axial sculpture of strong, projected, widely spaced ribs (10–11 on last whorl), terminating at the last abapical spiral cord. Spiral sculpture of well-developed cords (5 on penultimate whorl, 8 on convex part of last whorl), and fine spiral threads, covering the whole teleoconch. Base bearing two strong spiral cords.

Remarks – Although *Manzonia scalaris* was common in the Middle Miocene Central Paratethys, it was a rare component of the Rissooidea assemblages at all localities. The Middle Miocene–Recent *Manzonia crassa* (Kanmacher, 1798) – which is known in the Badenian Central Paratethys – differs from *M. scalaris* in morphology by its protoconch sculpture, regularly convex teleoconch whorls, bearing more widely spaced axial ribs and much finer spiral cords (see Kowalke & Harzhauser 2004, fig. 8C; Landau *et al.* 2018, pl. 103).

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, ?Bosnia, Hungary, Poland, Romania, Slovakia, and Ukraine. Late Miocene: Proto-Mediterranean Sea (Tortonian): N Italy. Hungarian part of the Pannonian Basin: Mecsek Mts: Hidas (Csepreghy-Meznerics 1950), Bakony Mts: Bánd (Kókay 1966; own data), Börzsöny Mts: Letkés (Kovács & Stein 2023), Cserhát Hills: Márkháza (own data).

Genus *Mohrensternia* Stoliczka, 1868
Type species: *Rissoa angulata* Eichwald, 1830 (type by subsequent designation)

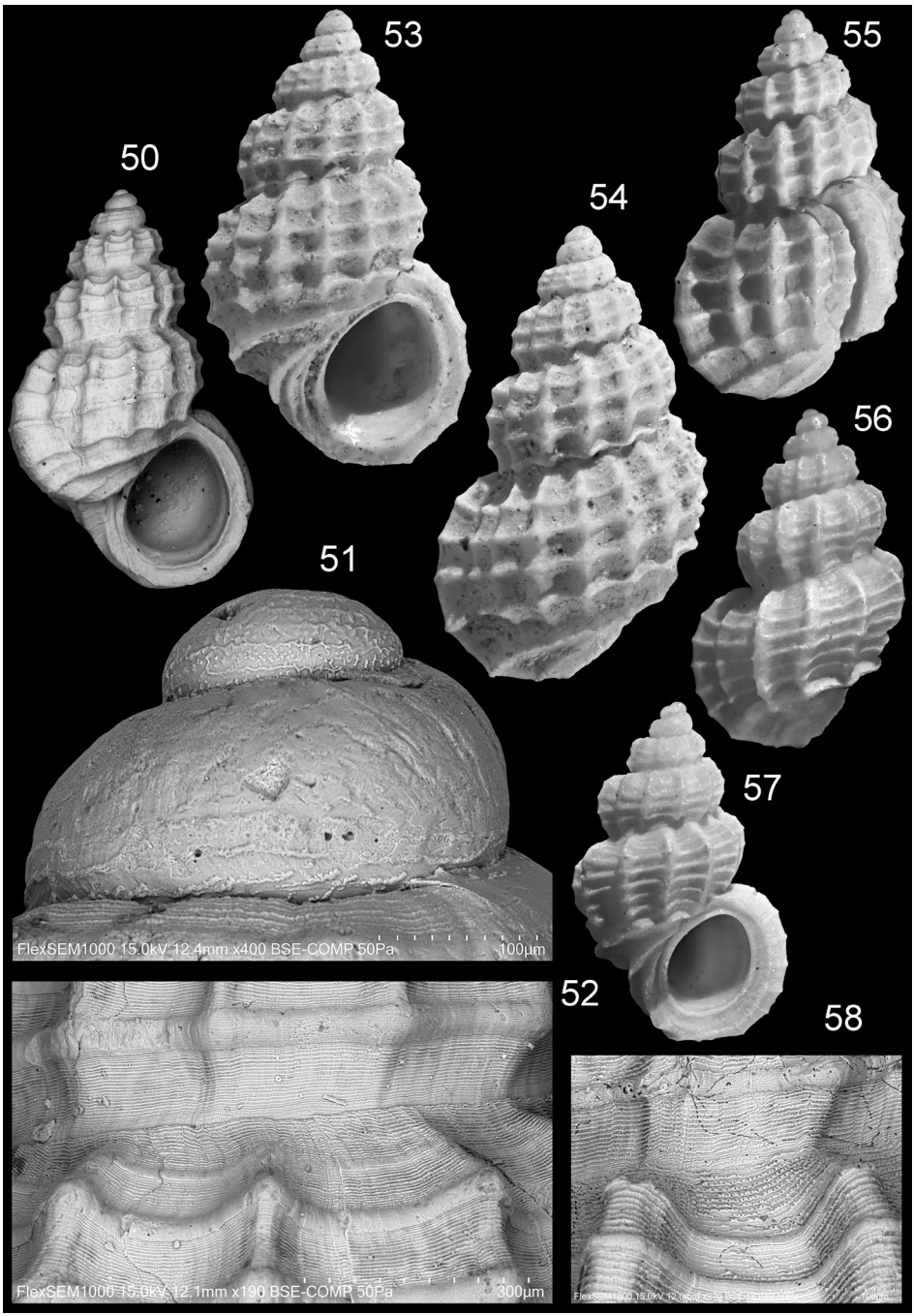
Remarks – *Mohrensternia* has been dealt with in detail by numerous authors (for references see our chresonymies below, and Kowalke & Harzhauser 2004; Anistratenko 2005; Tămaş D. *et al.* 2013), and a brief overview of the

genus was provided by Chirli & Forli (2021). *Mohrensternia* is a Badenian–Sarmatian (Langhian–Serravallian) genus, and endemic to the Central and Eastern Paratethys. It is thought to be derived from the Early–Middle Miocene Central Paratethyan *Rissoa* group, the origin of the genus, however, has not yet been fully clarified (Anistratenko 2005). Although rich late Badenian–Sarmatian *Mohrensternia* assemblages have been studied in several papers, early–middle Badenian occurrences have only been recorded in a few works (e.g., Boettger 1902; Friedberg 1923; Kókay 1966).

The *Mohrensternia* assemblage of the Nagy Hill locality contains approx. 6600 specimens, this material appears to be the largest known in the Badenian Central Paratethys. More than 4600 specimens are identified at species level in this paper, they represent two basic groups: i) specimens with slender shells, ii) specimens with broad shells. Both groups are characterized by high level of intraspecific variability of inflation of whorls and development of sculpture, moreover, shells in various stages of transitional morphology are also frequent. The number of available *Mohrensternia* species has been widely discussed in the literature. Based on our personal communication with Vitaliy Anistratenko, we adopt his systematic arrangement (Anistratenko 2005), and recognize two species in the study material: *Mohrensternia angulata* (Eichwald, 1830) and *M. perinflata* Friedberg, 1923.

