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Dedicated to the Memory of Barnabás Géczy (1925–2022)

Ilona Valley revisited – A rich early Miocene gastropod fauna from the North Hungarian Basin

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Abstract – A new mollusc material from the Ilona Valley Section (Mátra Mts, Hungary) is investigated. Strata of the section represent the Ilonavölgy Member of the Pétervására Sandstone Formation. Based on geochemical data and mollusc biostratigraphy these deposits appear to be early Ottnangian in age. The mollusc fauna displays much higher diversity than was recognized in earlier studies from the locality in question and from other Ottnangian sites in the Paratethys. The rich material verifies the extended stratigraphic and palaeogeographic ranges of numerous taxa, and allows of designating 12 new gastropod species: *Clanculus* s. l. *gulyasi* n. sp., *Gibbula kralli* n. sp., *Calliostoma nandori* n. sp., *Ormastralium erazmusi* n. sp., *Sconsia landaui* n. sp., *Cirsotrema kokayi* n. sp., *Ocinebrina deaki* n. sp., *Calagrassor mathiasi* n. sp., *Clavatula* s. l. *barnabasi* n. sp., *Clavatula* s. l. *istvani* n. sp., *Dentimargo barnai* n. sp., *Solatisonax pozsgayae* n. sp. With 106 figures and 1 table.

Key words – Burdigalian, Gastropoda, Ilona Valley, Miocene, North Hungarian Basin, Ottnangian

INTRODUCTION

The last papers that dealt with the early Miocene mollusc fauna of the Ilona Valley Section (Ilona-völgy, Parádfürdő, Mátra Mts, N Hungary) were published almost 40 years ago (Főzy & Leél-Őssy 1985*a*, *b*). As the Eggenburgian/ Ottnangian boundary has once again come to the fore in the recent literature (Kováč *et al.* 2018) it seems important to reinvestigate the significant invertebrate fossil material of the locality, and to revise data of earlier studies. The aim of this paper is to describe and illustrate a newly collected, diverse gastropod assemblage. For this work both the palaeontological collection of the Department of Geology, Eötvös Loránd University (Budapest), where remains of the fossil assemblage dealt with by Prof. Tamás Báldi, István Főzy and Szabolcs Leél-Őssy are stored, and the manuscript of the subsequent publications that contains later unpublished photos (Főzy & Leél-Őssy 1982) were also studied.

The Eggenburgian (~20.4–18.3 Ma), and the Ottnangian (~18.3–17.3 Ma) are lower Miocene Paratethyan regional stages corresponding to the lower–middle part of the standard Burdigalian Stage (20.44–15.97 Ma). In the late Eggenburgian – early Ottnangian the Burdigalian Seaway connected the Central Paratethys with the western Proto-Mediterranean Sea across the North Alpine Foreland Basin, and made possible the faunal immigration mainly from the Mediterranean (Halásová *et al.* 1996; Rögl 1999; Grunert *et al.* 2010) (Fig. 1/A). The connection with the North Sea and the open Trans-Tethyan Gateway in this period is discussed in the literature; see e.g. Grunert *et al.* (2012), Sant *et al.* (2017), Kováč *et al.* (2018). During the late Eggenburgian – early Ottnangian the studied site belonged to the 'Early Miocene North Hungarian Basin' in the Central Paratethys (other names: North Hungarian Bay, N Hungarian – S Slovakian "Paleogene" Basin, Filakovo–Pétervására Basin), and it was characterized by a fully marine shallow water environment with mainly tidal influenced deposits (Hámor 2007).

The Ilona Valley Section is located 5 km south to Parádfürdő village in the valley of the Ilona Creek (Fig. 1/C). The petrologic, stratigraphic, and faunistic characteristics of the outcrop were treated by Rozlozsnik (1939), Báldi (1983, 1986, 2009), Csepreghy-Meznerics (1960), Főzy & Leél-Őssy (1985*a*, *b*), and Sztanó (1994). The section explores strata of 17 m fine, grey, micaceous sand, pebbly, glauconitic sandstone beds and thin, coaly clay layers (Fig. 1/D), the deposits represent the Ilonavölgy Mb. of the Pétervására Fm. The upper Oligocene – lower Miocene Pétervására Sandstone is typical of the North Hungarian Basin, it was deposited in shallow sea water (20–40 m) of normal salt content, and made up of grey or yellowish brown glauconitic, fine- to coarse-grained, bedded or pebbly sandstone (Kercsmár 2015; Szőcs & Hips 2018). The Ilonavölgy Mb. is the southernmost and youngest development of the formation, and differs from the typical Pétervására Sandstone by being unusually rich in marine invertebrate (solitary coral, mollusc, bryozoan, balanid) remains. The age of deposits was thought to be Eggenburgian for a long time (Báldi 1983; Haas 2012). Recently the possibility of a younger age (Ottnangian) was raised on revisions of fossil gastropods (Harzhauser & Landau 2019), and the assignment of the deposits to the Ottnangian was also suggested by Less (2020*a*, *b*): based on Sr isotope stratigraphy the age of the deposits of the Ilonavölgy Mb. is 18.0–17.3 Ma. Similar revaluation were published earlier from the region by

Pálfy *et al.* (2007) concerning the age of the Gyulakeszi Rhyolite Tuff Fm. that overlies the famous mammal and bird track-bearing sandstone at Ipolytarnóc (N Hungary). The previously accepted 19.6±1.4 Ma (Eggenburgian) age was revised as the tuff yielded a single-crystal zircon U–Pb total isochron age of 17.42±0.04 Ma. The Ottnangian Stage is characterized by two periods: the first reflects a marine shallow water environment, the second brackish or freshwater environments (Harzhauser *et al.* 2014), consequently the age of the Ilonavölgy Mb. is recognized in this paper as early Ottnangian.

Concerning the Ottnangian gastropod research in Hungary one cannot find comprehensive papers. The use of "Helvetian", more specifically "lower Helvetian" in the pre-1968 literature may refer to the Ottnangian age, especially if the authors make comparisons with the fauna described by Rudolf Hoernes (1875). However, data of works in the 1950s–1960s that dealt with Helvetian molluscs without sufficient illustrations (e.g., Báldi *et al.* 1964; Bohn-Havas

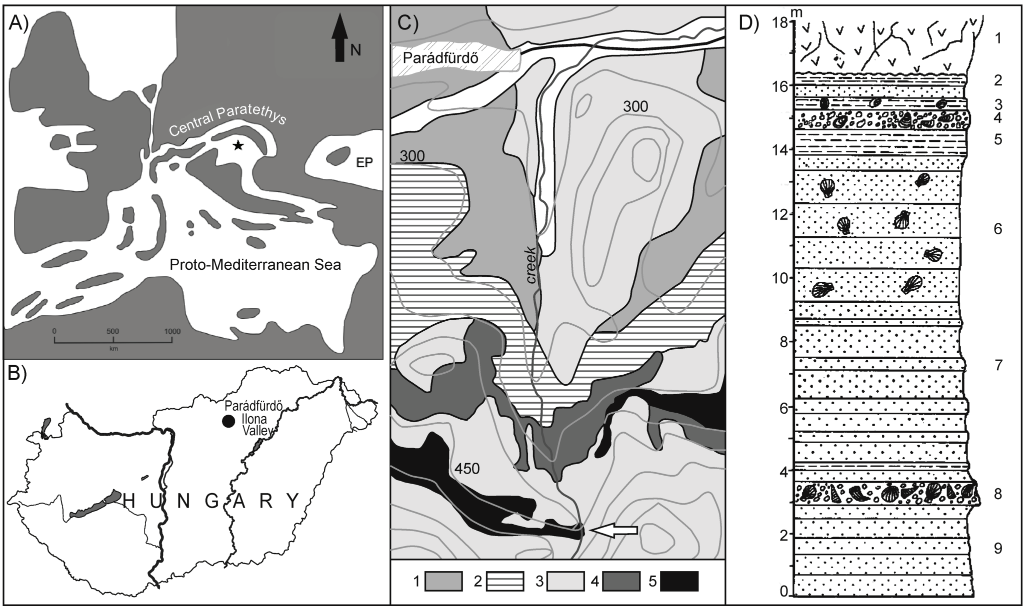


Fig. 1. A. Location of the studied region in the Ottnangian (modified from Grunert *et al.* 2010). – **B.** Location of the Ilona Valley in N Hungary. – **C.** Simplified geological map of the locality area (the study section marked by an arrow). 1 = Egerian–Eggenburgian aleurolite, claymarl – Szécsény Schlier Fm.; 2 = Egerian–Eggenburgian Pétervására Sandstone Fm.; 3 = Lower–middle Miocene volcanic rocks (andesites, tuffites); 4 = Ottnangian aleurolite, sand, pebble – Zagyvapálfalva Fm.; 5 = Karpatian aleurolite, clay, sand – Garáb Schlier Fm. (modified from https://map.mbfsz.gov.hu/fdt100). – **D.** The Ilona Valley Section, measured from the water level of the creek. Beds: 1 = andesite; 2 = sandy clay; 3 = grey, fossiliferous clay; 4 = gravel with *Ostrea* fragments; 5 = micaceous sand; 6 = sandstone, sand with pebbles and pectinid fragments; 7 = sandstone with hardened limonitic bank; 8 = fossiliferous conglomerate (Ilonavölgy Mb.); 9 = micaceous sand, sandstone (modified from Főzy & Leél-Őssy 1985*a*, *b*)

1964; Csepreghy-Meznerics 1951, 1953, 1959, 1966; Hámor 1964, 1970; Somos & Kókay 1960) need confirmation. Ottnangian faunas were discussed by József Kókay in several papers (1971, 1972, 1973, 1991, and 1996) focusing on the Transdanubian Várpalota region, but these studies also contain mainly fauna lists without any detailed systematic descriptions. Moreover, based on a comprehensive revision of the Karpatian bivalve faunas of the Central Paratethys, Kókay's stratigraphic analysis was questioned, and strata recorded earlier as Ottnangian around Várpalota were reinterpreted and assigned to the Karpatian by Mandic (2003). Ottnangian molluscs of the Borsod Subbasin of the North Hungarian Basin were treated by Bohn-Havas (1985). In this work the palaeoecological approach was dominant without systematic descriptions of the studied species, and only a few coastal taxa (11 bivalve and 3 gastropod species) were illustrated.

In the recent palaeontological literature Ottnangian gastropods were discussed by Kowalke & Reichenbacher (2005), Schneider *et al.* (2009), Schneider & Mandic (2014), and Harzhauser *et al.* (2014), however, open marine mollusc faunas were not analysed. Beside these papers significant taxonomic revisions of Ottnangian species were offered in numerous papers by Mathias Harzhauser and Bernard Landau (for references see Harzhauser *et al.* 2022). These works comprehensively dealt with the early–middle Miocene marine gastropods of the Paratethys.

MATERIAL AND METHODS

All specimens investigated in this paper came from the mollusc assemblage of the fossil-bearing Bed 8 of the Ilona Valley Section (Parádfürdő). The material (including the holotypes and the marked paratypes) are stored in the Hungarian Natural History Museum (HNHM, Budapest), in the collection of the Department of Geology, Eötvös Loránd University, and in private collection of Zoltán Vicián. As most of the mollusc species recorded herein have been discussed comprehensively in the literature, only taxa of special interest or the new records are treated briefly. Detailed systematic descriptions are provided for the new taxa. The gastropod specimens were prepared by abrasive blasting by József Szakonyi. Most of the illustrated material was coated with ammonium chloride for photography.

Abbreviations: shell length (SL), shell height (SH), and shell width (SW) in mm.

MOLLUSC MATERIAL

The fossil-bearing Bed 8 of the Ilona Valley Section consists of a conglomerate containing abraded, well-rounded quartzite pebbles. The poorly sorted clastic layer (which consists of small sand grains and gravels in different size) is cemented by a limonitic matrix, the quantity of sandstone, aleurite, and clay gravels is subordinate (Főzy & Leél-Őssy 1985*a*, *b*). The thickness of the bed is ~70 cm, the lower 30–40 cm is relatively poor in fossils and dominated by pectinids, the 90% of the fauna came from the upper half. The main part of the fauna is formed of bivalves and gastropods; scaphopods, solitary corals, and bryozoans are moderately frequent; balanids, brachiopods, and shark teeth are rare. The assemblage represents an autochthonous community. The preserved sculpture of the gastropod shells and the appearance of double-valved bivalves indicate that the majority of the specimens were buried in their original habitat. The preservation of the gastropod shells, however, is generally poor due to the aragonite-to-calcite transformation. Numerous gastropod shells appear to be covered partly by bryozoans (Figs 12, 13, 60, 67, and 81).

The newly collected mollusc assemblage consists of 240 bivalve, and 1400 gastropod specimens, as well as more than 50 scaphopod fragments. Description of the bivalve fauna is the goal of a subsequent paper. About 1210 specimens from the gastropod material were determined at least at genus level (Table 1). The family based faunal composition of the determined gastropods is shown on Fig. 2. The most abundant family is the Naticidae with 26%; unfortunately the poor preservation does not allow species level determination within this group. The second dominant family is the Clavatulidae (18%). These two families form almost the half of the entire gastropod assemblage. Beside the mass occurrence of the Clavatulidae, diverse appearances of the Trochidae, Velutinoidea, Cypraeoidea, Tonnoidea, and Marginellidae are also significant. The percentages roughly correspond to data previously reported (Főzy & Leél-Őssy 1985*a*, *b*).

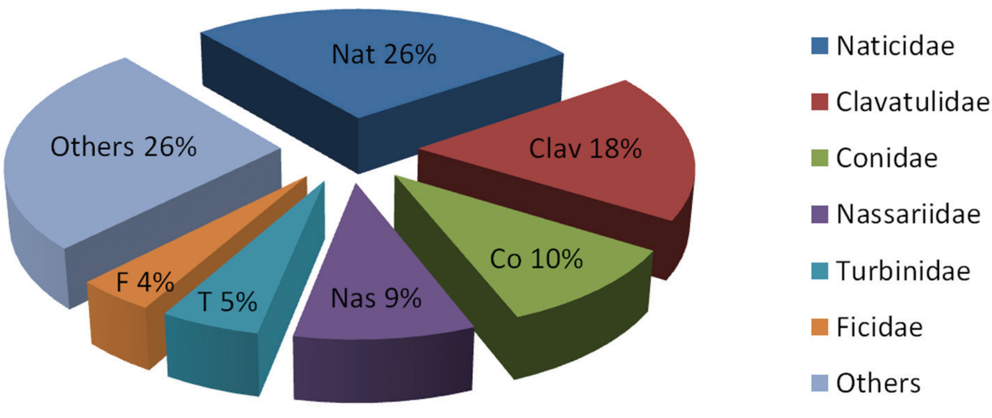


Fig. 2. Family based faunal composition of the gastropod material in the mollusc assemblage of Bed 8, Ilona Valley Section

The gastropod fauna is of special interest for at least four reasons:
i) 12 new taxa are introduced;
ii) numerous taxa are recorded for the first time in the North Hungarian Basin;
iii) extended stratigraphic range of several taxa are verified;
iv) the material is characterized by the co-existence of Eggenburgian and Ottnangian markers and taxa that were previously recorded only from younger strata (Karpatian–Badenian).

SYSTEMATIC PALAEONTOLOGY

Class Gastropoda Cuvier, 1795
Subclass Patellogastropoda Lindberg, 1986
Superfamily Patelloidea Rafinesque, 1815
Family Patellidae Rafinesque, 1815

Remarks – The reinvestigation of the collection of the Department of Geology, Eötvös Loránd University clarified that the *Patella anceps* Michelotti, 1847 record in Főzy & Leél-Őssy (1985*a*, *b*) without any description and illustration is a misidentification, and the specimen in question represents *Hipponix interruptus* Michelotti, 1847 (see below). One *Patella*? specimen occurs in the material (Figs 3–4). It differs from *Patella anceps* by its lower and more eccentric shell bearing widely spaced, low, weakly developed radial ribs.