Most of the gastropods in the Nagy Hill assemblage represent fully marine conditions. Species of nearshore, shallow, infralittoral environments predominate the material, only a few species in low specimen numbers are known from circalittoral habitats. *Mohrensternia*, however, is thought to be an euryhaline genus indicating semi-marine to brackish-water environments (Anistratenko 2005). Considering the facts that i) other brackish-water gastropod markers (e.g., Melanopsidae, Batillariidae or Potamididae) are missing in the material, ii) *Mohrensternia* specimens are typical of each layer in the study section (they are not restricted to a special type of deposit), and iii) habitats of the early Badenian *Mohrensternia* are poorly known, we suppose that the specimens described herein are characterized by fully marine environment (and see Procházka 1900: 110). Moreover, two early Badenian representatives of the genus were recorded from euhaline sea water: *Mohrensternia angulata* (Eichwald, 1830) by Kókay (1966)

→ **Figs 50–55.** *Manzonia miocrassicosta* Sacco. – **Figs 50–52.** HNHM INV 2025.345A., SL 3.2 mm, apertural view (17×), protoconch (scale bar 100 μm), and detail of lateral view (scale bar 300 μm). – **Figs 53–54.** INV 2025.345B., SL 4.5 mm, apertural and abapertural views (14×). – **Fig. 55.** INV 2025.345C., SL 3.4 mm, abapertural view (16×) (Mecsekpölöske). – **Figs 56–58.** *Manzonia scalaris* (Du Bois de Montpéreux). HNHM INV 2025.346., SL 2.6, abapertural and apertural views (18×), detail of lateral view (scale bar 100 μm) (Mecsekpölöske)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FlexSEM1000 15.0kV 12.4mm x400 BSE-COMP 50Pa 100µm
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58
FlexSEM1000 15.0kV 12.1mm x190 BSE-COMP 50Pa 300µm

and *M. inflata* (Hörnes, 1856) (= *Rissoa turricula* Eichwald, 1830) by Bohn-Havas (1973).

The following analyses are considered preliminary presentations. Discussion of the whole *Mohrensternia* material of the Nagy Hill locality (with additional investigation of approx. 2000 poorly preserved indet. specimens) is planned for the future.

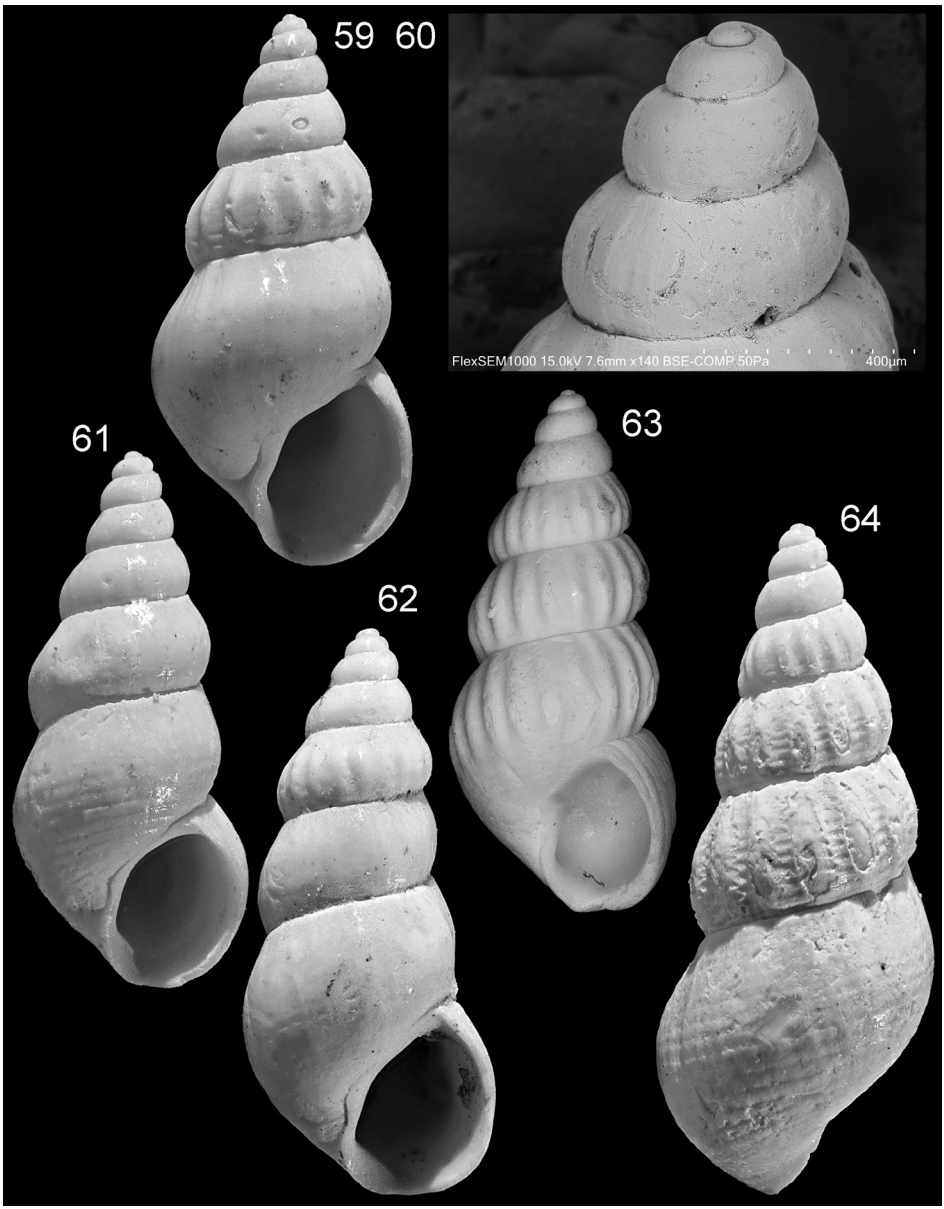
Mohrensternia angulata (Eichwald, 1830)
(Figs 59–64)

1830 *R*[*issoa*] *angulata* m. – Eichwald, p. 218.
1853 *Rissoa angulata* m. – Eichwald, p. 268, pl. 10, fig. 10.
1856 *Rissoa angulata* Eichwald – Hörnes, p. 577, pl. 48, fig. 23.
1864 *Rissoa angulata* Eichwald – Schwartz von Mohrenstern, p. 54, pl. 4, fig. 45.
1923 *Mohrensternia angulata* (Eichwald) – Friedberg, p. 392, pl. 23, figs 15–16.
1950 *Rissoa* (*Mohrensternia*) *angulata* Eichwald – Csepreghy-Meznerics, p. 21.
1966 *Rissoa* (*Mohrensternia*) *angulata* Eichwald – Kókay, p. 37, pl. 2, fig. 21.
2004 *Mohrensternia angulata* (Eichwald) – Kowalke & Harzhauser, p. 124, fig. 9A–B (*cum syn.*)
2005 *Mohrensternia angulata* (Eichwald) – Anistratenko, p. 383, figs 5D–E, 6A–B.
2006 *Mohrensternia* ex. gr. *angulata* (Eichwald) – Iljina, pl. 7, fig. 2.
? 2010 *Mohrensternia angulata* (Eichwald) – Tóth *et al.*, fig. 6a [= ? *Mohrensternia inflata* (Hörnes, 1856)]
2013 *Mohrensternia angulata* Eichwald – Tămaş D. *et al.*, p. 74, fig. 3f (*cum syn.*).
2014 *Mohrensternia angulata* Eichwald – Filipescu *et al.*, fig. 10.10.
2021 *Mohrensternia angulata* (Eichwald) – Chirli & Forli, p. 228, text-figs 32–37, pl. 182, fig. B2–20 (*cum syn.*) (*non* fig. B1 = ? *Micromelania* sp.)
2021 *Mohrensternia angulata* (Eichwald) – Zahradníková & Fordinál, pl. 10, fig. m.

Material – HNHM INV 2025.347., 2555 specimens (max. SL 4.5 mm) (Mecsekpölöske).

Description – Small, slender to gently broad shell with high spire, and (generally worn) protoconch of about 2½ smooth whorls. Spire whorls convex, irregularly widening, smooth or ornamented, suture narrow and shallow. Last whorl convex, aperture suboval, outer lip non-thickened, smooth within, umbilicus small. Sculpture missing on several specimens, or very weakly developed, if present, shells bearing orthocline to slightly prosocline, low, rounded, moderately widely spaced axial ribs, and numerous, fine spiral cords.

Remarks – The study material (as most of the *Mohrensternia angulata* materials in the literature) is characterized by a high level of intraspecific variability in shell breadth, spire shape (high conical or with irregularly inflated whorls), and the presence of sculpture (ranging from partially to fully ornamented shells). Considering the literature, the *Mohrensternia angulata* specimens illustrated by Friedberg (1923, pl. 23, figs 15–16), Anistratenko (2005, figs



Figs 59–64. *Mohrensternia angulata* (Eichwald). – **Fig. 59.** HNHM INV 2025.347A., SL 3.7 mm, apertural view (20×). – **Fig. 60.** INV 2025.347B., protoconch (scale bar 400 µm). – **Fig. 61.** INV 2025.347C., SL 3.6 mm, apertural view (20×). – **Fig. 62.** INV 2025.347D., SL 3.8 mm, apertural view (20×). – **Fig. 63.** INV 2025.347E., SL 3.5 mm, apertural view (20×). – **Fig. 64.** INV 2025.347F., SL 4.5 mm, abapertural view (20×) (Mecsekpölöske)

5D–E, 6A), Iljina (2006, pl. 7, fig. 2) show the greatest similarity to our material. *Mohrensternia angulata* is one of the earliest representatives of the genus in the Middle Miocene Pannonian Basin. It was recorded from the early Badenian by Csepreghy-Meznerics (1950) and Kókay (1966, 1985), the study material confirms the presence of the species in this age. The Pliocene specimen illustrated by Malatesta (1974, pl. 13, fig. 20) under the name *Mohrensternia angulata* from Italy probably represents a *Micromelania* specimen (M. Forli *pers. com.*).

Distribution – Middle–Late Miocene: Central Paratethys (Badenian): Austria, Hungary, and Ukraine. For a detailed Sarmatian chresonymy and palaeogeographic distribution see Tămaş D. *et al.* (2013). Hungarian part of the Badenian Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), Hidas (Csepreghy-Meznerics 1950), Bakony Mts: Herend sub-basin (Kókay 1966, 1985), Mány-Zsámbék area: Perbál (Kókay 1985).

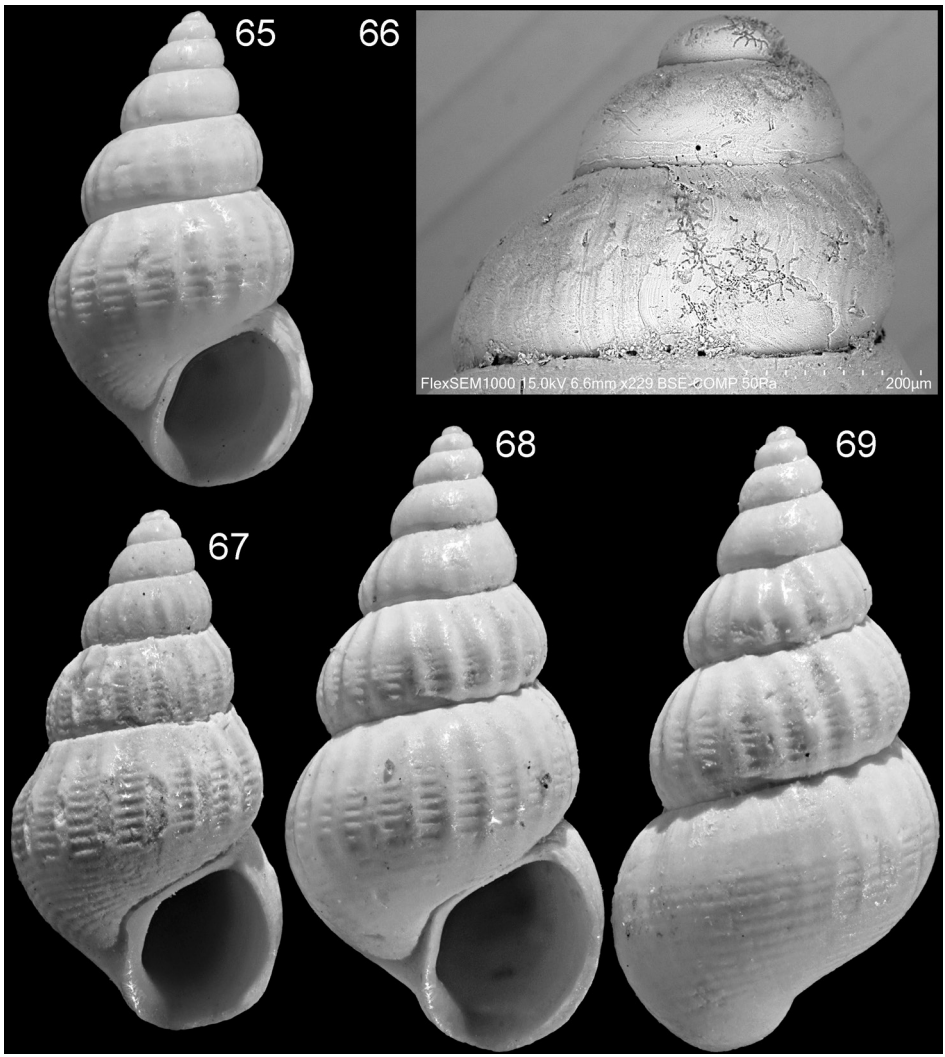
Mohrensternia perinflata Friedberg, 1923
(Figs 65–69)

1923 *Mohrensternia pseudoinflata* [sic] – Friedberg, pl. 23, fig. 13 (*non* Hilber, 1897).
1923 *Mohrensternia perinflata* – Friedberg, p. 391, pl. 23, fig. 14.
1968 *Mohrensternia perinflata* Friedberg – Zelinskaya *et al.*, p. 144, pl. 36, fig. 18.
1985 *Mohrensternia pseudoinflata* Friedberg [sic] – Kókay, p. 65, pl. 9, figs 10–11.
2005 *Mohrensternia perinflata* Friedberg – Anistratenko, p. 379, text-fig. 4C–D.
2021 *Mohrensternia perinflata* Friedberg – Chirli & Forli, p. 233, pl. 187, fig. C1–4.

Material – HNHM INV 2025.348., 2086 specimens (max. SL 4.5 mm) (Mecsekpölöske).

Description – Small, broad shell with broad, conical spire, worn protoconch of about 2¾ convex, smooth whorls. Teleoconch of 5 regularly convex whorls, suture shallow, aperture suboval, outer lip non-thickened, smooth within. Axial sculpture of moderately widely spaced, slightly prosocline, low, narrow, rounded ribs with concave interspaces, ribbing fading away on base of last whorl. Spiral sculpture of numerous strong, narrow cords, generally visible only in interspaces.

Remarks – Taxonomical revision of the species was arranged by Anistratenko (2005) with detailed discussion of morphological variability, including specimens with sigmoid and non-sigmoid axial ribbing. Our *Mohrensternia perinflata* material is characterized by non-sigmoid axial sculpture, it is closely allied to the Sarmatian *M. perinflata* specimen which was illustrated by Friedberg (1923, pl. 23, fig. 13) as *M. pseudoinflata* (refigured by Anistratenko 2005, text-fig. 4C). The late Badenian–Sarmatian *Mohrensternia inflata* (Hörnes, 1856) differs by its regularly conical spire and sculpture of more widely spaced axial ribs with generally smooth interspaces. The late Badenian–Sarmatian *Mohrensternia pseudinflata* Hilber, 1897 is distinguished by its larger



Figs 65–69. *Mohrensternia perinflata* Friedberg. – **Figs 65–66.** HNHM INV 2025.348A., SL 3.2 mm, apertural view (20×), protoconch (scale bar 200 µm). – **Fig. 67.** INV 2025.348B., SL 3.5 mm, apertural view (20×). – **Figs 68–69.** INV 2025.348C., SL 4.2 mm, apertural and abapertural views (20×) (Mecsekpölöske)

protoconch, and less convex spire whorls with periphery below the mid-whorl (see Hilber 1897, fig. 19; Anistratenko 2005, text-fig. 4B). Kókay (1985) described and illustrated two *Mohrensternia* specimens from the late Badenian Pannonian Basin. The author cited Friedberg's (1923, pl. 23, fig. 13) illustration which specimen was assigned to *M. perinflata* by Anistratenko (2005).