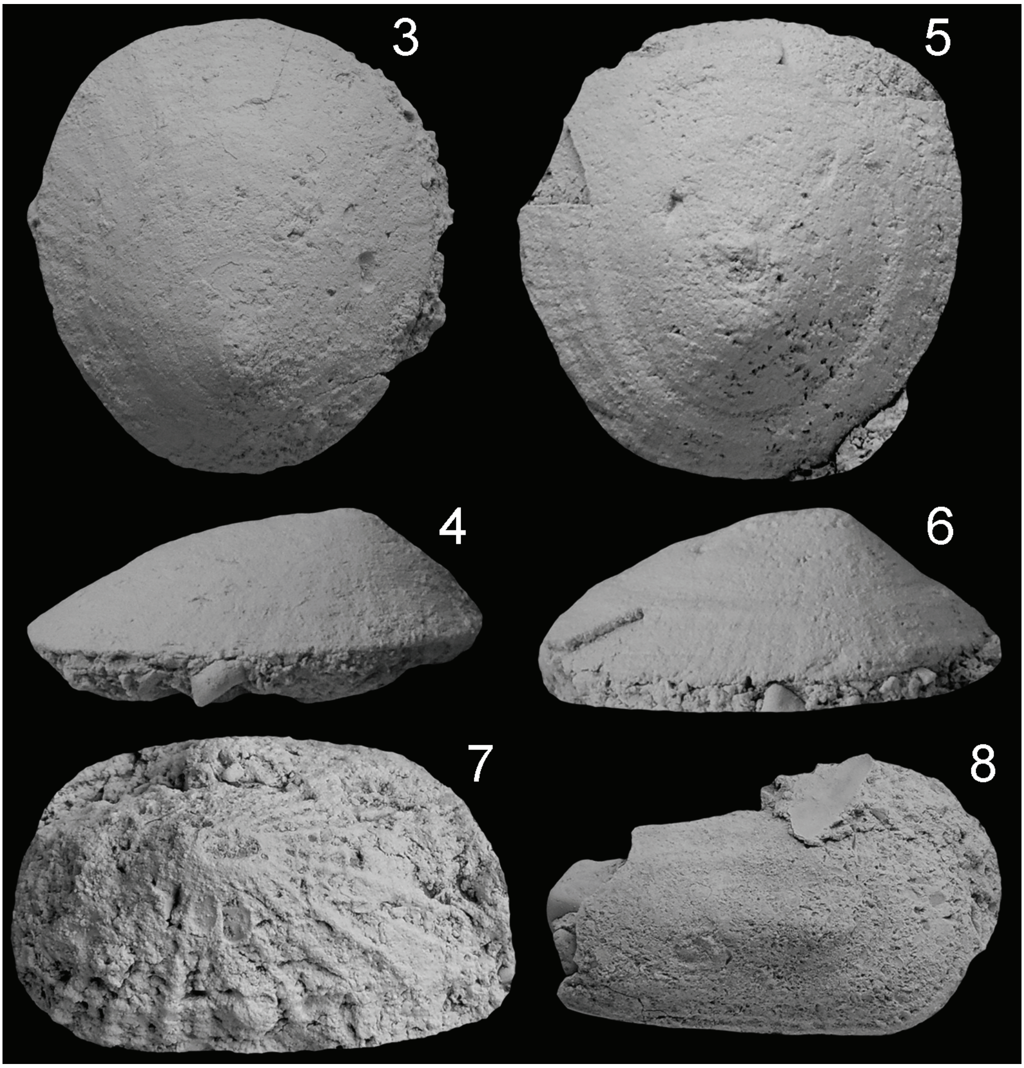
Superfamily Lottioidea Gray, 1840
Family Nacellidae Thiele, 1891

Remarks – Four fragmentary *Cellana danningeri* Harzhauser et Landau, 2014 specimens occur in the new material (Figs 5–6). The species was described from the Ottnangian of the North Alpine Foreland Basin (Allerding) (Harzhauser *et al.* 2014: 87, pl. 1, fig. 6). A similar shell was figured in the manuscript by Főzy & Leél-Őssy (1982, pl. 5, fig. 13), however, the taxon was omitted from their published papers.

Subclass Vetigastropoda Salvini-Plawen, 1980
Superfamily Fissurelloidea Fleming, 1822
Family Fissurellidae Fleming, 1822

Remarks – The family is represented by fragmentary *Diodora* and *Scutus* specimens; the first genus is a new record in the Ilona Valley assemblage. From the Ottnangian *Diodora italica* was recorded by Hölzl (1973). The middle Miocene range of two Recent *Diodora* species recorded from the Paratethys in earlier literature [*D. italica* (Defrance, 1820), *D. graeca* (Linnaeus, 1758)] was questioned by Dell'Angelo *et al.* (2017), and a new species, *D. stalennuyi* Dell'Angelo, Sosso, O. Anistratenko et V. Anistratenko, 2017 was introduced for the Badenian *D. italica* and *graeca* records of W Ukraine. The poorly preserved specimen figured herein on Figure 7 differs from the above mentioned taxa by bearing much coarser ribbing and a relatively high shell, it is recorded herein as *Diodora* sp.

The Aquitanian–Langhian *Scutus bellardii* (Michelotti, 1847) (Fig. 8) – that was known only from the Badenian in the Central Paratethys (Bałuk 1975,



Figs 3–4. *Patella*? sp., SH ~3.8, SW 16 (3.5×), dorsal and lateral views. – **Figs 5–6.** *Cellana danningeri* Harzhauser et Landau, 2014, SH ~4.6, SW 14.3 (4×), dorsal and lateral views. – **Fig. 7.** *Diodora* sp., SH 8.6, SL 16.5 (3.8×), dorsal view. – **Fig. 8.** *Scutus bellardii* (Michelotti, 1847), SH ~3.6, SL 20 (2.8×), dorsal view

2006) – was illustrated in the manuscript by Főzy & Leél-Őssy (1982, pl. 5, fig. 15), but the taxon was omitted from the published papers.

Superfamily Trochoidea Rafinesque, 1815
Family Throchidae Rafinesque, 1815

Remarks – Three species appear in the new material: *Clanculus* s. l. *gulyasi* n. sp., *Gibbula kralli* n. sp., and *Paroxystele orientalis* (Cossmann et Peyrot, 1917). The early–middle Miocene *Paroxystele orientalis* (Figs 17–18) was widespread in the Proto-Mediterranean Sea and the Paratethys, it is known from the Eggenburgian and Ottnangian as well (Nosowska 2020). *Paroxystele orientalis* specimens were figured by Főzy & Leél-Őssy (1982, pl. 8, figs 6–7) only in their manuscript under the name '*Diloma amadei* Brogniart, 1825' [*sic*]. The Burdigalian specimen illustrated by Csepreghy-Meznerics (1959, pl. 23, figs 4–5) from the Ózd-Egercsehi Subbasin of the North Hungarian Basin as *Oxystele amadei magneolata* [*sic*] Sacco probably represents *Paroxystele orientalis*.

Genus *Clanculus* Montfort, 1810

Clanculus s. l. *gulyasi* n. sp.
(Figs 9–11)

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Holotype – PAL 2022.17.1., SH 12.4 mm, SW 13.6 mm.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Péter Gulyás, Hungarian geologist and fossil collector.

Material – Holotype.

Diagnosis – *Clanculus* species with trochiform shell, gradate spire, paucispiral protoconch, rounded teleoconch whorls. Sculpture of spiral rows of beads, two on sutural ramp, five on lateral wall, six on base.

Description – Trochiform shell with moderately elevated, gradate spire and eroded, paucispiral protoconch. Teleoconch of 3½ rounded whorls, suture slightly impressed. Last whorl 77% of total height, bearing two rows of fine beads on sutural ramp, and five rows of primary beads on convex part, equal in strength and spacing. Base slightly rounded, bearing six rows of beaded cords. The poor preservation does not allow the detailed investigation of the umbilicus and the apertural part, only the lower columellar tooth can be traced.

Remarks – As distinctive diagnostic features of the two *Clanculus* subgenera (*Clanculus* Montfort, 1810, *Clanculopsis* Monterosato, 1880; see Nosowska 2020; Harzhauser 2021) cannot be searched, the new species is assigned to *Clanculus* sensu lato. Only a few *Clanculus* species are known in the early Miocene of Europe, and the genus has not been recorded from the Ottnangian Paratethys. The Chattian–Burdigalian *Clanculus* (*Clanculopsis*) *araonis* (Basterot, 1825) differs by its broader, conical spire and by more spiral rows of beads; the Burdigalian *C.* (*Clanculus*) *perrisi* (Grateloup, 1832) has more widely spaced spiral sculpture. From the Badenian Central Paratethys three species are worth comparing with the new one. The widespread *Clanculus* (*Clanculopsis*) *tuberculatus* (Eichwald, 1830) has less rounded whorls and different sculpture with much stronger beads and its spiral rows are separated by narrow but distinct spiral furrows (Nosowska 2020, text-figs 4–5). *Clanculus* (*Clanculopsis*) *robustus* Friedberg, 1928 differs by its conical spire and sculpture of strong primary and weak secondary spiral rows of beads (Nosowska 2020, text-fig. 3/A–C). *Clanculus* (*Clanculus*) *pseudaraonis* (Strausz, 1960) is characterized by higher last whorl and lower spire, rounded spire whorls and non beaded spiral cords on base (Strausz 1966, pl. 52, figs 17–20).

Genus *Gibbula* Risso, 1826

Gibbula kralli n. sp.
(Figs 12–16)

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1985*a Bolma meynardi* – Főzy & Leél-Őssy, pl. 2, fig. 6 (non Michelotti).
1985*b Bolma meynardi* – Főzy & Leél-Őssy, pl. 2, fig. 6 (non Michelotti).

Holotype – PAL 2022.18.1., SH 21.7 mm, SW 25 mm (Figs 14–16).
Paratype 1 – PAL 2022.20.1., SH 12.2 mm, SW 20.5 mm (Fig. 12).
Paratype 2 – PAL 2022.19.1., SH 14.4 mm, SW 21.6 mm.
Paratype 3 – Coll. Vicián, SH 11.6 mm, SW 20.3 mm.
Paratype 4 – PAL 2022.21.1., SH 17 mm, SW 20.3 mm.
Paratype 5 – PAL 2022.22.1., SH 12.8 mm, SW 17.2 mm.
Paratype 6 – Coll. Vicián, SH 15 mm, SW 23 mm (Fig. 13).

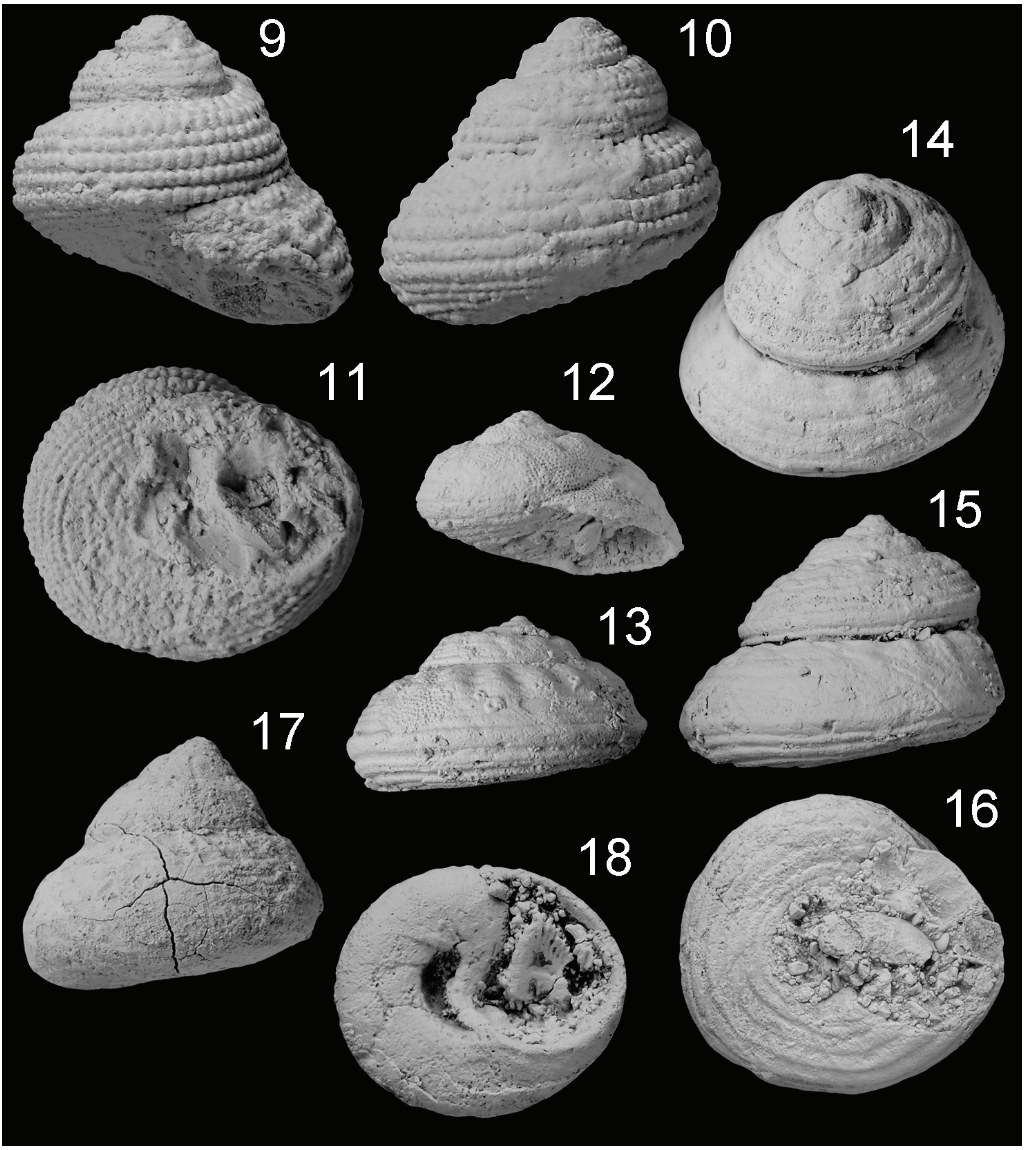
Type strata and locality – Lower Ottnangian (early Miocene) sandstone (the Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Norbert Králl, Hungarian private fossil collector.

Material – 14 specimens. Holotype, Paratypes 1–6, and 7 specimens in private collections of the authors. Max. SH 21.7 mm.

Diagnosis – *Gibbula* species with trochiform shell, paucispiral protoconch, 4½ rounded, carinate teleoconch whorls, depressed base, sculpture of strong spiral cords and low axial rugae.

Description – Trochiform shell, eroded protoconch of approximately 2 rounded whorls, teleoconch of about 4½ whorls. Spire of rounded whorls, suture



Figs 9–11. *Clanculus* s.l. *gulyasi* n. sp., holotype, SW 13.6 (3×), apertural, abapertural, and basal views. – **Figs 12–16.** *Gibbula kralli* n. sp. – **Fig. 12.** Paratype 1, SW 20.5 (1.6×), apertural view. – **Fig. 13.** Paratype 6, SW 23 (1.6×), abapertural view. – **Figs 14–16.** Holotype, SW 25 (1.6×), apical, abapertural, and basal views. – **Figs 17–18.** *Paroxystele orientalis* (Cossmann et Peyrot, 1917). – **Fig. 17.** SW 20.3 (1.8×), abapertural view. – **Fig. 18.** SW 20 (1.8×), basal view

slightly impressed on early whorls, deeply incised on last whorl, subsutural ramp broad, rounded, sloping. Last whorl 79% of total height, carinate, base depressed, slightly rounded. Aperture ovoid, prosocline, outer lip attached below periphery. Neither the moderately wide umbilicus, nor the columella can be searched in detail due to matrix filling. Spiral sculpture of 3 low, broad cords on subsutural ramp, 3 strong cords below, 1 elevated peripheral cord, and 6 broad cords on base separated by narrow, deep grooves. Axial sculpture of broad, low rugae on sutural ramp overriding by spiral cords.

Remarks – Based on morphology (see Harzhauser 2021: 22) the new species is assigned to genus *Gibbula*. Two taxa were recorded by Főzy & Leél-Őssy (1985*a*, *b*) as potential forms with which *Gibbula kralli* n. sp. could be confused: *Bolma meynardi* and *Gibbula semirotunda*. The turbinid *Bolma meynardi* (Michelotti, 1847) is characterized by much larger, angular shell with extensive basal callus (Landau *et al.* 2013), while the specimens presented herein possess medium-sized shell with somewhat carinate whorls bearing strong spiral cords on base. The Pliocene *Gibbula semirotunda* Sacco, 1896 is somewhat similar in morphology (see Sacco 1896, pl. 3, fig. 38; Spadini 2021, fig. 2/C–D). This species was not added to the fauna list of the locality but was mentioned among the frequent taxa by Főzy & Leél-Őssy (1985*a*, *b*). *Gibbula semirotunda* differs from *G. kralli* n. sp. by its smaller size with rounded whorls bearing a deep furrow at mid-height. The early–late Miocene *Gibbula sagus* (Defrance, 1828) [= *Gibbula pseudomagus* (d'Orbigny, 1852)] differs in smaller size, higher spire, higher and rounded whorls usually bearing a wide and shallow furrow at mid-height, and less depressed base (Landau *et al.* 2017). The Miocene *Gibbula sallomacensis* (Cossmann et Peyrot 1917, pl. 3, figs 73–76) is distinguishable by its shouldered whorls and much finer spiral sculpture. The middle Burdigalian *Gibbula* n. sp. aff. *sagus* specimens figured by Pfister & Wegmüller (2007, pl. 1, figs 13–15, pl. 2, figs 5–7) are similar in sculpture but are distinguishable by their much higher whorls. *Gibbula puschii* (Andrzejowski, 1830) – known as *G. buchi* Dubois in the earlier Paratethyan literature (Nosowska 2020; see Strausz 1966) – is also an early–late Miocene species that differs from *Gibbula kralli* n. sp. mainly by its higher shell sculptured by broader and strongly nodose peripheral cords.

Superfamily Turbinoidea Rafinesque, 1815

Family Calliostomatidae Thiele, 1924 (1847)

Genus *Calliostoma* Swainson, 1840

Remarks – The specimens recorded herein as *Calliostoma scutiformis* (Sacco, 1896) (Figs 19–20) were figured by Főzy & Leél-Őssy first as *C. granulatus* (1982, pl. 8, figs 8–10), then as *Diloma amadei* [*sic*] (1985*a*, *b*, pl. 2, figs 7–8). *Calliostoma* *granulatum* (Born, 1778) is a similar form but differs by granulate sculpture. *Paroxystele amedei* (Brongniart, 1823) is distinguishable from *Calliostoma scutiformis* in lower shell with rounded whorls (see Ferrero Mortara *et al.* 1984, pl. 49, fig. 1). The middle Miocene–Recent *Calliostoma scutiformis* was discussed by Landau *et al.* (2003).

Calliostoma nandori n. sp.
(Figs 21–23)

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1985*a Trochus* sp. – Főzy & Leél-Őssy, pl. 2, figs 4–5.
1985*b Trochus* sp. – Főzy & Leél-Őssy, pl. 2, figs 4–5.

Holotype – PAL 2022.23.1., SH 10.6 mm, SW 13.4 mm (Figs 22–23).