Indeed, Kókay's material differs in morphology (protoconch development, whorl inflation) from *Mohrensternia pseudinflata* Hilber, so these specimens are regarded herein as representatives of *M. perinflata*.

Distribution – Middle–Late Miocene: Central Paratethys (Badenian): Hungary, and Ukraine. For Sarmatian distributions see Anistratenko (2005). Hungarian part of the Badenian Pannonian Basin: Mecsek Mts: Pécsvárad (Kókay 1985), Mecsekpölöske (this paper), Mány-Zsámbék area: Perbál (Kókay 1985).

Genus *Obtusella* Cossmann, 1921
Type species: *Rissoa intersecta* Wood, 1857 (type by monotypy)

Obtusella communis (Boettger, 1907)

1907 *Cingula* (*Cingulina*) *communis* n. sp. – Boettger, p. 162.
2023 *Obtusella communis* (Boettger) – Kovács & Stein, p. 23, pl. 2, figs 11–12 (*cum syn.*).

Material – HNHM INV 2025.349., 2 fragmentary specimens (Tekeres).

Description – Small, globose shell with protoconch of about 2½ smooth, rounded whorls. Teleoconch of two whorls occasionally showing hardly visible, fine spiral ornaments. Ovate aperture, outer lip smooth within, narrow umbilicus.

Remarks – The Paratethyan *Obtusella communis* (Boettger, 1907) specimens are similar in size and overall morphology to *Obtusella taurominima* (Sacco, 1895) but differ in lack of a dense, well-defined spiral sculpture that is typical of the latter species (Kovács & Stein 2023).

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, Hungary, Poland, and Romania; ?Eastern Paratethys (Tshokrakian): Ciscaucasia, S Russia. Hungarian part of the Pannonian Basin: Mecsek Mts: Tekeres (this paper), Budapest: Illés street (Kókay 1996), Börzsöny Mts: Letkés (Kovács & Stein 2023).

Genus *Rissoa* Desmarest, 1814
Type species: *Rissoa ventricosa* Desmarest, 1814 (type by subsequent designation)

Rissoa costeiensis Kowalke et Harzhauser, 2004
(Figs 70–77)

2004 *Rissoa costeiensis* n. sp. – Kowalke & Harzhauser, p. 117, fig. 5B.
2013 *Rissoa costeiensis* Kowalke et Harzhauser – Tămaş A. *et al.*, p. 58, fig. 2c.

Material – HNHM INV 2025.350., 731 specimens (max. SL 4.4 mm) (Mecsekpölöske).

Description – Small shell with high spire, protoconch of about 3 convex, smooth whorls. Teleoconch of 3–4 slightly oblate, convex to subangulate whorls, subcircular to suboval aperture, outer lip non-thickened, smooth within, narrow umbilicus present. Sculpture of low, broad, rounded axial ribs with concave interspaces, slightly projected at mid-whorl (14–16 on last whorl), and numerous fine spiral cords, generally visible only in interspaces.

Remarks – The study material is closely allied to the type in overall morphology, but differs by its larger size (SL of type: 3 mm), and smooth to gently ribbed 1st teleoconch whorl. The specimens display moderate intraspecific variability in shell breadth. *Rissoa clotho* Hörnes, 1856 differs by its lower protoconch, fewer and more widely spaced axial ribs, and the periphery of spire whorls appears below the mid-whorl (see Kowalke & Harzhauser 2004; Tămaş A. *et al.* 2013).

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, and Romania. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper).

Family *Rissoinidae* Stimpson, 1865
Genus *Rissoina* d'Orbigny, 1841
Type species: *Rissoa* (*Rissoina*) *inca* d'Orbigny, 1841 (type by monotypy)

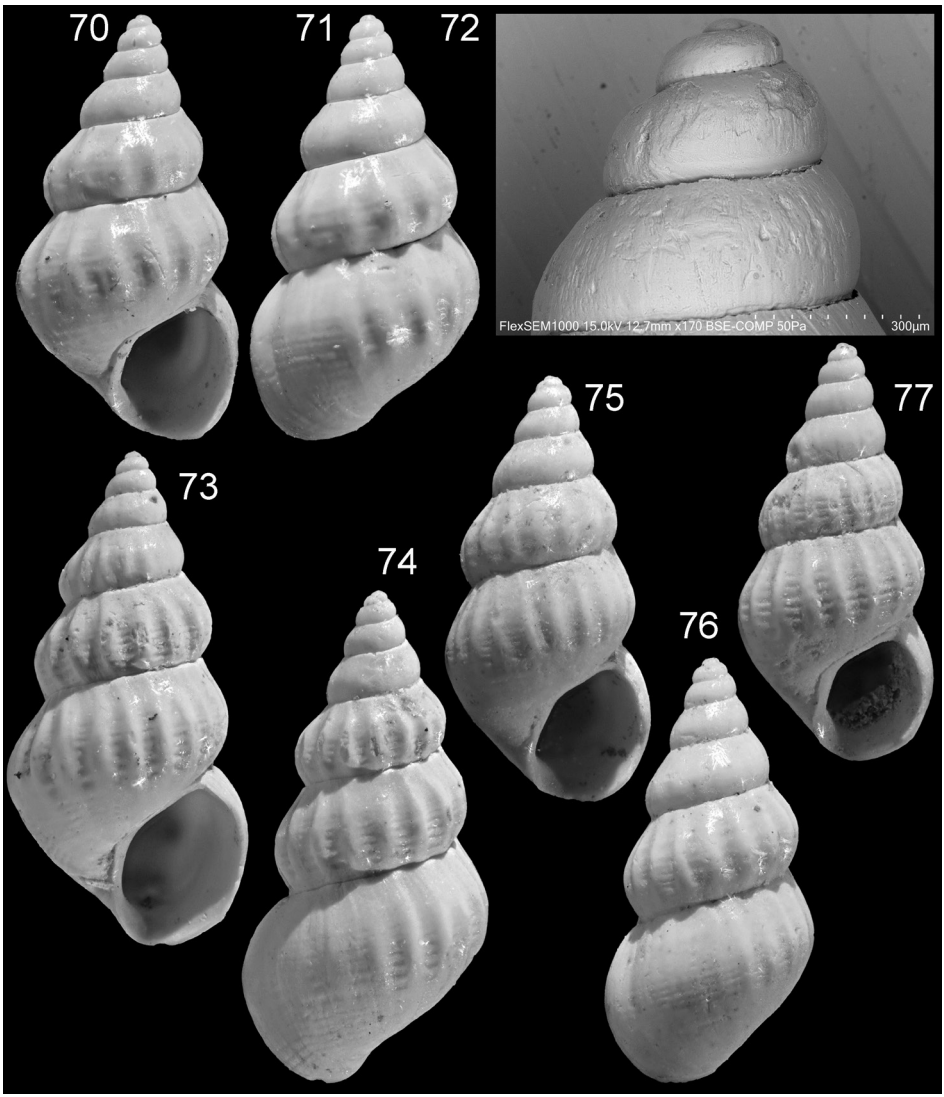
Rissoina podolica Cossmann, 1921
(Figs 78–80)

1856 *Rissoina pusilla* – Hörnes, p. 557, pl. 48, fig. 4 (*non* Brocchi, 1814).
1921 *Rissoina podolica* nov. sp. – Cossmann, p. 317, pl. 3, figs 43–44.
2023 *Rissoina podolica* Cossmann – Kovács & Stein, p. 24, pl. 3, figs 8–12 (*cum syn.*).

Material – HNHM INV 2025.351., ~5100 specimens (Mecsekpölöske), 3 specimens (Tekeres) (max. SL 7.2 mm).

Description – Slender shell with conical, multispiral, smooth protoconch and 8 slightly convex teleoconch whorls. Ovate aperture, outer lip bearing a strong labral varix. Teleoconch sculpture of narrow, straight to slightly opisthocline axial ribs (22–32 on last whorl), dense, fine spiral threads in interspaces, and weakly developed spiral cords on base.

Remarks – Both the morphological and taxonomical issues of *Rissoina podolica* were discussed by Kovács & Stein (2023). As we mentioned, *Rissoina podolica* is very close in teleoconch morphology to *R. subconoidea* (Grateloup, 1847) from the Miocene NE Atlantic, therefore comparison of protoconchs seems indispensable. Unfortunately, as with other *Rissoina* assemblages in the



Figs 70–77. *Rissoa costeiensis* Kowalke et Harzhauser. – **Figs 70–72.** HNHM INV 2025.350A., SL 3.6 mm, apertural and abapertural views (16×), protoconch (scale bar 300 µm). – **Figs 73–74.** INV 2025.350B., SL 4.4 mm, apertural and abapertural views (15×). – **Figs 75–76.** INV 2025.350C., SL 3.6 mm, apertural and abapertural views (16×). – **Fig. 77.** INV 2025.350D., SL 3.5 mm, apertural view (16×) (Mecsekpölöske)

Central Paratethys, the study specimens have fragmentary protoconchs (Fig. 80), so we cannot conclusively solve the problem, therefore provisionally retain the separation of the two taxa.

Distribution – Early Miocene: Central Paratethys (Karpatian): Austria. Middle Miocene: Central Paratethys (Badenian): Austria, Bosnia, Bulgaria, Hungary, Poland, Romania, Slovakia, and Ukraine. Hungarian part of the Badenian Pannonian Basin: Mecsek Mts: Mecsekpölöske, Tekeres (this paper), Bakony Mts: Bánd, Várpalota (Kókay 1966; Strausz 1966), Börzsöny Mts: Letkés, Szob (Csepreghy-Meznerics 1956; Kovács & Stein 2023), Cserhát Hills: Márkháza, Sámsonháza (Csepreghy-Meznerics 1954; own data).

Rissoina vindobonensis Sacco, 1895
(Figs 81–82)

1856 *Rissoina bruguierei* – Hörnes, p. 558, pl. 48, fig. 5 (*non* Payraudeau, 1826).
1895 *Rissoina* [*Rissoina*] *bruguierei* var. *vindobonensis* – Sacco, p. 35.
2023 *Rissoina vindobonensis* Sacco – Kovács & Stein, p. 25, pl. 4, figs 1–4 (*cum syn.*).

Material – HNHM INV 2025.352., 1 fragmentary specimen (SL 5.7 mm) (Mecsekpölöske).

Description – Slender shell with 6 convex teleoconch whorls, protoconch missing. Broken aperture, outer lip smooth within. Teleoconch sculpture of 17 weakly developed, widely spaced axial ribs, and fine spiral cords in interspaces.

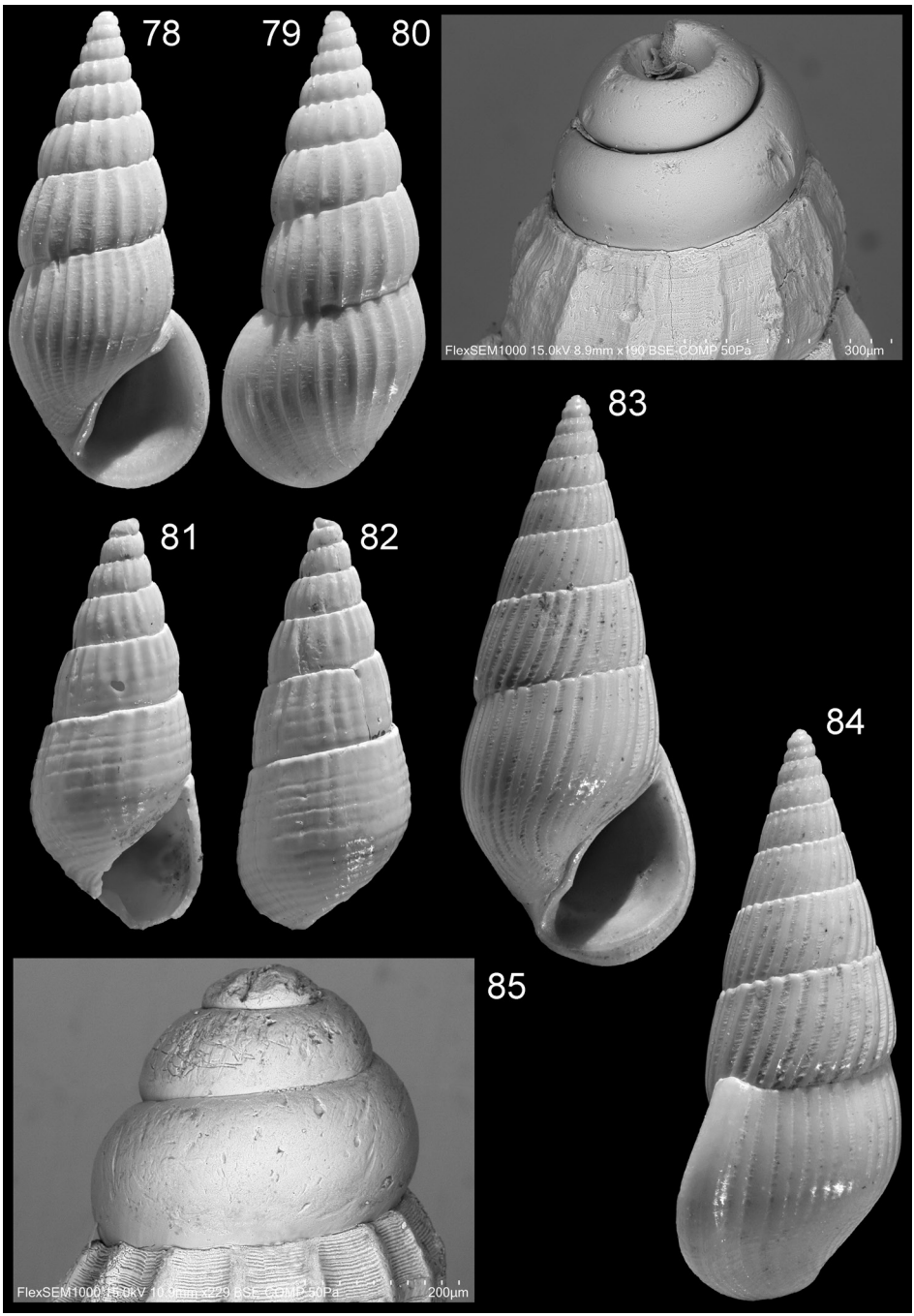
Remarks – *Rissoina vindobonensis* differs from *R. podolica* in sculpture by bearing more widely spaced, broader, and generally more opisthocline axial ribs and stronger spiral cords.