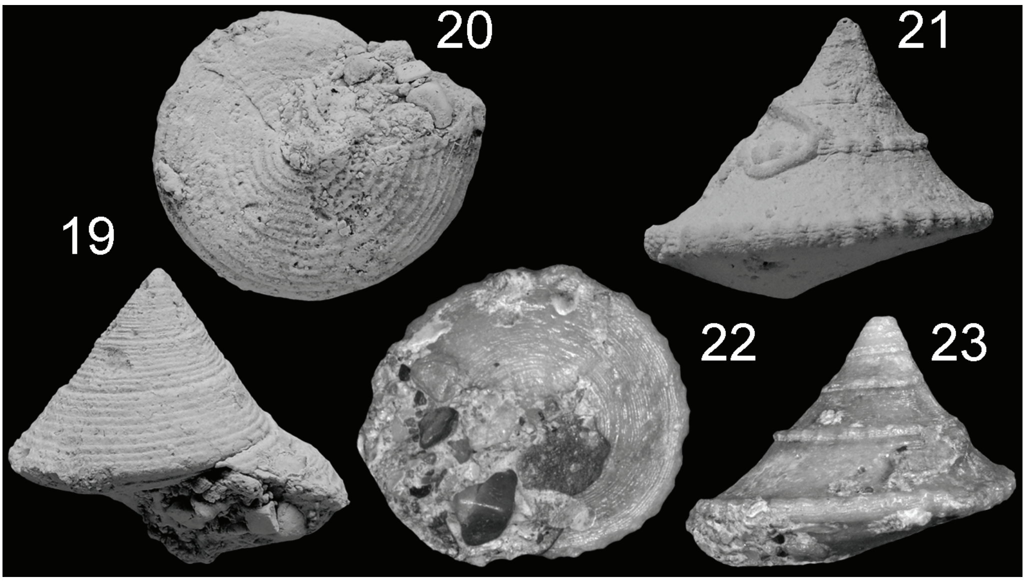
Paratype 1 – Coll. Vicián, SH 11.8 mm, SW 14.3 mm (Fig. 21).

Paratype 2 – Coll. Vicián, SH 7.3 mm, SW 10.1 mm.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (the Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Nándor Králl, Hungarian private fossil collector.

Material – 7 specimens. Holotype, paratypes 1–2, and 4 specimens in private collections of the authors. Max. SH 11.8 mm.



Figs 19–20. *Calliostoma scutiformis* (Sacco, 1896), SW 16.7 (2.5×), apertural and basal views. – **Figs 21–23.** *Calliostoma nandori* n. sp. – **Fig. 21.** Paratype 1, SW 14.3 (3×), abapertural view. – **Figs 22–23.** Holotype, SW 13.4 (3×), basal and abapertural views

Diagnosis – *Calliostoma* species with trochiform shell, moderately high spire of concave outline, 4 teleoconch whorls, concave last whorl, depressed base, sculpture of numerous spiral threads, prominent, beaded peribasal cord.

Description – Trochiform shell, eroded protoconch, teleoconch of about 4 whorls, suture linear. Spire moderately high, outline concave. First spire whorl slightly rounded, from second whorl profile concave. Last whorl 73–75% of total height, regularly concave to peribasal cord, base depressed, slightly rounded. Apertural part cannot be searched. Sculpture of numerous, fine spiral threads on entire shell, prominent, beaded peribasal cord covering spiral threads.

Remarks – Although the diagnostic honeycomb-like microsculpture of the protoconch cannot be traced, based on overall morphology the new species is assigned to genus *Calliostoma*. *Calliostoma scutiformis* differs by its less concave whorl profile, much stronger spiral cords, and the lack of or weakly developed peribasal cord (Ferrero Mortara *et al.* 1984, pl. 49, figs 1–2; Landau *et al.* 2003, pl. 14, fig. 2). The early Miocene *Calliostoma audebardi* (Basterot, 1825) is distinguishable by higher shell bearing a strong subsutural cord (Cossmann & Peyrot 1917, pl. 4, figs 65–67). The most closely allied form is the middle–late Miocene *Calliostoma benoisti* (Cossmann & Peyrot 1917, pl. 4, figs 73–75) from which *C. nandori* n. sp. differs by its more depressed shell.

Family Turbinidae Rafinesque, 1815

Remarks – Four turbinid species were recorded by Főzy & Leél-Őssy (1985*a*, *b*): *Bolma meynardi* (see above), *B. castrocarensis* (Foresti, 1876), *Astrea* [*sic*] *carinata* (Borson, 1821), and *A. speciosa* (Michelotti, 1847). None of these appear in the newly collected material, but a new species, *Ormastralium erazmusi* n. sp. displays a relative abundance in the gastropod assemblage.

Genus *Ormastralium* Sacco, 1896

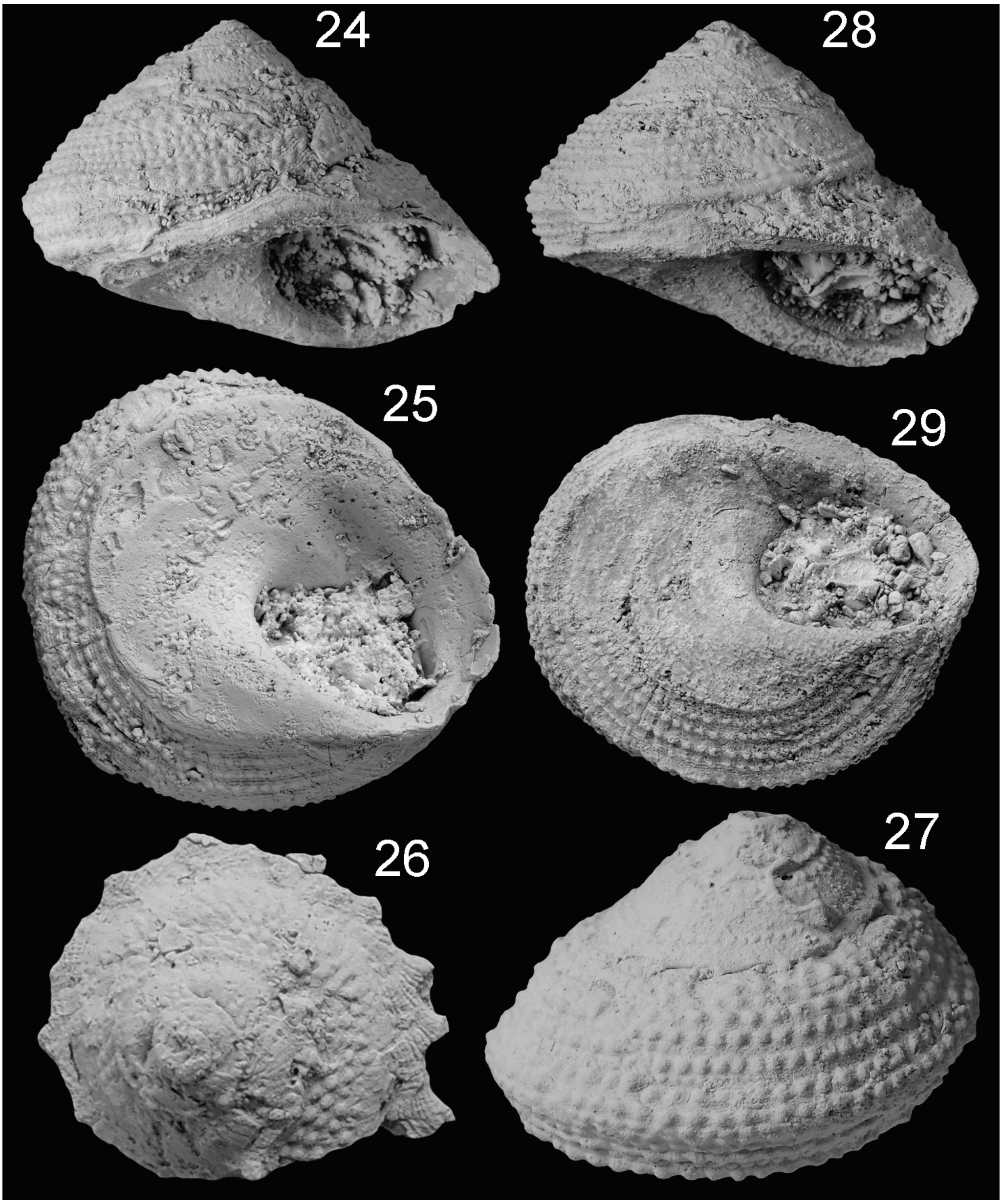
Ormastralium erazmusi n. sp.
(Figs 24–29)

Zoobank.org:act:086C54F6-CECD-4DF5-B517-1117554D23A9

Holotype: PAL 2022.24.1., SH 31.4 mm, SW 40.4 mm (Figs 24–25).
Paratype 1 – PAL 2022.25.1., SH 10.8 mm, SW 17.4 mm (Fig. 26).
Paratype 2 – PAL 2022.26.1., SH 24.3 mm, SW 31.2 mm (Fig. 27).
Paratype 3 – Coll. Vicián, SH 30.5 mm, SW 38.2 mm (Figs 28–29).
Paratypes 4–10 – PAL 2022.27.1.–2022.33.1.
Paratype 11 – Coll. Vicián.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (the Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Erazmus Vicián, father of the third author (Hungary).



Figs 24–29. *Ormastralium erazmusi* n. sp. – **Figs 24–25.** Holotype, SW 40.4 (1.5×), apertural and basal views. – **Fig. 26.** Paratype 1, SW 17.4 (3×), apical view. – **Fig. 27.** Paratype 2, SW 31.2 (2×), abapertural view. – **Figs 28–29.** Paratype 3, SW 38.2 (1.5×), apertural and basal views

Material – 62 specimens. Holotype, paratypes 1–11, and 50 specimens in private collections of the authors. Max. SH 31.4 mm.

Diagnosis – *Ormastralium* species with turbiniform shell, protoconch of 2¼ whorls, teleoconch of 4½ whorls, low, conical spire, broad sutural ramp, rapidly expanding last whorl, prosocline aperture, flat base, expanded basal callus, sculpture of spiral rows of beads and spined peripheral carina on spire.

Description – Medium-sized, turbiniform shell. Eroded protoconch of approximately 2¼ whorls, junction with teleoconch marked by appearance of spiral sculpture. Teleoconch of about 4½ whorls. Spire conical, suture slightly impressed, sutural ramp broad, slightly concave on spire, slightly rounded on last whorl. Last whorl 80–81% of shell height, rapidly expanding. Aperture ovoid, prosocline, outer lip attached below periphery, basal callus expanded. Axial sculpture absent. Spiral sculpture of 8 rows of fine beads on sutural ramp of last whorl, fine threads between the last three rows abapically. Peripheral carina on spire whorls bearing 14–15 horizontal spines, last whorl lacks carina, peripheral and basal angulation beaded. Three beaded spiral rows between peripheral and basal angulation. Flat base without umbilicus, bearing four beaded spiral rows with fine threads between them.

Remarks – The *Astrea* [*sic*] *speciosa* record in Főzy & Leél-Őssy (1982, pl. 7, figs 1–4, 1985*a*, *b*) refers to the new species introduced herein. The middle–late Miocene *Ormastralium speciosum* (Michelotti, 1847) is a smaller form with less extended basal callus and more finely granulated spiral cords (see Sacco 1896, pl. 2, figs 25–26; Ferrero Mortara *et al.* 1984, pl. 46, fig. 6). The early–late Miocene *Ormastralium carinatum* (Borson, 1821) is characterized by very finely sculptured shell, the late Miocene – Pliocene *O. fimbriatum* (Borson, 1821) differs by bearing subsutural spines. The Ottnangian *Bolma paratethyca* Harzhauser et Landau, 2014 is characterized by pagodiform early teleoconch, the Pliocene *B. castrocarensis* (Foresti, 1876) bears more widely spaced spiral rows of beads. *Ormastralium erazmusi* n. sp. is relatively common in the gastropod assemblage with a proportion of 5%.

Subclass Caenogastropoda Cox, 1960
Superfamily Cerithioidea Fleming, 1822
Family Cerithiidae Fleming, 1822

Remarks – The family is represented by only one *Thericium* sp. specimen (Fig. 30). Based on the axial ribs which are slightly pointed at midwhorls, it belongs to the *Thericium vulgatum* (Bruguière, 1792) group. The genus is a new record in the North Hungarian Basin.

Family Turritellidae Lovén, 1847

Remarks – Four species are represented by 43 fragmentary turritellid specimens in the new material. Each species is typical of the shallow sublittoral environments of 0–25 m water depth (Harzhauser & Landau 2019).

The newly collected gastropod material confirms the presence of two Eggenburgian markers, *Turritella inaequicingulata* Hölzl, 1958 (= *Turritella terebralis subgradata* in Főzy & Leél-Őssy 1985*a*, *b*) (Fig. 31) and *Peyrotia desmarestina* (Basterot, 1825) (Figs 32–33), which was recorded by Báldi (1983) and Főzy & Leél-Őssy (1985*a*, *b*) without any description or illustration. *Allmonia paucicincta* (Sacco, 1895) (Fig. 34) was illustrated by Főzy & Leél-Őssy (1985*b*, pl. 3, figs 1–2) as *Protoma cathedralis* (Brongniart). The species is characterized by a long stratigraphic range in the Egerian–Badenian. Numerous fragments are assigned to the Eggenburgian–Ottnangian *Helminthia doublierii* (Matheron, 1842) (Fig. 35). The species was recorded from the lower Miocene deposits of Bántapuszta (Várpalota region) by Steininger (1973, pl. 3, fig. 9).

Superfamily Stromboidea Rafinesque, 1815
Family Rostellariidae Gabb, 1868

Remarks – The late Oligocene – middle Miocene *Varicospira decussata* (Basterot, 1825) recorded by Főzy & Leél-Őssy 1985*a*, *b*) as *Rimella decussata* without any description or illustration does not appear in the newly collected material.

Superfamily Calyptraeoidea Lamarck, 1809
Family Calyptraeidae Lamarck, 1809

Remarks – Nine poorly preserved *Calyptraea* sp. specimens occur in the material. The genus is a new record in the Ilona Valley assemblage.

Superfamily Hipponicoidea Troschel, 1861
Family Hipponicidae Troschel, 1861

Remarks – The family is represented by two *Hipponix interruptus* Michelotti, 1847 specimens (Fig. 36). The late early – middle Miocene species that is known from Badenian deposits of the Pannonian Basin (Strausz 1966) is a new record in the Ilona Valley assemblage.

Superfamily Naticoidea Guilding, 1834
Family Naticidae Guilding, 1834

Remarks – Although genus *Cochlis* predominates the gastropod assemblage with 26%, due to poor preservation none of the specimens are determined at species level, so the presence of *Natica millepunctata* (Lamarck, 1822) recorded by Főzy & Leél-Őssy (1985*a*, *b*) cannot be verified. There are some morphological similarities between the illustrated material (Figs 37–38) and the *Natica burdigalensis* Mayer, 1864 specimen recorded by Csepreghy-Meznerics (1959: 148, pl. 23, fig. 6) from the Burdigalian Ózd-Egercsehi Subbasin, however, the studied assemblage is insufficient for exact determination.

Superfamily Velutinoidea Gray, 1840

Remarks – The Ilona Valley assemblages of this superfamily and of the Cypraeoidea will be discussed in a separate paper, in this study only a brief overview is presented.

The alpha diversity of the Velutinoidea with nine species is noteworthy. Only one *Trivia* and two *Erato* species were recorded in the Ottnangian by Hölzl (1973) and Steininger (1973). All taxa described herein are new in the North Hungarian Basin.

Family Triviidae Troschel, 1863

Remarks – Three poorly preserved specimens are assigned to genus *Trivia*. Genus *Niveria* is represented by two species: *Niveria* cf. *dertonensis* (Michelotti, 1847) and *N.* cf. *pseudoasulcata* (Sacco, 1894), both were previously recorded only from the Badenian in the Central Paratethys.

Family Eratoidae Gill, 1871

Remarks – Although apertures of the specimens are filled with matrix, six forms can be separated: the Aquitanian–Serravallian *Erato hemmoorensis* F. A. Schilder, 1929, and *E. italica* F. A. Schilder, 1932, the Eggenburgian–Serravallian *E.* cf. *planulosa* Sacco, 1894, the Badenian–Tortonian *E.* cf. *praecedens* F. A. Schilder, 1933, and *Erato* sp. A and B. In the Central Paratethys *Erato italica*, and *E. praecedens* were not known from pre-Badenian deposits. Based on morphology the Ottnangian *Erato cypraeola gallica* record in Steininger (1963, pl. 12, fig. 12; 1973) is considered herein as a representative of *Erato hemmoorensis* (for comparison of this species and distributions of the afore mentioned taxa see Fehse & Grego 2012).

Superfamily Cypraeoidea Rafinesque, 1815

Remarks – The rich cypraeoid material of moderate preservation is of special interest as representatives of the superfamily are extremely rare in the Ottnangian Paratethys: one *Schilderia* species was recorded by Hölzl (1973) from Bavaria, and one *Zonarina* specimen by Harzhauser *et al.* (2014) from Austria.

All species described herein are new records in the North Hungarian Basin. The small fauna is closely related to that of the early Miocene Torino Hills (N Italy). Due to matrix fillings of apertures determinations are based on external morphological features.

Family Eocypraeidae F. A. Schilder, 1924

Remarks – The presence of genus *Apiocypraea* in the assemblage is noteworthy from the palaeogeographical point of view. The *Apiocypraea tauroperlonga* (Sacco, 1894) specimens (Figs 39–40) agree well with the type (Sacco 1894, pl. 2, fig. 36).