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, Bulgaria, Hungary, Poland, Romania, and Ukraine; Eastern Paratethys (Konkian): S Russia; Proto-Mediterranean Sea (Serravallian): Türkiye. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), Bakony Mts: Bánd, Várpalota (Kókay 1966; Strausz 1966), Börzsöny Mts: Letkés, Szob (Csepreghy-Meznerics 1956; Kovács & Stein 2023).

Genus *Zebinella* Mörch, 1876
Type species: *Helix decussata* Montagu, 1803 (type by subsequent designation)

Zebinella extranea (Eichwald, 1830)
(Figs 83–85)

→ **Figs 78–80.** *Rissoina podolica* Cossmann. HNHM INV 2025.351., SL 6.6 mm, apertural and abapertural views (10×), protoconch (scale bar 300 μm) (Mecsekpölöske). – **Figs 81–82.** *Rissoina vindobonensis* Sacco. HNHM INV 2025.352., SL 5.7 mm, apertural and abapertural views (10×) (Mecsekpölöske). – **Figs 83–85.** *Zebinella extranea* (Eichwald). HNHM INV 2025.353A., SL 5.7 mm, apertural and abapertural views (14×), protoconch (scale bar 200 μm) (Mecsekpölöske)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FlexSEM1000 15.0kV 8.9mm x190 BSE-COMP 50Pa
300µm
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81
82
84
85
FlexSEM1000 15.0kV 10.0mm x219 BSE-COMP 50Pa
200µm

1830 *R*[*issoa*] *extranea* m. – Eichwald, pp. 218–219.
1950 *Rissoina decussata* – Krach, p. 304, pl. 1, fig. 10 (*non* Montagu, 1803).
2023 *Zebinella extranea* (Eichwald) – Kovács & Stein, p. 25, pl. 4, figs 5–6 (*cum syn.*).

Material – HNHM INV 2025.353., 4180 specimens (max. SL 8.1 mm) (Mecsekpölöske).

Description – Elongated, slender, conical shell with protoconch of 2½ convex and smooth whorls. Teleoconch of 8 whorls, early 2 spire whorls slightly rounded, otherwise almost flattened. Ovate aperture, thickened outer lip, smooth within. Sculpture of numerous narrow, flat, slightly curved, opisthocline axial ribs and fine, dense spiral threads in interspaces.

Remarks – *Zebinella extranea* is very abundant at the study locality. Specimens show slight intraspecific variability in width of axial ribs: some specimens bear finer and more closely spaced ribbing. *Zebinella decussata* (Montagu, 1803) and the specimens described herein as *Z.* aff. *decussata* differ by their slenderer shells, narrower protoconchs, more convex spire whorls and finer, less opisthocline axial ribs. Our previous chresonimy of the species is completed herein by the *Rissoina decussata* record presented by Krach (1950, pl. 1, fig. 10). This specimen bears strong, wide and flat axial ribbing typical of *Zebinella extranea*.

Distribution – Middle Miocene: Central Paratethys (Badenian): Austria, Hungary, Poland, and Slovakia; Proto-Mediterranean Sea (Serravallian): Türkiye. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), Börzsöny Mts: Letkés (Kovács & Stein 2023).

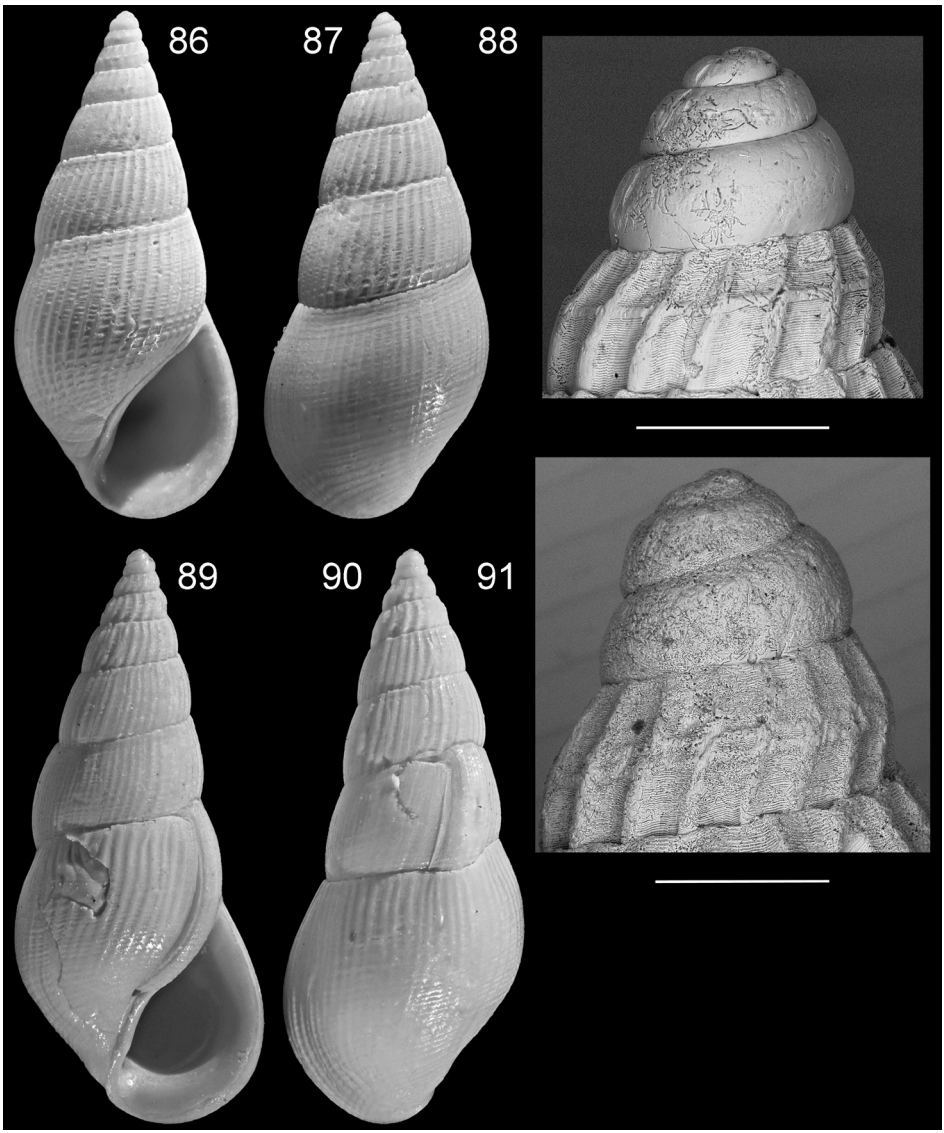
Zebinella aff. *decussata* (Montagu, 1803)
(Figs 86–91)

1968 *Rissoina* (*Zebinella*) *decussata* (Montagu) – Hinculov, p. 123, pl. 28, fig. 18.
1975 *Rissoina* (*Zebinella*) *decussata* (Montagu) – Bałuk, p. 91, pl. 10, figs 8–9.
1981 *Rissoina* (*Zebinella*) *decussata* (Montagu) – Švagrovský, p. 123, pl. 38, fig. 5.
2006 *Rissoina* (*Zebinella*) *decussata* (Montagu) – Bałuk, p. 188, pl. 4, fig. 5.
2013 *Rissoina* (*Zebinella*) cf. *decussata* (Montagu) – Landau *et al.*, p. 77, pl. 6, fig. 13, pl. 58, fig. 8.

Material – HNHM INV 2025.354., 105 specimens (max. SL 7.0 mm) (Mecsekpölöske).

Description – Elongated, slender, conical shell with protoconch of ~3 convex, smooth whorls. Teleoconch of 7 whorls, spire whorls slightly convex with narrow and shallow subsutural concavity, suture shallow. Last whorl convex, aperture ovate, outer lip thickened, smooth within. Sculpture of numerous narrow, slightly curved, opisthocline axial ribs and fine, dense spiral threads in interspaces. Protovarices appearing on 10 adult specimens in the study material.