Family Cypraeidae Rafinesque, 1815

Remarks – *Schilderia nikolsburgensis* Schilder, 1927 is a frequent species in the Badenian Paratethys. The specimen studied herein corresponds to the type in morphology (see Fehse 2001: 7), this record markedly extends the stratigraphic range of the species. Although the *Prozonarina* cf. *tauroporcellus* Sacco specimen is slightly deformed, it agrees well with its type (Sacco 1894, pl. 2, fig. 16). The *Miolyncina* cf. *conjungens* (Sacco) specimen is close to the type in overall morphology (Sacco 1894, pl. 2, fig. 16), but its specific morphological feature cannot be seen for the matrix filling in the aperture. Genus *Zonarina* displays a remarkable diversity. Based on its external morphology, a slightly deformed shell is recorded herein as *Zonarina* cf. *extusdentata* (Sacco, 1894), other two specimens represent *Zonarina* cf. *extuspirata* (Sacco, 1894). Two cypraeids were recorded by Főzy & Leél-Őssy (1985*a*, *b*), however, specimens were illustrated only in the manuscript. One of the '*Trona loibersdorfensis* Schilder, 1932' specimens (Főzy & Leél-Őssy 1982, pl. 4, fig. 3) in fact represents *Zonarina* cf. *elongatula* (Sacco, 1894), and one specimen also appears in the new material. The record of *Zonaria flavicula* (Lamarck, 1810) (Főzy & Leél-Őssy 1982, pl. 4, figs 6–8) was based on a misidentification. These specimens and a newly collected specimen with low, rounded shell bearing uniformly curved aperture differ from the known Miocene forms, they probably represent a new *Zonarina* species.

Superfamily Tonnoidea Suter, 1913 (1825)

Remarks – The tonnoidean material presented herein is of special interest again as its high alpha diversity with six species is unusual in the early Miocene Paratethys. Only three-three species were recorded with certainty by Landau *et al.* (2009) from the Ottnangian and the Karpatian, respectively. On the other hand from the Ottnangian Kaltenbachgraben (Bavaria) assemblages similar high

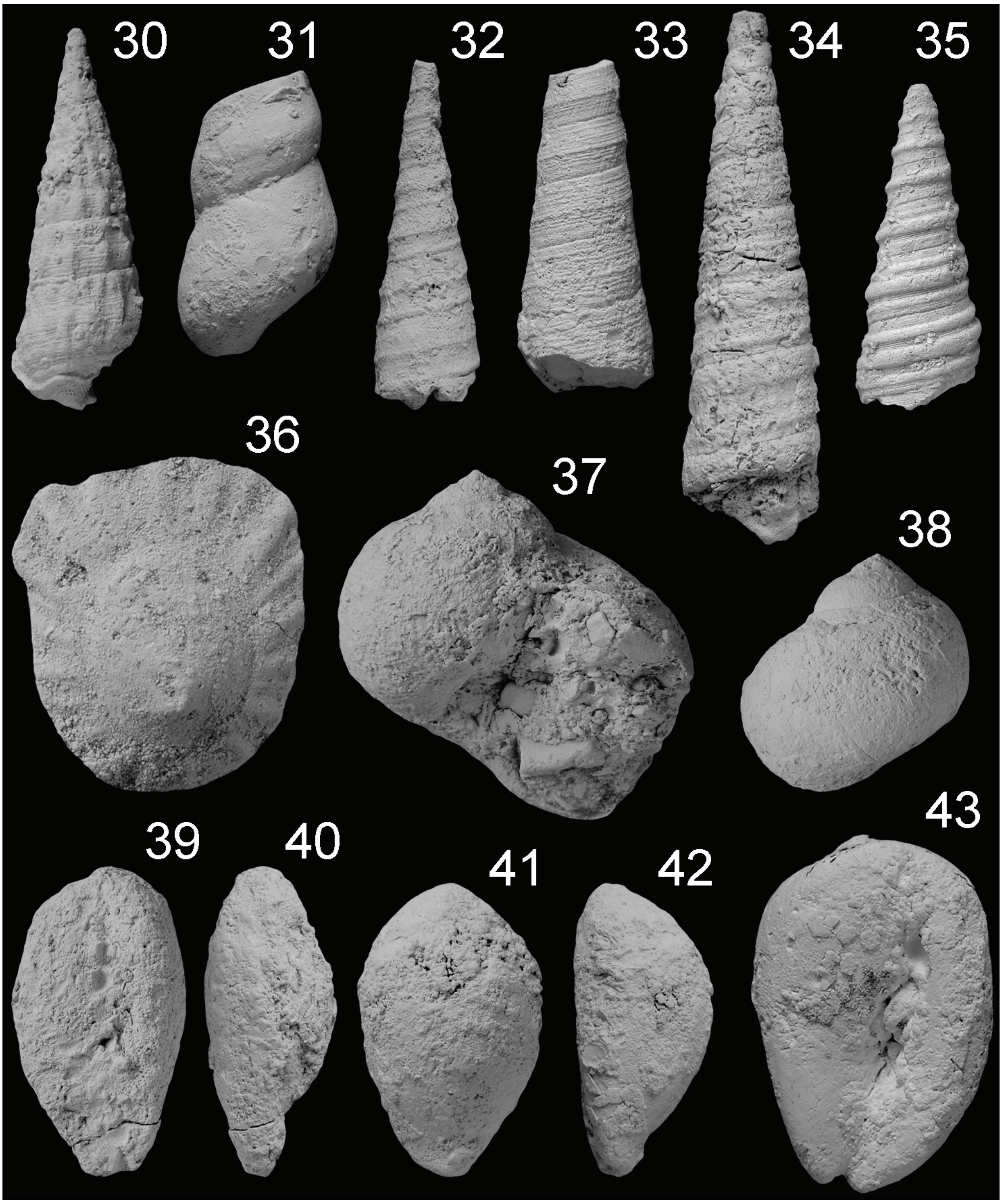


Fig. 30. *Thericium* sp., SL 30 (1.6×), abapertural view. – **Fig. 31.** *Turritella* cf. *inaequicingulata* Hölzl, 1958, SL 30 (1.2×), abapertural view. – **Fig. 32.** *Peyrotia desmarestina* (Basterot, 1825), SL 36.5 (1.2×), apertural view. – **Fig. 33.** *Peyrotia* cf. *desmarestina* (Basterot, 1825), SL 42 (1×), apertural view. – **Fig. 34.** *Allmonia paucicincta* (Sacco, 1895), SL 67 (1×), apertural view. – **Fig. 35.** *Helminthia doublierii* (Matheron, 1842), SL 30.5 (1.2×), abapertural view. – **Fig. 36.** *Hipponix interruptus* Michelotti, 1847, SH 2.9, SW 13.4 (3×), dorsal view. – **Figs 37–38.** *Cochlis* sp. – **Fig. 37.** SL 22 (2×), apertural view. – **Fig. 38.** SL 15.2 (2×) abapertural view. – **Figs 39–40.** *Apiocypraea* cf. *tauroperlonga* (Sacco, 1894), SL 38.7 (1×), apertural and lateral views. – **Figs 41–42.** *Zonarina* sp. A, SL 36.4 (1×), apertural and lateral views. – **Fig. 43.** *Cypraecassis cypraeiformis* (Borson, 1820), SL 30 (1.5×), apertural view

diversity was described by Hölzl (1973: 191), although in lack of descriptions or illustrations this record needs confirmation. The Ilona Valley material, however, extends the stratigraphic range of the species in question. It must be noted that neither the Eggenburgian *Semicassis subsulcosa* (Hoernes et Auinger, 1884), nor the two tonnoidean Ottnangian markers, *Semicassis neumayri* (Hoernes, 1875), and *Sconsia ottnangiensis* (Sacco, 1890) appear in the studied assemblage.

Family Cassidae Latreille, 1825

Remarks – *Cypraecassis cypraeiformis* (Borson, 1820) is represented by a single specimen (Fig. 43). The species is known in the European early Miocene–Pliocene (Landau *et al.* 2009) but in the Central Paratethys it has not been recorded previously from pre-Badenian deposits.

Genus *Sconsia* Gray, 1847

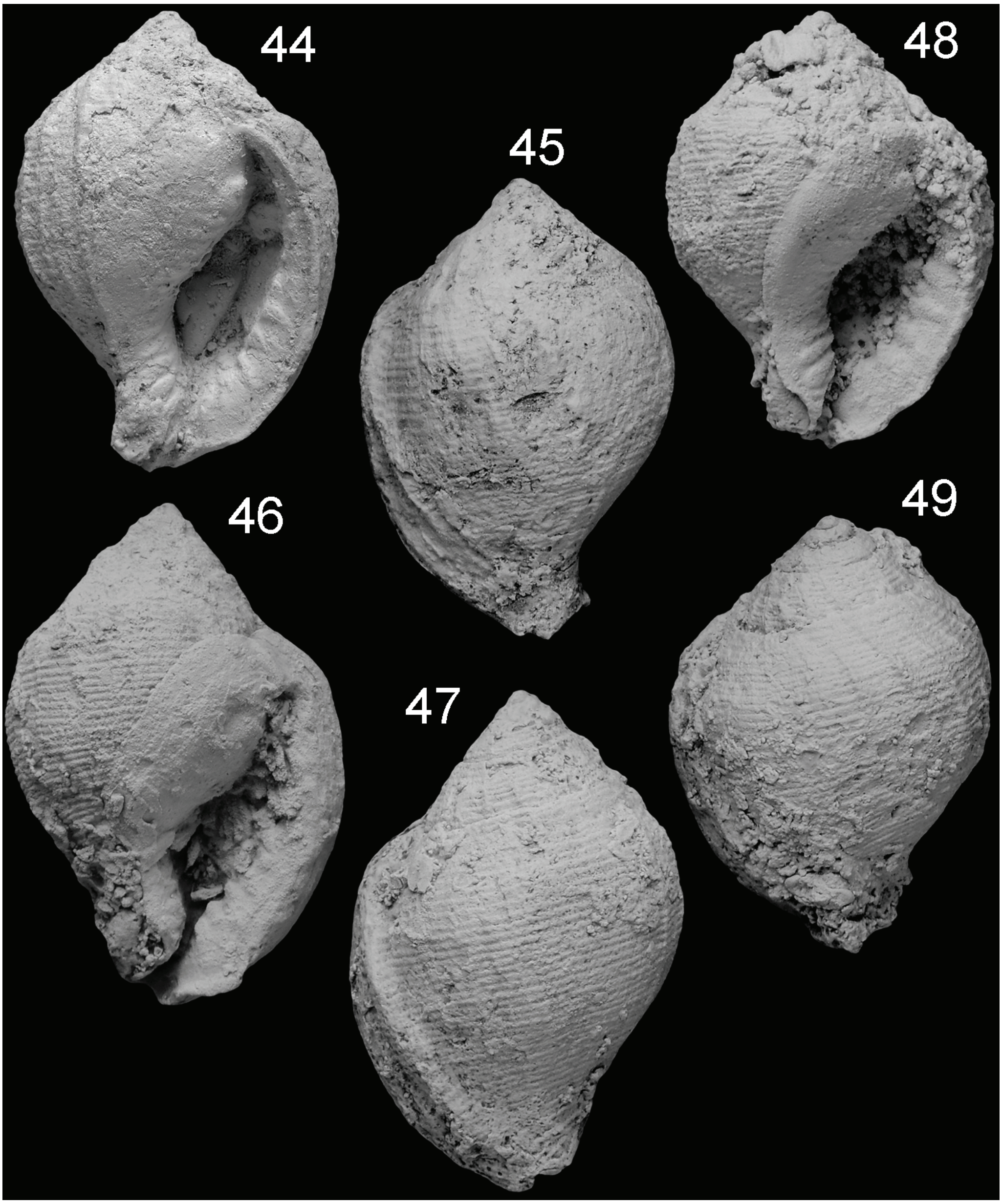
Sconsia landaui n. sp.
(Figs 44–49)

Zoobank.org:act:21F3D03D-3084-4C70-B481-9A267005DF5D

1985*a* *Echinophoria* sp. – Főzy & Leél-Őssy, pl. 3, fig. 5.
1985*b* *Echinophoria* sp. – Főzy & Leél-Őssy, pl. 3, fig. 4.

Holotype – PAL 2022.34.1., SL 26.5 mm, SW 18.4 mm (Figs 44–45).
Paratype 1 – Coll. Vicián, SL 27.5 mm, SW 18 mm (Figs 46–47).
Paratype 2 – Coll. Vicián, SL 24.2 mm, SW 18 mm (Figs 48–49).
Paratype 3 – PAL 2022.35.1., SL 22.8 mm, SW 17.4 mm.
Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.
Derivation of name – In honour of Bernard M. Landau, palaeontologist (Naturalis Biodiversity Center, Leiden, the Netherlands).
Material – 7 specimens. Holotype, paratypes 1–3, and 3 specimens in private collections of the authors. Max. SL 27.5 mm.
Diagnosis – *Sconsia* species with globose shell, conical spire, teleoconch of four whorls, last whorl constricted at base, pyriform aperture, outer lip thickened by labral varix, prominent denticles within, thickened parietal callus bearing prominent parietal tooth, excavated columella, moderately long, recurved siphonal canal, axial sculpture of weak protovarices, and fine riblets, spiral sculpture of fine cords on entire shell.
Description – Medium-sized, globose shell, moderately elevated, conical spire, eroded protoconch. Teleoconch of approximately four whorls, last whorl

89–91% of total length, globose, weakly shouldered with slightly concave sutural ramp, regularly convex below, strongly constricted at base. Aperture moderately wide, pyriform, anal canal deep. Outer lip thickened by labral varix, bearing about nine well-developed denticles within. Parietal callus thickened, expanded,



Figs 44–49. *Sconsia landaui* n. sp. – **Figs 44–45.** Holotype, SL 26.5 (2.3×), apertural and abapertural views. – **Figs 46–47.** Paratype 1, SL 27.5 (2.3×), apertural and abapertural views. – **Figs 48–49.** Paratype 2, SL 26.5 (2.2×), apertural and abapertural views

sharply delimited, bearing prominent parietal tooth adapically. Columella excavated, bearing irregular folds along its entire length. Columellar callus moderately thickened. Siphonal canal moderately long, narrow, slightly recurved posteriorly. Axial sculpture of narrow, slightly projected protovarices, and fine, irregularly spaced, prosocline riblets, 8–9 on last whorl, overriding by spiral cords. Spiral sculpture of numerous, rounded cords on entire shell.

Remarks – Based on morphology, the new species is assigned to genus *Sconsia* (for diagnosis of the genus see Beu 2008: 305, 321). Members of genera *Echinophoria* and *Semicassis* are characterized by much shorter and strongly twisted siphonal canal. *Sconsia landaui* n. sp. is closely allied to the Ottnangian *Sconsia ottnangiensis* (Sacco, 1890) in size but differs by its narrower shell, higher spire, much thicker labral varix, and presence of axial sculpture. According to Landau *et al.* (2009) denticles of *Sconsia ottnangiensis* are variable in strength, however, they are less prominent than that of *S. landaui* n. sp. (see Landau *et al.* 2009, pl. 5, figs 1–2). The *Sconsia landaui* n. sp. material was misidentified as *Echinophoria* sp. by Főzy & Leél-Őssy (1985*a*, *b*). Indeed, the new species somewhat resembles *Echinophoria haueri* (Hoernes et Auinger, 1884) in sculpture but differs in smaller size, higher spire, longer siphonal canal, much stronger labral varix and prominent denticles (see Landau *et al.* 2009, pl. 3, figs 6–8). *Echinophoria haueri* occurs in the Burdigalian Proto-Mediterranean Sea, and is also known from Badenian localities in the Central Paratethys (Landau *et al.* 2009), but it was not recorded from pre-Badenian localities in this realm.

Family Cymatiidae Iredale, 1913

Remarks – Both cymatiid species recorded herein are new records in the North Hungarian Basin. *Monoplex* s.l. *subcorrugatus* (d'Orbigny, 1852) is widespread in the Aquitanian–Burdigalian Aquitaine Basin (France), it differs from the middle Miocene–Recent *M.* s. l. *corrugatus* (Lamarck, 1822) by its smaller size and sculpture of stronger spiral cords and thicker varices (Figs 50–51). The species was discussed by Lozouet *et al.* (2001) and Landau *et al.* (2009). *Pseudosassia turrita* (Eichwald, 1830) was recorded in the Ottnangian by Hölzl (1973). The sculpture of the species is variable, the specimen figured herein bears well-developed axial ribs which is usually become obsolete on the late teleoconch whorls of the Badenian specimens (Landau *et al.* 2009) (Figs 52–53).

Family Bursidae Thiele, 1925

Remarks – Both species recorded herein are new records in the North Hungarian Basin. The bursid specimen on Figs 54–55 bearing prominent tubercles on the shoulder cord and strong, smooth P3 primary cord is assigned to

Aquitanobursa cf. *grateloupi* (d'Orbigny, 1852) (see Sanders *et al.* 2019). From the Ottnangian *Bursa* cf. *papillosa* (Pusch) was recorded by Hölzl (1973). This species is regarded as a synonym of the early Miocene–Recent *B. corrugata* (Perry, 1811), and differs from the specimen figured herein by its slightly lower spire and nodose P3 (see Landau *et al.* 2009, pl. 8, figs 7–10). The early Miocene–Recent *Aspa marginata* (Gmelin, 1791) is known in the Ottnangian (Steininger 1973; Landau *et al.* 2009), the Ilona Valley record extends its palaeogeographical distribution (Figs 56–57).

Superfamily Ficoidea Meek, 1864
Family Ficidae Meek, 1864

Remarks – *Ficus condita* (Brongniart, 1823) was illustrated from the locality by Főzy & Leél-Őssy (1985*a*, pl. 3, fig. 4). The late Oligocene – late Miocene species shows a wide geographical range in Europe, it was widely distributed in the Ottnangian as well (Steininger 1973; Harzhauser *et al.* 2014).

Superfamily Epitonioidea Berry, 1910 (1812)
Family Epitoniidae Berry, 1910 (1812)

Remarks – Two epitoniid species occur in the material, *Scalina subreticulata* (d'Orbigny, 1852) and *Cirsotrema kokayi* n. sp. *Scalina subreticulata* (Fig. 60) was recorded as *Acrilla amoena* (Philippi, 1843) by Főzy & Leél-Őssy (1985*a*, *b*), the taxon was revised by Harzhauser *et al.* (2014). The early–middle Miocene species is known from Ottnang (Hoernes 1875; Steininger 1973) as well, later it was widely distributed in the Badenian Central Paratethys, in the Pannonian Basin it was illustrated by Csepreghy-Meznerics (1969, pl. 1, fig. 30) from the Bükk Mts.

Genus *Cirsotrema* Mörch, 1852

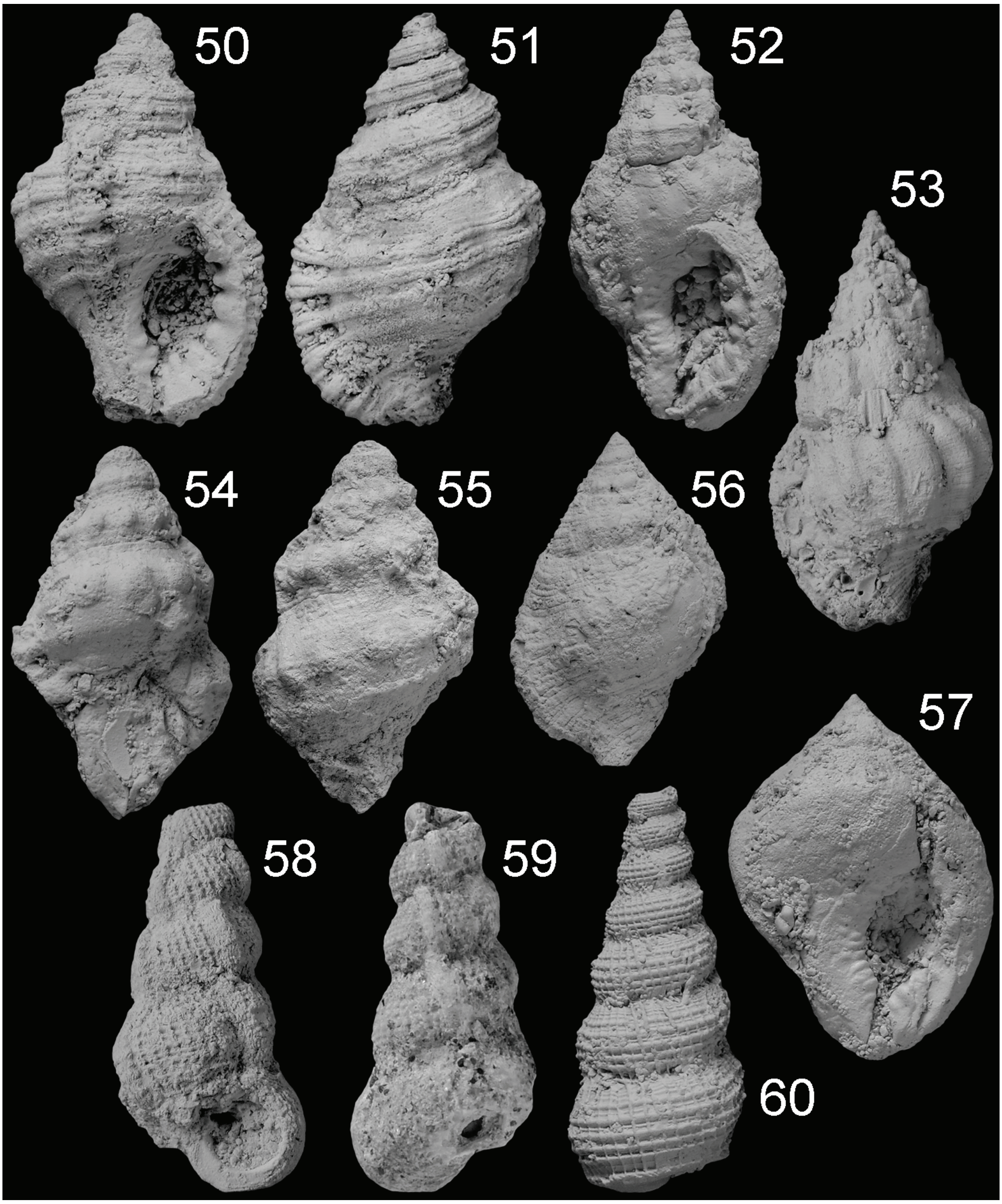
Cirsotrema kokayi n. sp.
(Figs 58–59)

Zoobank.org:act:CB8B45B1-9DC5-4D52-8A46-6CC76252CEFE

Holotype – PAL 2022.54.1., SL 22 mm, SW 10.8 mm (Figs 58–59).

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of József Kókay, late Hungarian geologist, palaeontologist (1928–2013).



Figs 50–51. *Monoplex* s.l. *subcorrugatus* (d'Orbigny, 1852), SL 34.5 (1.5×), apertural and abapertural views. – **Figs 52–53.** *Pseudosassia turrita* (Eichwald, 1830), SL 41 (1.3×), apertural and abapertural views. – **Figs 54–55.** *Aquitanobursa* cf. *grateloupi* (d'Orbigny, 1852), SL 31.3 (1.5×), apertural and abapertural views. – **Figs 56–57.** *Aspa marginata* (Gmelin, 1791). – **Fig. 56.** SL 35 (1.2×), abapertural view. – **Fig. 57.** SL 38 (1.2×), apertural view. – **Figs 58–59.** *Cirsotrema kokayi* n. sp., holotype, SL 22 (2.2×), apertural and abapertural views. – **Fig. 60.** *Scalina subreticulata* (d'Orbigny, 1852), SL 39 (1.3×), abapertural view

Material – Holotype.

Diagnosis – *Cirsotrema* species with turriculate shell, rounded teleoconch whorls, subcircular aperture, strong labral varix. Sculpture of fine axial ribs and varices, fine spiral cords and a strong basal cord.

Description – Slender, turriculate shell, protoconch missing, preserved teleoconch of four rounded whorls, suture deep. Aperture subcircular, outer lip thickened by labral varix. Spiral sculpture of fine primary cords, 6 on penultimate whorl, and a strong basal cord. Secondary spiral cords appear on the abapical part of the whorls in interspaces from the second preserved whorls. Axial sculpture of fine, prosocline, wavy ribs, 23 on penultimate whorl, and broad, rounded varices, 3 on first preserved whorl, 4 on second whorl, and 3–3 on penultimate and last whorls.

Remarks – Based on morphology, the new species is assigned to *Cirsotrema*. The genus was discussed e.g. by Kilburn (1985), Landau *et al.* (2006, 2013), and Carone & Ardovini (2008). Comparing the early Miocene *Cirsotrema* species in Europe, *C. subspinosum* (Grateloup, 1840) and *C. crassicostatum* (Deshayes, 1853) have broader and more squatter shell, while the more similar *C. bourgeoisi* De Boury, 1912 differs by its less rounded whorls with subangulate shoulder, and broader and generally fused axial ribs. *Cirsotrema kokayi* n. sp. is also distinguishable from the Burdigalian–Recent *Cirsotrema pumiceum* (Brocchi, 1814) by bearing much finer and well-separated axial ribs.

Superfamily Muricoidea Rafinesque, 1815
Family Muricidae Rafinesque, 1815

Remarks – One *Chicoreus* (*Triplex*) and three Ocenebrinae species are new records in the Ilona Valley material. *Chicoreus* (*Triplex*) *aquitanicus* (Grateloup, 1833) is widespread in the early–late Miocene of Europe (Landau *et al.* 2013), it also occurs in the Ottnangian (Hölzl 1973) (Figs 61–62). Three fragmentary specimens bearing well-developed axial ribs overriding by strong primary and fine secondary spiral cords resemble the Karpatian–Badenian *Ocinebrina kojumdgievae* (Bałuk, 1995) in morphology, but in lack of an adult shell we use open nomenclature (Figs 63–64). The species was recently discussed by Kovács (2020).

Two muricids were mentioned from the locality by Főzy & Leél-Őssy (1985*a*, *b*): *Murex trinodosus* Bellardi, 1873, and *Murex erinaceus* Linné, 1766 [*sic*]. The former was illustrated in their manuscript (1982, pl. 3, fig. 5), it is obviously a misidentification. The other name, *erinaceus* was widely used in the previous Hungarian literature for the middle Miocene–Pliocene *Jaton sowerbyi* (Michelotti, 1841) (Kovács *et al.* 2018). *Jaton* is known in the Karpatian Central Paratethys (Várpalota – Kókay 1967, pl. 1, fig. 7); and the morphology of the

Eggenburgian *Murex* (*Ocenebra*) *erinaceus* var. *sublaevis* Schaffer, 1912 (type refigured by Steininger *et al.* 1971, pl. 10, fig. 9) also corresponds to the morphology of this genus.

Genus *Ocinebrina* Jousseaume, 1880

Ocinebrina deaki n. sp.
(Figs 65–67)

Zoobank.org:act:03EDA821-C080-46E4-972B-F69C1CB68425

Holotype – PAL 2022.36.1., SL 16 mm, SW 9 mm (Fig. 67).

Paratype 1 – Coll. Vicián, SL 20.6 mm, SW 11.7 mm (Figs 65–66).

Paratype 2 – PAL 2022.37.1., SL 21.4 mm, SW 11.5 mm.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

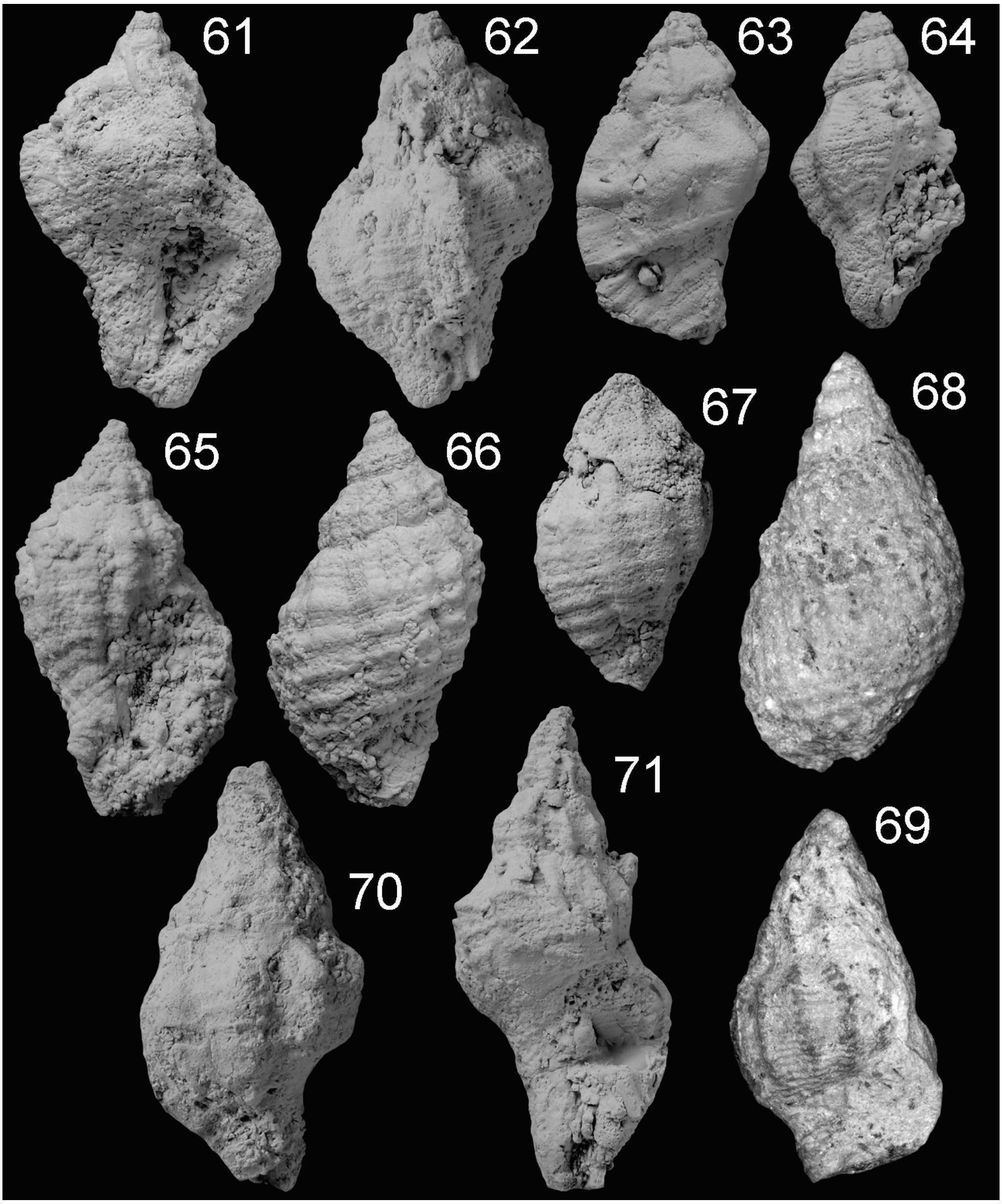
Derivation of name – In honour of Konrád Deák, Hungarian private fossil collector.

Material – 5 specimens. Holotype, paratypes 1–2, and 2 specimens in private collections of the authors. Max. SL 21.4 mm.

Diagnosis – *Ocinebrina* species with slender shell, paucispiral protoconch, shouldered teleoconch whorls, ovate aperture, broad, rounded axial ribs, strong, rounded primary spiral cords.

Description – Shell slender, of medium size, eroded paucispiral protoconch, somewhat scalate spire. Teleoconch of about three shouldered whorls, suture shallow, undulating. Last whorl 83% of the total length, bearing sloping sutural ramp, rounded below, constricted at base. Aperture ovate, siphonal fasciole recurved, bearing spiral cords. Axial sculpture of broad, rounded ribs, overriding by spiral cords; spiral sculpture of strong, rounded primary cords (7 on the rounded part of last whorl) and finer secondaries in interspaces and on sutural ramp.

Remarks – Although the sealed siphonal canal, one of the diagnostic features of *Ocinebrina* cannot be traced, based on the overall morphology the new species is assigned to the genus. In the early Miocene Paratethys *Ocinebrina* was not common. The Eggenburgian *Ocinebrina schoenni* (Hörnes, 1853) has broader shell with less sloping sutural ramp and sharper axial ribs, while the widespread Eggenburgian–Badenian *O. crassilabiata* (Hilber, 1879) is characterized by broad, rounded, biconical shell. The Karpatian–Badenian *Ocinebrina credneri* (Hoernes et Auinger, 1885) shows some resemblance (see Hoernes & Auinger 1885, pl. 26, figs 16–17; Kovács *et al.* 2018) but differs by its larger size and much higher spire. The middle–late Miocene *Ocinebrina dertonensis* (Bellardi, 1873) is



Figs 61–62. *Chicoreus* (*Triplex*) *aquitanicus* (Grateloup, 1833), SL 35.3 (1.4×), apertural and abapertural views. – **Figs 63–64.** *Ocinebrina* cf. *kojumdgievae* (Bałuk, 1995). – **Fig. 63.** SL 21.2 (2×), abapertural view. – **Fig. 64.** SL 20.2 (2×), apertural view. – **Figs 65–67.** *Ocinebrina deaki* n. sp. – **Figs 65–66.** Paratype 1, SL 20.6 (2.5×), apertural and abapertural views. – **Fig. 67.** Holotype, SL 16 (2.5×), abapertural view. – **Fig. 68.** *Nassarius* sp. A, SL 10.7 (5×), abapertural view. – **Fig. 69.** *Nassarius* sp. B, SL 6.7 (7×), apertural view. – **Fig. 70.** Fasciolariidae sp. A, SL 21.4 (2.5×), abapertural view. – **Fig. 71.** Fasciolariidae sp. B, SL 30.3 (2×), apertural view

a more elongated form with longer siphonal canal. The "Helvetien" *Ocinebrina occitanica* Cossmann et Peyrot, 1924 is a broader form with less sloping sutural ramp and somewhat narrower spiral cords.

Superfamily Buccinoidea Rafinesque, 1815

Remarks – Five buccinoid families (Nassariidae, Columbellidae, Tudiclidae, Fasciolariidae, Eosiphonidae), an unassigned genus, and a small Buccinoidea sp. material appear in the assemblage. The specimens are characterized by extremely poor to poor preservation.

Family Nassariidae Iredale, 1916

Remarks – Although 111 specimens are assigned to genus *Nassarius*, none of them can be determined at species level. Both well-defined Ottnangian markers [*Nassarius pauli* (Hoernes, 1875), and *N. schultzi* Harzhauser et Kowalke, 2004] are missing from the assemblage. *Nassarius* sp. A has an elongated ovoid shell bearing fine, dense axial ribs and spiral cords (Fig. 68). The specimen somewhat resembles *Nassarius schultzi* in shell proportion but differs by bearing more spiral cords. Two other *Nassarius* groups (B and C) are separated in the material with different morphology, and two *Cyllenina*? sp. indet. specimens are recorded. *Nassarius* sp. B (Fig. 69) bears widely spaced, narrow axial ribs and dense spiral sculpture, it resembles the syntypes of "*Nassa*" *omissa* Bellardi, 1882 from the 'Elveziano' of N Italy (Ferrero Mortara *et al.* 1981, pl. 23, figs 1–2).

The *Nassa conglobata* record in Főzy & Leél-Őssy (1982, pl. 6, fig. 8, 1985*a*, *b*) is a misidentification. *Demoulia conglobata* (Brocchi, 1814) is a Pliocene species characterized by broad shell and rather inflated whorls – similar shells, e.g., the Badenian *Nassarius doliolum* (Eichwald, 1830) do not appear in the new material.

Family Columbellidae Swainson, 1840

Remarks – The family is poorly represented by two *Mitrella* sp. indet. specimens. The genus is a new record in the Ilona Valley assemblage. Only one species, *Mitrella fallax* (Hoernes et Auinger, 1880) was reported in the early Miocene Central Paratethys by Harzhauser & Landau (2021).