Remarks – The teleoconch morphology of the specimens in the study material is somewhat similar to that of *Zebinella decussata* (Montagu, 1803), but



Figs 86–91. *Zebinella* aff. *decussata* (Montagu). – **Figs 86–88.** HNHM INV 2025.354A., SL 5.7 mm, apertural and abapertural views (12×), protoconch (scale bar 300 μm). – **Figs 89–91.** HNHM INV 2025.354B., SL 7.0 mm, apertural and abapertural views (11×), protoconch (scale bar 250 μm) (Mecsekpölöske)

their protoconch morphology differs by broader and lower protoconch (see Fig. 88: H 0.37 mm, W 0.42 mm, D nucleus 0.12 mm) (for Montagu's species see Van Dingenen *et al.* 2016; Landau *et al.* 2018). *Zebinella decussata* was frequently

recorded in the Badenian Central Paratethys (Kojumdgieva 1960; Zelinskaya *et al.* 1968; Hinculov 1968; Atanacković 1969; Bałuk 1975, 2006; Krach 1950, 1981; Švagrovský 1981). These specimens, however, together with the Serravallian material described by Landau *et al.* (2013) from the Karaman Basin (Türkiye) seem to differ from *Zebinella decussata* by their broader shells and (if preserved) broader protoconchs. Although Landau *et al.* (2013, 2018) and Van Dingenen *et al.* (2016) considered the Middle Miocene Paratethyan forms conspecific with the Plio-Pleistocene *Zebinella decussata* from the Mediterranean and NE Atlantic regions, in our opinion the forms reported from the Middle Miocene are not identical to *Z. decussata*. The Miocene materials may represent a new species but its formal description would require a detailed morphological comparison of the fossil and extant assemblages.

Comparing our material with well-known species, *Zebinella semidecussata* (Boettger, 1902) is characterized by more convex spire whorls, bearing stronger axial ribs (see Zilch 1934, pl. 6, fig. 2; Kovács & Stein 2023, pl. 4, fig. 7). *Zebinella varicosa* (Boettger, 1906) is distinguishable by its slenderer shell with slightly more convex spire whorls, and it has much finer and sharper axial ribbing (see Zilch 1934, pl. 6, fig. 99; Bałuk 1975, pl. 10, figs 2–3; Bałuk 2006, text-fig. 3A). According to Bałuk (1975) the protoconchs of *Zebinella varicosa* and *Z. decussata* (sensu Bałuk) also differ.

Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Poland, Romania, and Slovakia; Proto-Mediterranean Sea (Serravallian): Türkiye. Hungarian part of the Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper).

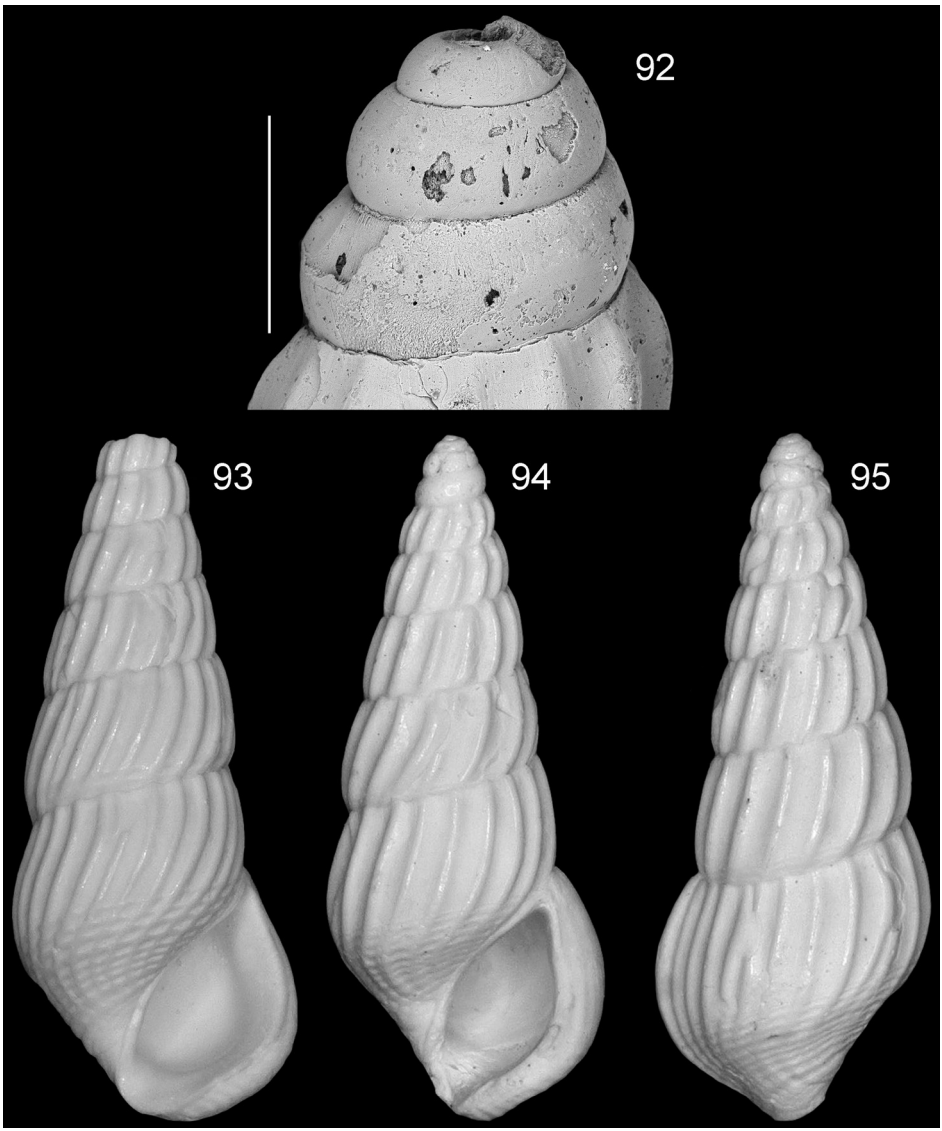
Zebinella cf. *eleonorae* (Boettger, 1902)
(Figs 92–95)

cf. 1902 *Rissoina* (*Zebinella*) *eleonorae* n. sp. – Boettger, p. 150.
cf. 1934 *Rissoina* (*Zebinella*) *eleonorae* Boettger – Zilch, p. 215, pl. 6, fig. 1.

Material – HNHM INV 2025.355., 47 specimens (max. SL 5.2 mm) (Tekeres).

Description – Elongated, slender, conical shell with protoconch of 3 rounded and smooth whorls. Teleoconch of 7 slightly convex whorls. Ovate aperture, thickened and somewhat flaring outer lip, smooth within. Axial sculpture of numerous strong, slightly curved, opisthocline axial ribs (16–18 on penultimate whorl), spiral sculpture of strong cords appearing only on suprasutural part of spire whorls and lower half on last whorl, otherwise the whorls smooth.

Remarks – The most closely allied species in size and morphology is *Zebinella eleonorae* Boettger, 1902 but it differs from the material figured herein by bearing



Figs 92–95. *Zebinella* cf. *eleonorae* (Boettger). – **Fig. 92.** HNHM INV 2025.355A. Protoconch (scale bar 300 μm). – **Fig. 93.** HNHM INV 2025.355B., SL 4.6 mm, apertural view (20×). – **Figs 94–95.** HNHM INV 2025.355C., SL 4.2 mm, apertural and abapertural views (22×) (Tekeres)

finer spiral cords on entire whorls. The *Zebinella eleonorae* specimen illustrated by Bałuk (2006, pl. 4, fig. 2) is a worn shell having more flattened whorls with less curved axial ribs.