Family Tudiclidae Cossmann, 1901

Remarks – Poorly preserved *Tudicla rusticula* (Basterot, 1825), *Euthria*? sp. indet., *Euthriofusus burdigalensis* (Basterot, 1825), and *Euthriofusus* sp. indet. specimens represent the family. *Tudicla rusticula* and *Euthriofusus burdigalen-*

sis are widespread in the European early Miocene, they frequently occur in the Egerian–Badenian Paratethys.

Family Fasciolariidae Gray, 1853

Remarks – Ten fragmentary specimens of very poor preservation are recorded herein as *Angustifusus* sp. aff. *hoessi* (Hoernes et Auinger, 1890). The specimens are characterized by elongated shell, slightly rounded, shouldered whorls bearing broad, rounded axial ribs and dense, fine, sharp spiral cords on the entire shell. The Ottnangian–Badenian species was discussed briefly by Harzhauser (2002). One large fragmentary specimen is recorded as *Polygona* sp. (Fig. 72). It is somewhat similar to the type of *Latirus productus* (Bellardi, 1884) (refigured by Ferrero Mortara *et al.* 1981, pl. 37, fig. 4) in size and morphology but clearly differs by bearing more weakly developed axial ribs. Two Fasciolariidae sp. indet. specimens are figured on Figs 70–71.

Family Eosiphonidae Kantor, Fedosov, Kosyan, Puillandre, Sorokin, Kano, Clark et Bouchet, 2021
Genus *Calagrassor* Kantor, Puillandre, Fraussen, Fedosov et Bouchet, 2013

Calagrassor mathiasi n. sp.
(Figs 73–76)

Zoobank.org:act:D71D29D4-C5C3-4B37-BF41-F7A0056A6D9C

Holotype – PAL 2022.53.1., SL 21 mm, SW 8 mm (Figs 73–75).

Paratype – Coll. Vicián, SL 25.4 mm, SW 10.5 mm (Fig. 76).

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Mathias Harzhauser, Austrian palaeontologist (Natural History Museum Vienna).

Material – 4 specimens. Holotype, paratype, and 2 specimens in private collections of the authors. Max. SL 25.4 mm.

Diagnosis – *Calagrassor* species with slender, fusiform shell, paucispiral protoconch, six rounded teleoconch whorls, ovate aperture. Sculpture of low, rounded axial ribs on early teleoconch whorls, strong spiral ribs on entire shell.

Description – Medium-sized, fusiform shell, apical angle ~35°, eroded, paucispiral protoconch. Spire of five slightly rounded whorls, suture shallow. Last whorl 70% of shell height, rounded, moderately constricted at base. Ovate aperture, moderately long siphonal canal. Each aperture is filled by matrix, its morphological features cannot be traced. Axial sculpture of low, narrow, rounded axial ribs on the first three teleoconch whorls, spiral sculpture of strong primary cords covering the entire shell (6 on penultimate whorl of the holotype), interspaces equal to cords width.

Remarks – Concerning the Miocene genera with similar morphology, *Bartonia* has comparable spiral sculpture but axial ribs; *Pisania* specimens are characterized by well-developed secondary cords; mitrids with similar sculpture (genera *Domiporta* and *Cancilla*) differ by higher spire, less constricted last whorl,

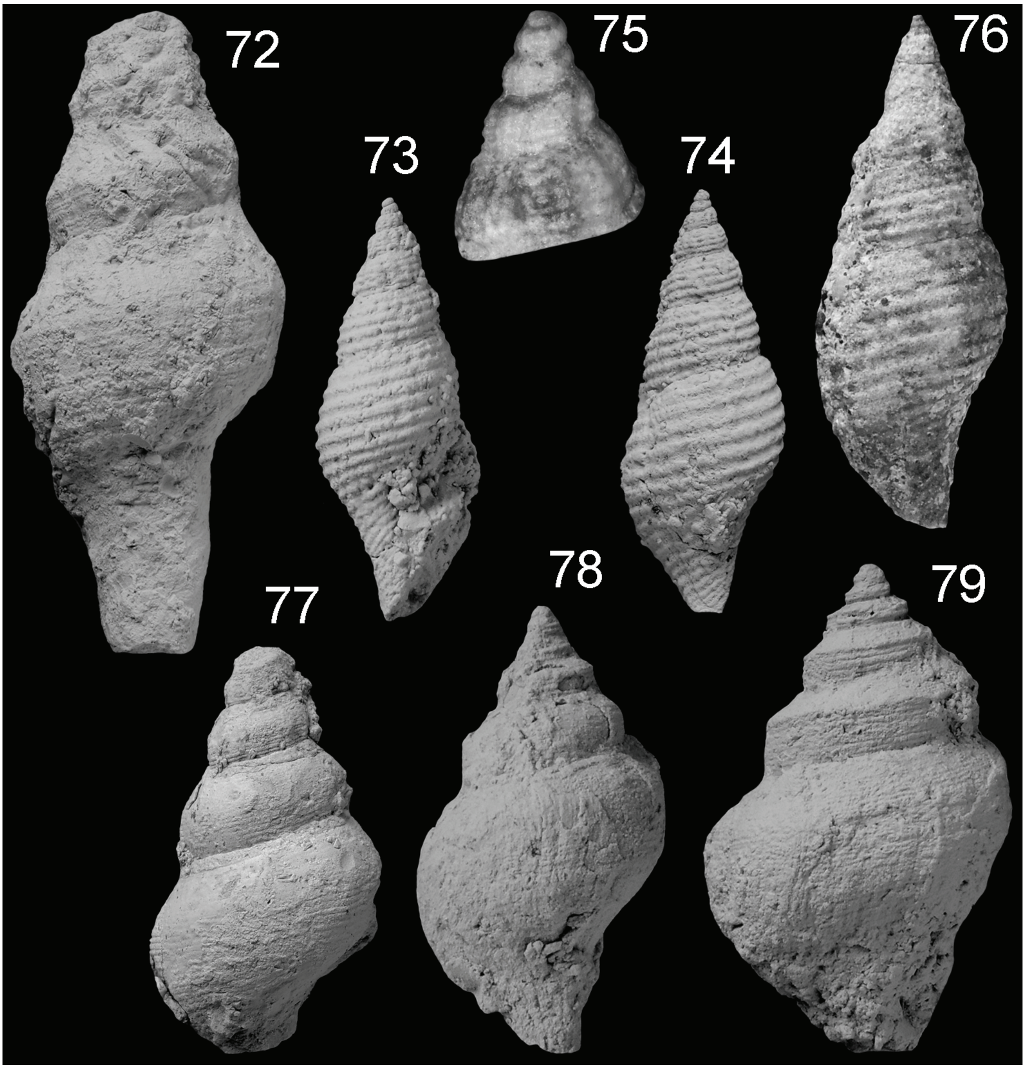


Fig. 72. *Polygona* sp., SL 87 (0.9×), abapertural view. – **Figs 73–76.** *Calagrassor mathiasi* n. sp. – **Figs 73–74.** Holotype, SL 21 (2.5×), apertural and abapertural views. – **Fig. 75.** Holotype, protoconch, and early teleoconch whorls (11.4×). – **Fig. 76.** Paratype, SL 25.4 (2.5×), abapertural view. – **Fig. 77.** *Aquilofusus* ? sp., SL 33 (1.5×), abapertural view. – **Figs 78–79.** Buccinoidea sp. A. – **Fig. 78.** SL 22 (2.5×), abapertural view. – **Fig. 79.** SL 24 (2.5×), abapertural view

flattened spiral cords, and lack of axial ribs. Based on the diagnosis of the Recent *Calagrassor* (Kantor *et al.* 2013: 13), the new species is assigned to this genus. The type species, *Calagrassor aldermenensis* (Powell, 1971) has slightly broader shell bearing wider spiral cords. *Calagrassor mathiasi* n. sp. is more closely allied to *C. poppei* (Fraussen, 2001) in morphology (see Fraussen 2001, figs 1–5) but differs in smaller size. We are not aware of any *Calagrassor* species in the fossil record, it seems that *C. mathiasi* n. sp. is the earliest representative of the genus.

Superfamily Buccinoidea unassigned

Remarks – 11 fragmentary *Aquilofusus*? specimens occur in the assemblage, one of them is illustrated on Fig. 77. It is characterized by medium-sized shell with rounded whorls bearing widely spaced, low, rounded axial ribs on the early teleoconch whorls and fine, close-set spiral cords on the entire shell. The specimen somewhat resembles the Ottnangian *Scalapira*? n. sp. material presented by Harzhauser *et al.* (2014, pl. 3, figs 11–12).

Seven fragmentary specimens with scalate spire whorls bearing fine spiral cords are recorded herein as Buccinoidea sp. (Figs 78–79). They probably represent a new species, the poor preservation, however, does not allow the introduction of a new taxon. The Ottnangian *Bathytoma* n. sp. specimen figured by Harzhauser *et al.* (2014, pl. 4, fig. 11) is characterized by a similar spire shape, but it has smooth shell with much higher subsutural ramp.

Superfamily Volutoidea Rafinesque, 1815
Family Harpidae Bronn, 1849

Remarks – Based on the manuscript (Főzy & Leél-Őssy 1982, pl. 8, figs 1–2) the presence of *Oniscidia cythara* (Brocchi, 1814) in the Ilona Valley Section assemblage is confirmed herein. The late Oligocene – late Miocene species was widespread in the Badenian Paratethys (Landau *et al.* 2013), it was recorded from the Egerian Hungarian Paleogene Basin (Vicián *et al.* 2017), but its early Miocene occurrence is known only in the North Hungarian Basin in the Paratethys.

Superfamily Olivoidea Latreille, 1825
Family Ancillariidae Swainson, 1840

Remarks – The family is represented by one *Ancillarina subcanalifera* (d'Orbigny, 1852) specimen. The species differs from the Ottnangian marker *Turrancilla austriaca* (Hoernes, 1875) mainly by its higher and wider aperture. *Ancillarina subcanalifera* is characterized by a long stratigraphic range, it is known in the Egerian (late Oligocene – early Miocene) Hungarian Paleogene Basin (Báldi 1973), later it was widespread in the Badenian Central Paratethys (Bałuk 1997).

Family Olividae Latreille, 1825

Remarks – Eight *Amalda glandiformis* (Lamarck, 1810) specimens occur in the material, it was recorded from the locality in the previous literature (Báldi 1983; Főzy & Leél-Őssy 1985*a*, *b*). The early Miocene – late Pliocene species is very variable, and characterized by three morphotypes (Landau *et al.* 2013) from which only the forma *elongata* Deshayes appears in the assemblage (Fig. 80).

Superfamily Cancellarioidea Forbes et Hanley, 1851
Family Cancellariidae Forbes et Hanley, 1851

Remarks – One species, *Sveltia* cf. *varicosa* Brocchi, 1814 [*sic*] was recorded by Főzy & Leél-Őssy (1985*a*, *b*). The cancellariid material of these authors is lost, and other representatives of the family do not occur in the new gastropod assemblage.

Superfamily Conoidea Fleming, 1822

Remarks – Representatives of six conoidean families appear in the gastropod material. The Clavatulidae and the Conidae are dominant members of the fauna, while the Borsoniidae, Conorbidae, Turridae, and Pseudomelatomidae J. P. E. Morrison, 1966 are represented by only one-one taxon (*Pseudotoma* cf. *praecedens*, *Artemidiconus granularis*, *Gemmula* sp. indet., *Crassispira* sp. indet.) – all four are new records in the Ilona Valley assemblage.

Family Borsoniidae Bellardi, 1875

Remarks – The family is represented by two medium-sized, poorly preserved specimens which are referred to *Pseudotoma praecedens* Bellardi, 1877. The species was recorded from the Ottnangian by Hölzl (1973: 195). While the genus is relatively frequent in the Badenian Paratethys, it was previously unknown in the North Hungarian Basin. From the Badenian *Pseudotoma* species of similar size, *P. florae* and *P. luciae* Hoernes et Auinger, 1890 have more slender shells with higher spire, while *P. giselae* Hoernes et Auinger, 1890 bears a more scalate spire and its last whorl is strongly constricted at base. The early Miocene specimens presented herein slightly differ from the Badenian representatives of *Pseudotoma praecedens* in their lower subsutural ramp (see Kovács & Vicián 2021, pl. 1, figs 1–4). The specimen figured on Fig. 81 agrees well in morphology with the syntype of the species illustrated by Ferrero Mortara *et al.* (1981, pl. 16, fig. 4).

Family Conorbidae De Gregorio, 1880

Remarks – One specimen represents *Artemidiconus* cf. *granularis* (Borson, 1820) in the assemblage. The species is widespread in the Badenian Central Paratethys, but it is also known from the Aquitanian–Burdigalian in France and Italy (Harzhauser & Landau 2016).

Family Conidae Fleming, 1822

Remarks – One *Conilithes* species was described with certainty by Harzhauser & Landau (2016) from the Ottnangian Central Paratethys, *Conilithes antidiluvianus* (Bruguière, 1792) – this species does not occur in the Ilona Valley assemblage. *Conilithes allioni* (Michelotti, 1847) – typical of the Burdigalian Proto-Mediterranean Sea and NE Atlantic – was also recorded from the early Miocene Paratethys (? Ottnangian: Steininger 1973, pl. 9, fig. 6; Karpatian: Harzhauser 2002, pl. 9, figs 13–14). The illustrated specimens (Figs 82–83, and Főzy & Leél-Őssy 1985*a*, pl. 3, fig. 7) agree in size and morphology with *Conilithes allioni* (see Michelotti 1847, pl. 17, fig. 17; Harzhauser & Landau 2016, fig. 5/A). These specimens are characterized by pointed spire, strongly carinate shoulder and canaliculated sutural ramp, and the material shows close resemblance to a variety, *Conilithes allioni* var. *pupoidespira* Sacco (1893: 34, pl. 4, fig 11) from the 'Elveziano' of N Italy. The species predominates the Conidae fauna of the Ilona Valley.

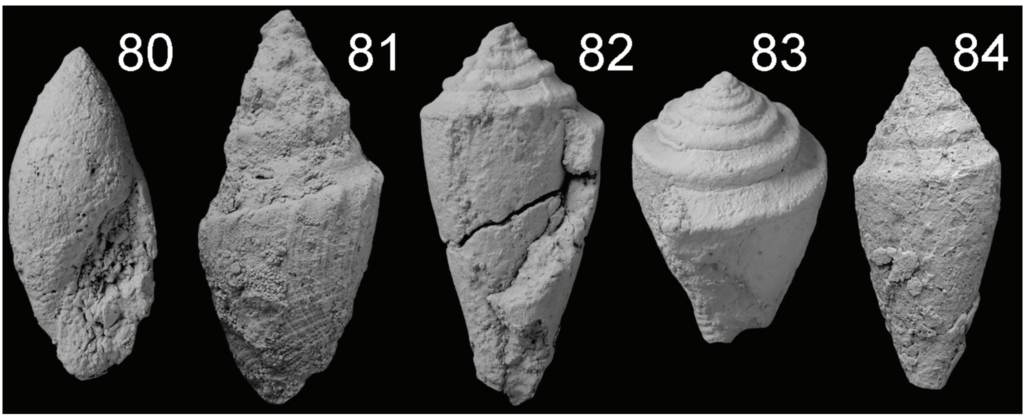


Fig. 80. *Amalda glandiformis* (Lamarck, 1810), SL 31.7 (1.3×), apertural view. – **Fig. 81.** *Pseudotoma praecedens* Bellardi, 1877, SL 41.4 (1.2×), abapertural view. – **Figs 82–83.** *Conilithes allioni* (Michelotti, 1847). – **Fig. 82.** SL 31.5 (1.5×), apertural view. – **Fig. 83.** SL 27 (1.2×), lateral view. – **Fig. 84.** *Conilithes* cf. *brezinae* (Hoernes et Auinger, 1879), SL 26.4 (1.6×), abapertural view

Another species also appears in the conoid assemblage, but due to the poor preservation it is described only with open nomenclature: *Conilithes* cf. *brezinae* (Hoernes et Auinger, 1879) (Fig. 84). The species was recorded as "aff. *brezinae*" from the Ottnangian by Hölzl (1973: 195). The Aquitanian–Burdigalian NE Atlantic *Conilithes subturritus* (d'Orbigny, 1852) is a similar form but differs by its lower spire. In the Paratethys a closely allied species, *Conilithes exaltatus* (Eichwald, 1830) occurs in the Karpatian–Badenian. It differs from *Conilithes brezinae* by its larger size, higher spire with lower sutural ramp, longer last whorl with a pronounced basal constriction, and a sharper carina on spire whorls (Harzhauser & Landau 2016).

Monteiroconus antiquus (Lamarck, 1810) and *Conus parvicaudatus* Sacco, 1893 recorded by Főzy & Leél-Őssy (1985*a*, *b*) are misidentifications as it clearly visible in the manuscript (Főzy & Leél-Őssy 1982, pl. 5, figs 4, 5). The former record represents *Conilithes allioni*, the latter *Conilithes* cf. *brezinae* specimens.

Family Clavatulidae Gray, 1853
Genus *Clavatula* Lamarck, 1801

Clavatula s. l. *barnabasi* n. sp.
(Figs 85–87)

Zoobank.org:act:C98CA6AA-DE2D-4D77-A9C0-8433800CBF25

Holotype – PAL 2022.38.1., SL 43.2 mm, SW 15.6 mm (Fig. 86).

Paratype 1 – PAL 2022.39.1., SL 30.8 mm, SW 15 mm (Fig. 87).

Paratype 2 – Coll. Vicián, SL 40.6 mm, SW 14.3 mm (Fig. 85).

Paratype 3 – PAL 2022.40.1.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Barnabás Géczy, late Hungarian palaeontologist (1925–2022).

Material – 7 specimens. Holotype, paratypes 1–3, and 3 specimens in private collections of the authors. Max. SL ~50 mm.

Diagnosis – *Clavatula* species with fusiform shell, teleoconch of eight whorls, ovate aperture, moderately long siphonal canal, shallow anal sinus, tripartite spire whorls, sculpture of well-developed growth lines and strong spiral cords.

Description – Medium-sized, fusiform shell, apical angle 26–28°, protoconch missing in all specimens. Teleoconch of eight whorls, suture shallow. Tripartite spire whorls with slightly swollen subsutural collar, moderately swollen suprasutural row of elongated, rib-like nodes, subsutural ramp slightly concave. Entire surface covered by broad, low spiral cords. Last whorl rounded, moderately constricted at base, bearing strong axial growth lines overriding by spiral cords forming a granulate sculpture. Aperture ovate, columella smooth, siphonal canal moderately long, sculptured by spiral cords, siphonal fasciole weakly swollen, slightly twisted. Shallow U-shaped anal sinus with apex mid-ramp.

Remarks – Based on the revision of the Miocene Paratethyan Clavatulidae (Harzhauser *et al.* 2022) the new species is assigned to the *Clavatula* sensu lato group. The Eggenburgian–Karpatian *Clavatula* s.l. *mariae* (Hoernes et Auinger, 1891) (see Harzhauser *et al.* 2022, fig. 28/E–G) is rather similar in size and morphology but differs by sculpture with suprasutural row of beads instead of axial nodes, and the lack of well-developed growth lines. The *Clavatula mariae* record from the locality in Báldi (1983) probably refers to *C. barnabasi* n. sp.

Clavatula s. l. *istvani* n. sp.
(Figs 88–92)

Zoobank.org:act:B6EC813D-AC9C-4EC1-9E8B-FB4EC04F2F05

1985*a* *Clavatula semimarginata* – Főzy & Leél-Őssy, pl. 3, fig. 6 [non *Tomellana semimarginata* (Lamarck, 1822)].
1985*b* *Clavatula semimarginata* – Főzy & Leél-Őssy, pl. 3, fig. 7 [non *Tomellana semimarginata* (Lamarck, 1822)].

Holotype – PAL 2022.41.1., SL 44 mm, SW 13.7 mm (Figs 90–91).

Paratype 1 – PAL 2022.42.1., SL 50.8 mm, SW 16.1 mm.

Paratype 2 – Coll. Vicián, SL 40.5 mm, SW 14.3 mm (Figs 88–89).

Paratypes 3–10 – PAL 2022.43.1.–2022.50.1.

Paratype 11 – Coll. Vicián, SL 45.7 mm, SW 14.8 mm (Fig. 92).

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

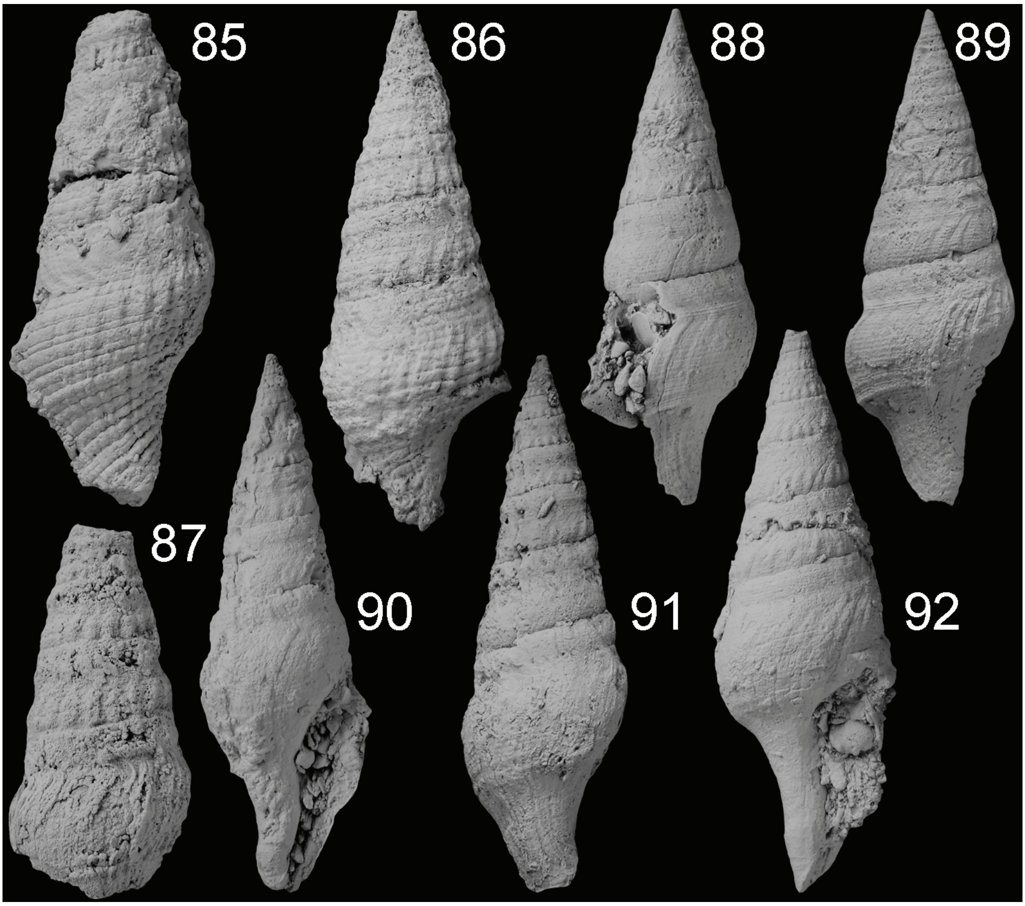
Derivation of name – In honour of István Főzy, Hungarian palaeontologist (HNHM).

Material – 217 specimens. Holotype, paratypes 1–11, and 205 specimens in private collections of the authors. Max. SL 51 mm.

Diagnosis – *Clavatula* species with fusiform shell, teleoconch of eight whorls, ovate aperture, smooth columella, moderately long siphonal canal, anal sinus moderately wide and deep, asymmetrically U-shaped, tripartite spire whorls, shell covered by fine spiral threads.

Description – Medium-sized, fusiform shell, apical angle 25–28°, protoconch missing in all specimens. Teleoconch of eight whorls, suture shallow, undulating. Tripartite spire whorls with slightly swollen subsutural collar, moderately swollen suprasutural row of tubercles, subsutural ramp slightly concave. Entire surface covered by fine, dense spiral threads. Last whorl 59–61% of total length, bearing two strong peribasal spiral cords. Shoulder rounded, last whorl convex below, moderately constricted at base. Aperture ovate, outer lip not thickened, columella smooth, siphonal canal moderately long, sculptured by spiral cords, siphonal fasciole weakly swollen, slightly twisted. Moderately wide and deep, asymmetrically U-shaped anal sinus with apex mid-ramp.

Remarks – *Clavatula* s. l. *istvani* n. sp. is characterised by its moderately deep, U-shaped anal sinus, moderately constricted last whorl and lack of spiny sculpture. The new species is assigned to the *Clavatula* sensu lato group (see



Figs 85–87. *Clavatula* s. l. *barnabasi* n. sp. – **Fig. 85.** Paratype 2, SL 40.6 (1.5×), abapertural view. – **Fig. 86.** Holotype, SL 43.2 (1.5×), abapertural view. – **Fig. 87.** Paratype 1, SL 30.8 (1.5×), abapertural view. – **Figs 88–92.** *Clavatula* s. l. *istvani* n. sp. – **Figs 88–89.** Paratype 2, SL 40.5 (1.5×), lateral and abapertural views. – **Figs 90–91.** Holotype, SL 44 (1.5×), apertural and abapertural views. – **Fig. 92.** Paratype 11, SL 45.7 (1.5×), apertural view

Harzhauser *et al.* 2022). The most closely allied species in morphology is *Clavatula* s. l. *mariae* (Hoernes et Auinger, 1891) but it differs by broader shell, slightly shorter siphonal canal and sculpture with more widely spaced spiral grooves. *Clavatula barnabasi* n. sp. differs by shallower anal sinus, much stronger growth lines and broader spiral cords. *Clavatula istvani* n. sp. predominates the clavatulid material, it is one of the most abundant taxa in the gastropod assemblage with 17.9%.

The *Clavatula* s.l. *istvani* n. sp. material was misinterpreted as *C. semimarginata* by Főzy & Leél-Őssy (1985*a*, *b*). *Tomellana semimarginata* (Lamarck) differs by its broader shell, higher base and longer siphonal canal. The Ilona Valley *Clavatula* material of Főzy & Leél-Őssy was synonymized under *Tomellana praecursor* (Schaffer, 1912) by Harzhauser *et al.* (2022), however, the specimens in question are distinguishable by their more slender shell, higher spire and sculpture of fine, dense spiral threads.

Family Turridae H. Adams et A. Adams, 1853

Remarks – Two poorly preserved *Gemmula* sp. indet. specimens are assigned to the family. In the Ottnangian *Gemmula coronata* (Münster in Goldfuss, 1841) was described by Steininger (1973) and Harzhauser *et al.* (2014). The genus is a new record in the Ilona Valley assemblage.

Family Fusiturridae Abdelkrim, Aznar-Cormano, Fedosov, Kantor, Lozouet, Phuong, Zaharias et Puillandre, 2018

Remarks – The *Fusiturris reevei* (Bellardi, 1847) record (*Clavatula reevei* Bellardi, 1904 [*sic*] in Főzy & Leél-Őssy 1985*a*, *b*) is a misidentification as it is visible in Főzy & Leél-Őssy (1982, pl. 6, fig. 7). Due to the poor quality of the photo, this specimen is recorded herein as Gastropoda sp. indet. The *Clavatula intermedia miopercostata* Sacco, 1904 [*sic*] record of the authors may refer to fusiform specimens with angulate whorls bearing strong axial ribs (see Sacco 1904, pl. 11, figs 49–50) or nodose keel like "*Pleurotoma*" *auingeri* Hoernes, 1875 or *Fusiturris inermis* (Hörnes, 1854). The last two species are known from Ottnangian deposits. Four fragmentary specimens in the new material are similar in morphology to these species but due to the poor preservation they are also considered as Gastropoda sp. indet.

Family Marginellidae Fleming, 1828

Remarks – The marginellid and the cystiscid material consists of poorly preserved specimens, apertures are filled with hard matrix, so columellar folds cannot be analysed in details. Two *Dentimargo* specimens appear in the material with different morphology: *Dentimargo* sp. A (Fig. 93) and *Dentimargo barnai* n. sp. (Figs 94–96). A *Volvarina* sp. indet. specimen is illustrated on Figs 97–98.

Genus *Dentimargo* Cossmann, 1899

Dentimargo barnai n. sp.
(Figs 94–96)

Zoobank.org:act:E5F70648-8029-4983-B046-E1BDD0F681E5

Holotype – PAL 2022.51.1., SL 16.6 mm, SW 9.3 mm.

Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Barna Páll-Gergely, Hungarian malacologist (Plant Protection Institute of the Centre for Agricultural Research).

Material – Holotype.

Diagnosis – *Dentimargo* species with broad shell, low, biconical spire, slightly rounded last whorl, outer lip with external varix.

Description – Biconical, broad shell, low, conical spire (apical angle 60°), abraded protoconch, suture indistinct. Last whorl ~77% of total length, slightly rounded, aperture moderately compressed, outer lip with external varix. Due to poor preservation columellar folds cannot be traced.

Remarks – Although the type specimen is poorly preserved, based on diagnostic features it is assigned to genus *Dentimargo*. The new species is characterized by its notably stout shell, we are not aware of similar form in the Miocene.

Family Cystiscidae Stimpson, 1865

Remarks – The family is represented by genus *Gibberula*. Despite the poor preservation, at least two different forms are separated: *Gibberula* aff. *subovulata* (d'Orbigny, 1852), and *Gibberula* sp. A. The latter group is characterized by ovoid shell and moderately elevated spire (Figs 99–100).

Subclass Heterobranchia Gray, 1840
Superfamily Architectonicoidea Gray, 1850
Family Architectonicidae Gray, 1850

Remarks – A *Solarium* sp. was illustrated by Főzy & Leél-Őssy (1985*a*, pl. 3, figs 1–2), the specimen is closely allied in morphology to *Psilaxys*? *semi-*

typica (Sacco, 1892) from the 'Elveziano' of N Italy. The species was recorded in the Ottnangian from the North Alpine Foreland Basin (Hölzl 1973) and the Badenian Central Paratethys (Schultz 1988). The originally figured specimen is lost, and other *Psilaxys* material does not appear in the new material.

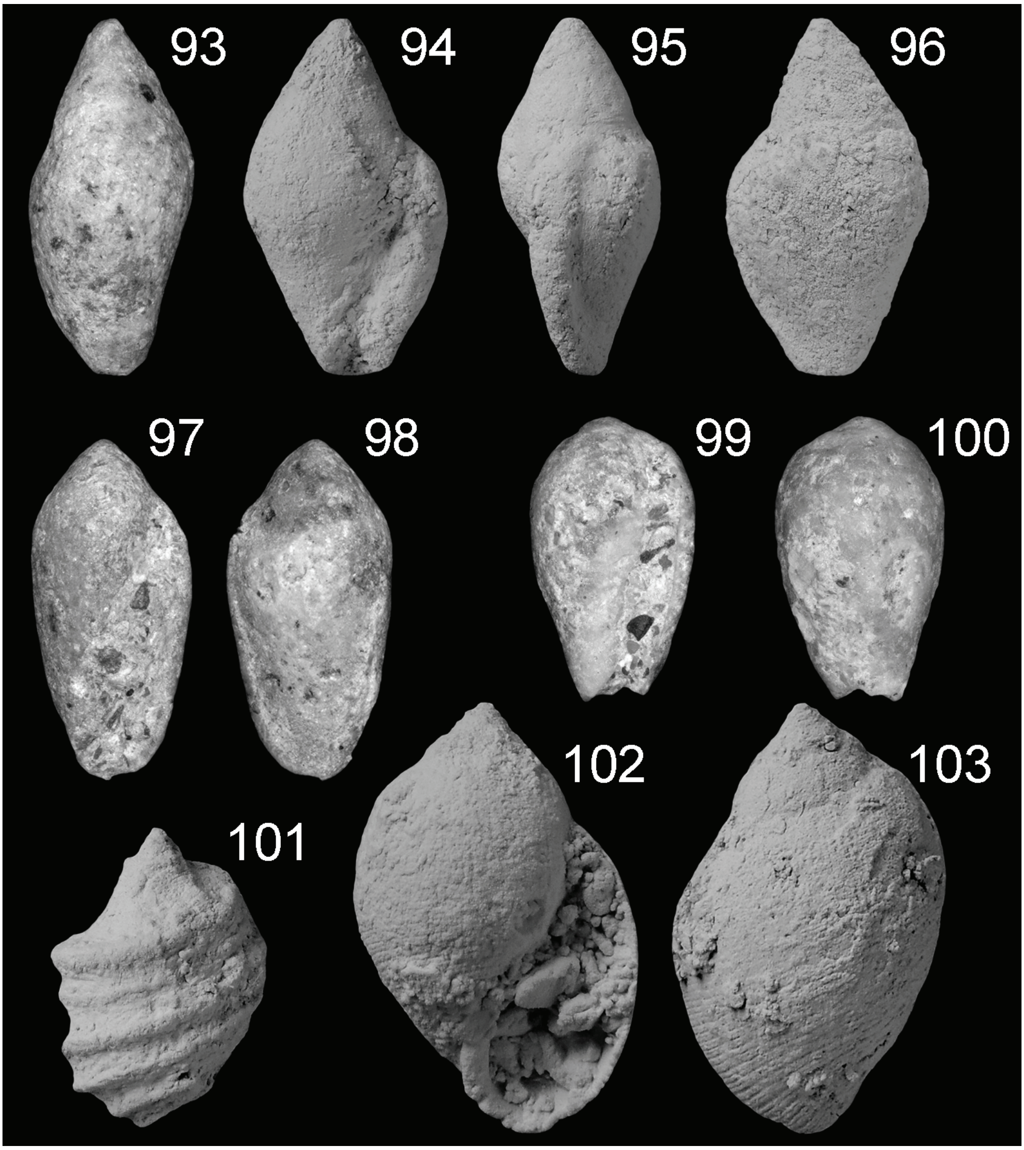


Fig. 93. *Dentimargo* sp. A, SL 12.2 (3.6×), abapertural view. – **Figs 94–96.** *Dentimargo barnai* n. sp., holotype, SL 16.6 (2.7×), apertural, lateral, and abapertural views. – **Figs 97–98.** *Volvarina* sp., SL 12 (3.5×), apertural and abapertural views. – **Figs 99–100.** *Gibberula* sp. A, SL 6.9 (5×), apertural and abapertural views. – **Fig. 101.** *Carinorbis clathrata* (Philippi, 1844), SL 12.5 (3×), abapertural view. – **Figs 102–103.** *Acteon* sp., SL 17.5 (3×), apertural and abapertural views

Genus *Solatisonax* Iredale, 1931

Solatisonax pozsgayae n. sp.
(Figs 104–106)

Zoobank.org:act:F3193D30-56BE-4B4D-8A2A-893AE56AC41D

Holotype – PAL 2022.52.1., SH 7.2 mm, SW 15.1 mm.