Distribution – Middle Miocene: Central Paratethys (Badenian): ?Hungary, ?Poland, and Romania. Hungarian part of the Pannonian Basin: Mecsek Mts: Tekeres (this paper).

Zebinella n. sp.
(Figs 96–97)

Material – 1 specimen (Letkés).

Description – Small, fragmentary, conical shell. Protoconch missing, teleoconch of 6 whorls. Spire whorls flattened with a shallow subsutural concavity, suture narrow, shallow. Ovate aperture, slightly thickened outer lip, smooth within. Sculpture of closely spaced, broad, low, rounded ribs on spire whorls (16 on penultimate whorl), becoming obsolete on last whorl.

Remarks – The specimen is a new find, it was not known when we described the Rissooidea assemblage of the Bagoly Hill A locality of Letkés (Kovács & Stein 2023). It differs from its congeners by bearing broad, orthocline ribs. The morphology somewhat resembles *Zebinella brandenburgi* (Boettger, 1897) from the Miocene of Romania but this species has more convex spire whorls and bears weak spiral threads (Zilch 1934, pl. 6, fig. 97). The axial ribs of *Zebinella nogradensis* (Csepreghy-Meznerics, 1954) (Cserhát Hills) are also weakening on late whorls but this species is a broader form and also has fine, regular spiral sculpture (Csepreghy-Meznerics 1954, pl. 1, fig. 20). The specimen figured herein might represent a new species but due to the lack of a well-preserved shell with complete protoconch we do not introduce a new taxon. With this shell the Rissooidea assemblage of Letkés consists of 20 species.

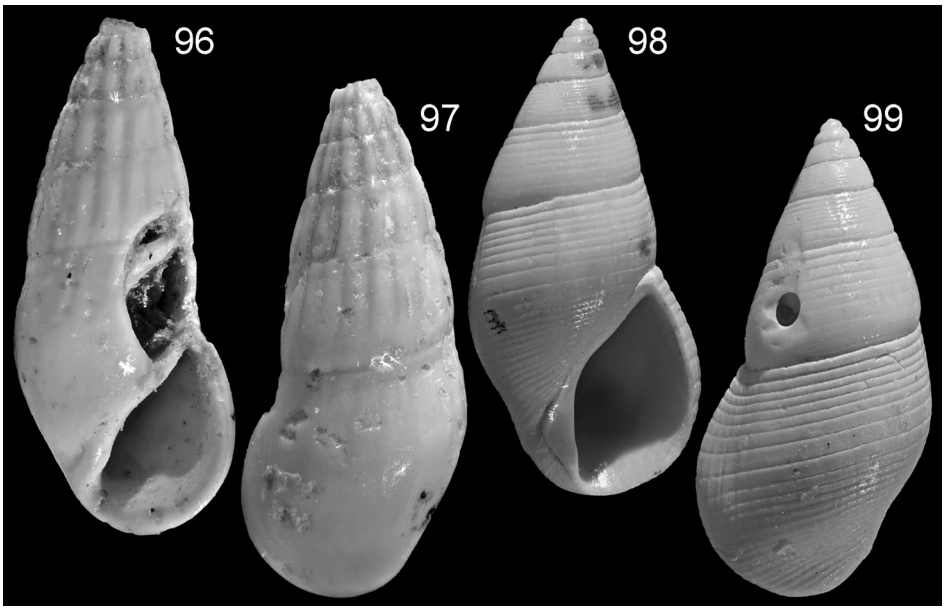
Distribution – Middle Miocene: Central Paratethys (Badenian): Hungary, Letkés (this paper).

Family Zebinidae Coan, 1964
Subfamily Stosiciinae Faber et Gori, 2016
Genus *Stosicia* Brusina, 1871
Type species: *Rissoa buccinalis* Grateloup, 1828 (type by monotypy)

Stosicia multicingulata Boettger, 1887
(Figs 98–99)

1887 *Stossichia multicingulata* n. sp. – Boettger, 142, pl. 6, fig. 3.
2023 *Stosicia multicingulata* Boettger – Kovács & Stein, p. 27, pl. 4, figs 12–14 (*cum syn.*).

Material – HNHM INV 2025.356., 37 specimens (max. SL 4.8 mm) (Mecsekpölöske).



Figs 96–97. *Zebinella* n. sp., SL 5.1 mm, apertural and abapertural views (13×) (Letkés). – **Figs 98–99.** *Stosicia multicingulata* Boettger. HNHM INV 2025.356., SL 4.6 mm, apertural and abapertural views (14×) (Mecsekpölöske)

Description – Shell fusiform, thick-walled, protoconch of about 2 rounded whorls, teleoconch of 5 slightly rounded whorls, shallow suture. Ovate aperture, outer lip thickened by a varix, three elongate denticles within, inner lip bearing a swelling abapically. Teleoconch sculpture of numerous flat, weakly developed, narrow spiral cords on entire shell.

Remarks – *Stosicia multicingulata* was widespread in the Badenian Central Paratethys but generally forms a small part in the fossiliferous gastropod assemblages.

Distribution – Early Miocene: Central Paratethys (Karpatian): Austria. Middle Miocene: NE Atlantic (Serravallian): France; Central Paratethys (Badenian): Austria, Bosnia, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, and Ukraine; Proto-Mediterranean Sea (Serravallian): Türkiye. Hungarian part of the Badenian Pannonian Basin: Mecsek Mts: Mecsekpölöske (this paper), Bakony Mts: Bánd (Kókay 1966), Börzsöny Mts: Letkés (Kovács & Stein 2023).

CONCLUSION

Two Rissooidea assemblages are described in this paper from two early Badenian localities in the Mecsek Mts. The small material of Tekeres (six species) is characterized by a mixed faunal composition (both shallow- and deep-water taxa are present) with dominance of two deeper-water *Alvania* species (*A. alexandrae*, *A. schwartzi*). The rich material of Mecsekpölöske represents an autochthonous shallow marine fauna consisting of 20 species. The most abundant taxa are *Alvania ampulla*, *A. helenae*, *Rissoa podolica* and *Zebinella extranea*, these four species account for 71% of the rissooidean material. Two new species are introduced from this diverse assemblage: *Alvania nemethi* n. sp. and *A. viciani* n. sp. Eight species: *Alvania* cf. *alexandrae*, *A. giselae*, *A. helenae*, *A. hispidula*, *A. productilis*, *Rissoa costeiensis*, *Zebinella* cf. *eleonorae* and *Z.* aff. *decussata* are recorded for the first time in the Hungarian part of the Miocene Pannonian Basin system from the Mecsek Mts.

Compared with other Rissooidea materials in the Pannonian Basin, the Mecsekpölöske fauna displays high alpha diversity. Only one Badenian locality is known with similar high diversity: Letkés, Bagoly Hill A (Börzsöny Mts), where also 20 rissooideans occur (Kovács & Stein 2023, this paper). The faunal compositions of the two assemblages, however, are markedly different as the Bagoly Hill A assemblage is characterized by mixed taphocoenosis. Only six species (*Alvania transiens*, *Manzonia scalaris*, *Rissoina podolica*, *R. vindobonensis*, *Zebinella extranea*, *Stosicia multicingulata*) appear at both localities, moreover, the proportions of these species in the whole materials also show differences. At other Middle Miocene localities of the Mecsek Mts the rissooideans show much lower diversity: 10 species are known from the Hidas area (Csepreghy-Meznerics 1950), 8 species from Pécsszabolcs and 7 species from Pécsvárad (Bohn-Havas 1973). These assemblages are typical of shallow marine environments, however, the records require taxonomical revision, and quantitative data are not available.

*

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