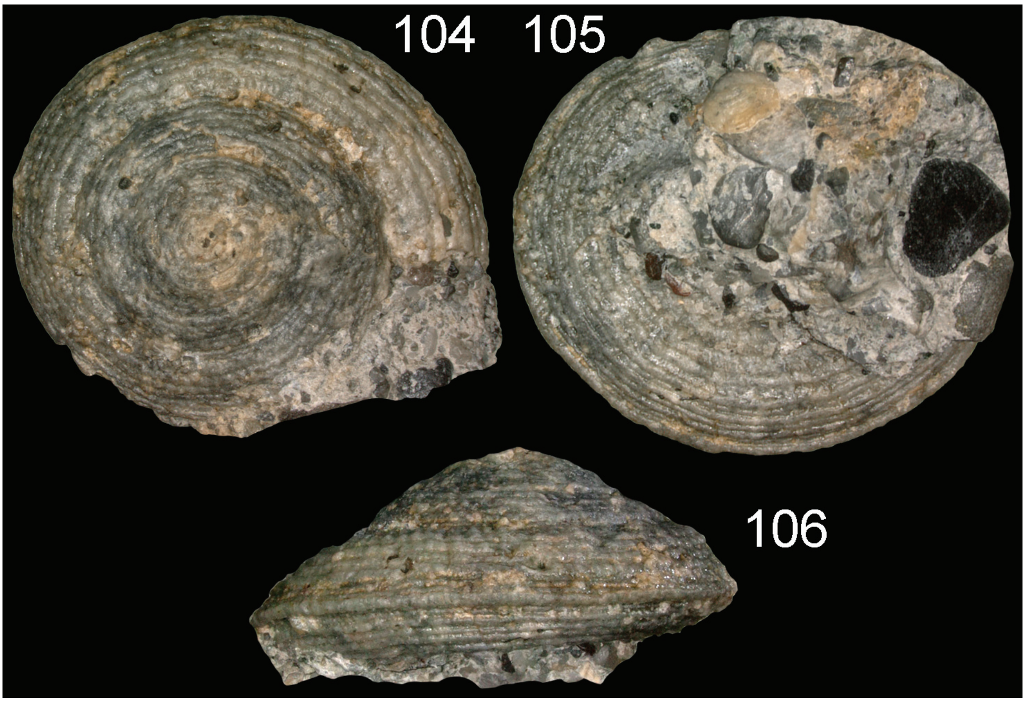
Type strata and locality – Lower Ottnangian (early Miocene) sandstone (Ilonavölgy Mb. of the Pétervására Fm.), Parádfürdő, Ilona Valley, Hungary.

Derivation of name – In honour of Réka Szakonyi–Pozsgay, wife of József Szakonyi fossil shell collector (Szombathely, Hungary).

Material – Holotype.

Diagnosis – *Solatisonax* species with lens-shaped shell, paucispiral protoconch, teleoconch of about 4 whorls, slightly rounded spire whorls, last whorl with prominent peripheral keel, spiral sculpture of close-set, beaded cords and fine threads, narrow grooves between upper, lower and infra peripheral cords.

Description – Lens-shaped shell, eroded paucispiral protoconch, teleoconch of approximetly 4 whorls (early teleoconch whorls eroded). Moderately



Figs 104–106. *Solatisonax pozsgayae* n. sp., Holotype, SW 15.1 (4×), apical, basal, and lateral views

depressed spire with somewhat rounded whorls, suture slightly incised. Last whorl 38% of total height, carinate with prominent peripheral keel, base slightly rounded. Neither the aperture nor the umbilicus can be searched due to matrix filling. Sculpture of close-set, beaded spiral cords. On last whorl: subsutural cord, 3 slightly less developed midcords, upper – lower – infra peripheral cords, 3 basal cords, basal keel, 3 proxumbilical cords. The prominent lower peripheral cord separated from the upper peripheral cord by a shallow groove bearing two secondary cords, and below from infra peripheral cord by a deep groove bearing fine threads.

Remarks – Based on shell morphology (see Bieler 1993: 156–157), the new species is assigned to genus *Solatisonax*. This genus is a new record in the Miocene Paratethys. The type specimen of *Solatisonax pozsgayae* n. sp. resembles the Recent *S. propinqua* Bieler, 1993 in morphology (see Bieler 1993, fig. 147) but differs by its larger size, and more rounded whorls. From the early Miocene numerous species are known with somewhat similar shell (see Sacco 1892; Cossmann & Peyrot 1919), but there are only a few to compare. The specimen illustrated by Janssen (1984, pl. 47, fig. 5) under the name *Architectonica briarti* (Koenen, 1882) has a strongly carinate shell but differs from *Solatisonax pozsgayae* n. sp. by its finer cords. The Aquitanian *Nipteraxis* cf. *misera* (Dujardin, 1837) specimen in Lozouet *et al.* (2001, pl. 36, fig. 2) has a slightly lower shell bearing more adapically placed and stronger lower peripheral cord. The Miocene *Solatisonax bieleri* Nielsen et Frassinetti, 2007 from Chile is similar in size but distinguishable by different development of the basal cords (Nielsen & Frassinetti 2007, figs L–M).

Superfamily Pyramidelloidea Gray, 1840
Family Pyramidellidae Gray, 1840

Remarks – The family is poorly represented by one *Turbonilla* sp. indet. specimen. The genus is a new record in the Ilona Valley assemblage.

Family Amathinidae Ponder, 1987

Remarks – One *Carinorbis clathrata* (Philippi, 1844) specimen occurs in the assemblage, it is a new record in the North Hungarian Basin (Fig. 101). The Miocene–Recent species was discussed by Landau *et al.* (2013). *Carinorbis clathrata* was frequently recorded from the Karpatian–Badenian Central Paratethys under the name *Phasianema/Fossarus costata* (Brocchi) in earlier literature (Strausz 1966; Harzhauser 2002). The species is also known in the 'Elveziano' of N Italy.

Superfamily Acteonoidea d'Orbigny, 1842
Family Acteonidae d'Orbigny, 1842

Remarks – Genus *Acteon* is a new record in the Ilona Valley assemblage. Two *Acteon* species were illustrated by Hölzl (1958) from the Bavarian Burdigalian: *A. subglobosa* d'Orbigny, 1852 (pl. 22, fig. 12) and *A. inflatus* (Borson, 1821) (pl. 22, fig. 13) – the latter taxon was also recorded in the Ottnangian by Steininger (1973). Both species differ from the specimen figured herein (Figs 102–103) by their more elongated shell. The *Acteon semistriatus burdigalensis* d'Orbigny, 1852 specimen illustrated by Steininger (1973, pl. 9, fig. 7) from Várpalota is also a more slender form, and is Badenian in age.

Superfamily Ringiculoidea Philippi, 1853
Family Ringiculidae Philippi, 1853

Remarks – 12 small ringiculid specimens appear in the material with striate spire whorls, the material represents *Ringicula minor* (Grateloup, 1838). The species was widespread during the early–middle Miocene in the NE Atlantic, the Proto-Mediterranean Sea and the Central Paratethys (Landau *et al.* 2013).

Superfamily Cylichnoidea H. Adams et A. Adams, 1854
Family Cylichnidae H. Adams et A. Adams, 1854

Remarks – The family is represented by three *Cylichna* sp. indet. specimens. The genus is a new record in the Ilona Valley assemblage.

Table 1. Gastropod taxa with specimen number in the studied mollusc assemblage of the Ilona Valley Section, Bed 8; and the early–middle Miocene species records in the Paratethyan literature (E – Eggenburgian, O – Ottnangian, K – Karpatian, B – Badenian). Taxa* recorded from the locality only by Főzy & Leél-Őssy (1982, 1985*a*, *b*).

	Taxa	Number	Illustration	E	O	K	B
	Patellidae						
1	*Patella*? sp.	1	Figs 3–4				
	Nacellidae						
2	*Cellana danningeri* Harzhauser et Landau, 2014	4	Figs 5–6		+		
	Fissurellidae						
3	*Diodora* sp.	2	Fig. 7				
4	*Scutus bellardii* (Michelotti, 1847)	1	Fig. 8				+
	Throchidae						
5	*Clanculus* s.l. *gulyasi* n. sp.	1	Figs 9–11				
6	*Gibbula kralli* n. sp.	14	Figs 12–16				
7	*Paroxystele orientalis* (Cossmann et Peyrot, 1917)	12	Figs 17–18	+	+	+	+

Table 1. (continued)

	Taxa	Number	Illustration	**E**	**O**	**K**	**B**
	Calliostomatidae						
8	*Calliostoma scutiformis* (Sacco, 1896)	8	Figs 19–20				
9	*Calliostoma nandori* n. sp.	7	Figs 21–23				
	Turbinidae						
10	*Ormastralium erazmusi* n. sp.	62	Figs 24–29				
	Cerithiidae						
11	*Thericium* sp.	1	Fig. 30				
	Turritellidae						
12	*Turritella* cf. *inaequicingulata* Hölzl, 1958	1	Fig. 31	+			
13	*Peyrotia desmarestina* (Basterot, 1825)	11	Figs 32–33	+			
14	*Allmonia paucicincta* (Sacco, 1895)	7	Fig. 34	+	+	+	+
15	*Helminthia doublierii* (Matheron, 1842)	15	Fig. 35	+	+		
–	Turritellidae sp. indet.	9					
	Calyptraeidae						
16	*Calyptraea* sp.	9					
	Hipponicidae						
17	*Hipponix interruptus* Michelotti, 1847	2	Fig. 36				+
	Naticidae						
18	*Cochlis* sp.	320	Figs 37–38				
	Triviidae						
19	*Niveria* cf. *dertonensis* (Michelotti, 1847)	1					+
20	*Niveria* cf. *pseudoasulcata* (Sacco, 1894)	1					+
21	*Trivia* sp.	3					
	Eratoidae						
22	*Erato hemmoorensis* F. A. Schilder, 1929	3		+	+		+
23	*Erato italica* F. A. Schilder, 1932	4					+
24	*Erato* cf. *planulosa* Sacco, 1894	2		+			+
25	*Erato* cf. *praecedens* F. A. Schilder, 1933	3					+
26	*Erato* sp. A	3					
27	*Erato* sp. B	3					
	Eocypraeidae						
28	*Apiocypraea* cf. *tauroperlonga* (Sacco, 1894)	2	Figs 39–40				
	Cypraeidae						
29	*Schilderia* cf. *nikolsburgensis* F. A. Schilder, 1927	1					+
–	*Schilderia* sp.	3					
30	*Prozonarina* cf. *tauroporcellus* (Sacco, 1894)	1					+
31	*Zonarina* cf. *elongatula* (Sacco, 1894)*	1					+
32	*Zonarina* cf. *extusdentata* (Sacco, 1894)	1					+
33	*Zonarina* cf. *extuspirata* (Sacco, 1894)	2					+
34	*Zonarina* sp. A	1	Figs 41–42				
–	*Zonarina* sp.	3					
35	*Zonarina* n. sp.	1					
36	*Miolyncina* cf. *conjungens* (Sacco, 1894)	1					+

Table 1. (continued)

	Taxa	Number	Illustration	E	O	K	B
	Cassidae						
37	*Cypraecassis cypraeiformis* (Borson, 1820)	1	Fig. 43				+
38	*Sconsia landaui* n. sp.	8	Figs 44–49				
	Cymatiidae						
39	*Monoplex* s. l. *subcorrugatus* (d'Orbigny, 1852)	2	Figs 50–51				
40	*Pseudosassia turrita* (Eichwald, 1830)	3	Figs 52–53		+		+
	Bursidae						
41	*Aquitanobursa* cf. *grateloupi* (d'Orbigny, 1852)	1	Figs 54–55				
42	*Aspa marginata* (Gmelin, 1791)	3	Figs 56–57		+	+	+
	Ficidae						
43	*Ficus condita* (Brongniart, 1823)	56	Főzy & Leél-Őssy 1985a, pl. 3/4	+	+	+	+
	Epitoniidae						
44	*Cirsotrema kokayi* n. sp.	1	Figs 58–59				
45	*Scalina subreticulata* (d'Orbigny, 1852)	4	Fig. 60		+	+	+
	Muricidae						
46	*Chicoreus* (*Triplex*) *aquitanicus* (Grateloup, 1833)	1	Figs 61–62		+		+
47	*Ocinebrina* cf. *kojumdgievae* (Bałuk, 1995)	4	Figs 63–64				+
48	*Ocinebrina deaki* n. sp.	5	Figs 65–67				
49	*Ocinebrina* sp. A	1					
	Nassariidae						
50	*Nassarius* sp. A	22	Fig. 68		+	+	+
51	*Nassarius* sp. B	1	Fig. 69				
–	*Nassarius* sp.	88					
52	*Cyllenina*? sp.	2					
	Columbellidae						
53	*Mitrella* sp.	2					
	Tudiclidae						
54	*Tudicla rusticula* (Basterot, 1825)	14		+	+	+	+
55	*Euthria*? sp.	2					
56	*Euthriofusus burdigalensis* (Basterot, 1825)	11		+	+	+	+
	Fasciolariidae						
57	*Polygona* sp.	1	Fig. 72				
58	*Angustifusus* aff. *hoessi* (Hoernes et Auinger, 1890)	10			+	+	+
59	Fasciolariidae sp. A	2	Fig. 70				
60	Fasciolariidae sp. B	1	Fig. 71				
	Eosiphonidae						
61	*Calagrassor mathiasi* n. sp.	4	Figs 73–76				
	Buccinoidea unassigned						
62	*Aquilofusus*? sp.	11	Fig. 77				
63	Buccinoidea sp.	7	Figs 78–79				
	Harpidae						
64	*Oniscidia cythara* (Brocchi, 1814)*		Főzy & Leél-Őssy 1982, pl. 8/1–2				+

Table 1. (continued)

	Taxa	Number	Illustration	**E**	**O**	**K**	**B**
	Ancillariidae						
65	*Ancillarina subcanalifera* (d'Orbigny, 1852)	1					+
	Olividae						
66	*Amalda glandiformis* (Lamarck, 1810)	9	Fig. 80	+	+	+	+
	Borsoniidae						
67	*Pseudotoma praecedens* Bellardi, 1877	2	Fig. 81		?		+
	Conorbidae						
68	*Artemidiconus* cf. *granularis* (Borson, 1820)	1					+
	Conidae						
69	*Conilithes allioni* (Michelotti, 1847)	114	Figs 82–83		?	+	+
70	*Conilithes* cf. *brezinae* (Hoernes et Auinger, 1879)	13	Fig. 84		?		+
	Clavatulidae						
71	*Clavatula* s. l. *barnabasi* n. sp.	7	Figs 85–87				
72	*Clavatula* s. l. *istvani* n. sp.	217	Figs 88–92				
73	*Perrona* sp.	2					
	Turridae						
74	*Gemmula* sp.	2					
	Pseudomelatomidae						
75	*Crassispira* sp.	1					
	Marginellidae						
76	*Dentimargo* sp. A	3	Fig. 93				
77	*Dentimargo barnai* n. sp.	1	Figs 94–96				
78	*Dentimargo* sp. B	1					
79	*Volvarina* sp.	8	Figs 97–98				
	Cystiscidae						
80	*Gibberula* sp. A	2	Figs 99–100				
81	*Gibberula* aff. *subovulata* (d'Orbigny, 1852)	4					
–	*Gibberula* sp.	11					
	Architectonicidae						
82	*Psilaxys*? cf. *semitypica* (Sacco, 1892)*		Főzy & Leél-Őssy 1985a, pl. 3/1–2		+		+
83	*Solatisonax pozsgayae* n. sp.	1	Figs 104–106				
	Pyramidellidae						
84	*Turbonilla* sp.	1					
	Amathinidae						
85	*Carinorbis clathrata* (Philippi, 1844)	1	Fig. 101			+	+
	Acteonidae						
86	*Acteon* sp.	1	Figs 102–103				
	Ringiculidae						
87	*Ringicula minor* (Grateloup, 1838)	12		+	+	+	+
	Cylichnidae						
88	*Cylichna* sp.	3					

CONCLUSION

Bed 8 of the Ilona Valley Section yielded a more diversified early Miocene mollusc assemblage than it was recognized in earlier literature: 88 gastropod species are recorded from the locality [86 species in this study, *Oniscidia cythara* in Főzy & Leél-Őssy 1982 and '*Solarium*' sp. in Főzy & Leél-Őssy 1985*a*). Extended stratigraphic and palaeogeographic range of numerous taxa are verified, and 12 new species are introduced. Both the literature data and the relatively high number of undetermined specimens indicate that the factual diversity must be somewhat higher; the question may be answered by further research.

The age of the fauna is confirmed by Sr isotope stratigraphy (Less 2020*a*, *b*). The co-existent gastropod index taxa correspond to the geochemical data. Two species are considered Eggenburgian markers in the Paratethyan literature; others are characterized by longer stratigraphic range, or representatives of younger stages (Ottnangian, Karpatian, Badenian). Consequently, the Ottnangian age is recognized based on the last occurrence of the Eggenburgian *Turritella* cf. *inaequicingulata*, and *Peyrotia desmarestina*, the appearance of the Ottnangian *Cellana danningeri*, and the presence of the Eggenburgian–Ottnangian *Helminthia doublierii*, and several Ottnangian–Badenian taxa (e.g., *Aspa marginata*, *Scalina subreticulata*) (Table I). The fauna derived from fully marine shallow water environments that were typical of the early period of the Ottnangian Central Paratethys.

The species-level alpha diversity of the studied material is twice as high as that of the Ottnangian localities in Austria: about 40 gastropod species were recorded from Ottnang (Hoernes 1875; Rögl 1973), and 32 species from Allerding (Harzhauser *et al.* 2014). The most highly diverse Ottnangian marine mollusc fauna was reported by Hölzl (1973) in the Kaltenbachgraben assemblages (Bavaria). In that region more than 170 gastropod species were recorded (subspecies omitted herein) from which 67 were described and/or illustrated by Steininger (1973). However, the specimens in question are poorly preserved and have not been properly illustrated. As this material is in need of revision, it cannot be efficiently compared with the fauna of the Ilona Valley.

The North Hungarian Basin data presented in this study complete significantly the picture of the early Ottnangian marine life of the Paratethys that has been based so far mainly on North Alpine Foreland Basin records.

*

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