

Dedicated to the Memory of Helmut Krock (1942–2018)

**Muricidae (Neogastropoda) assemblages from the
Middle Miocene of the Făget Basin (Romania) in the collection of the
Hungarian Natural History Museum, Budapest**

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Abstract – Early Badenian (Middle Miocene) Muricidae material that was collected at three SW Romanian sites (Coșteiu de Sus, Lăpugiu de Sus, Nemeșești), and stored in the collection of the Hungarian Natural History Museum, Budapest, is revisited. Fifty-one species are recorded and thirty three illustrated. A new species, *Ocinebrina landaui* n. sp. is designated. With 78 figures.

Key words – Badenian, Central Paratethys, Coșteiu de Sus, Lăpugiu de Sus, Middle Miocene, Muricidae, Nemeșești, Romania

INTRODUCTION

The aim of this paper is to provide a revision of the Early Badenian Muricidae material that was collected at three localities in the Făget Basin (SW Romania) during the late 19th and early 20th centuries, and is deposited in the collection of the Hungarian Natural History Museum, Budapest. Rich fossil materials are known from the region; however, some fossil groups recorded in earlier publications are in need of taxonomic revision. The present work contributes to the documentation of the actual range and diversity of the family Muricidae in the Middle Miocene Central Paratethys.

Coșteiu de Sus (*Kosteĵ in Hungarian*), Lăpugiu de Sus (*Felső-Lapugy*), and Nemeșești (*Nemesestĵ*) are well-known Middle Miocene fossiliferous sites (Fig. 1). All three are located in the small Neogene Făget Basin that represents an eastwards extension of the Pannonian Basin. The localities are characterized by tuffites, clays, and silts of the Lower Badenian Dej Formation; the Early Badenian mollusc fauna is typical of the Central Paratethys. Neogene deposits of the region have been known since the mid-19th century, and numerous papers have dealt with the rich fauna and especially with the mollusc assemblages. Muricids from

Coșteiu and Lăpușiu were first illustrated by HOERNES & AUINGER (1882, 1885); later a rich assemblage from Coșteiu was studied by BOETTGER (1902–1906). The history of the mollusc research of the region was summarized by KOVÁCS & BALÁZS (2016) with additional references; and two new muricid species were recently described by KOVÁCS (2018) from the collection of the HNHM.

MATERIAL AND METHODS

All specimens illustrated in this paper are stored in the palaeontological collection of the Hungarian Natural History Museum, Budapest. The taxonomy and morphological terminology follow MERLE *et al.* (2011) and LANDAU *et al.* (2007, 2013). Beside these monographs comprehensive works of BALUK (1995, 2006), HARZHAUSER (2002), and KOVÁCS *et al.* (2018) were used for the revision of Paratethyan muricid taxa. As most species recorded herein are thoroughly discussed in the literature, short synonymies are cited (types and a few relevant papers), and only taxa of special interest are described in detail.

Abbreviations used in the text: SL = shell length in mm; P = primary cord; ADP = adapical primary cord; MP = median primary cord; ABP = abapical primary cord; D = denticle.

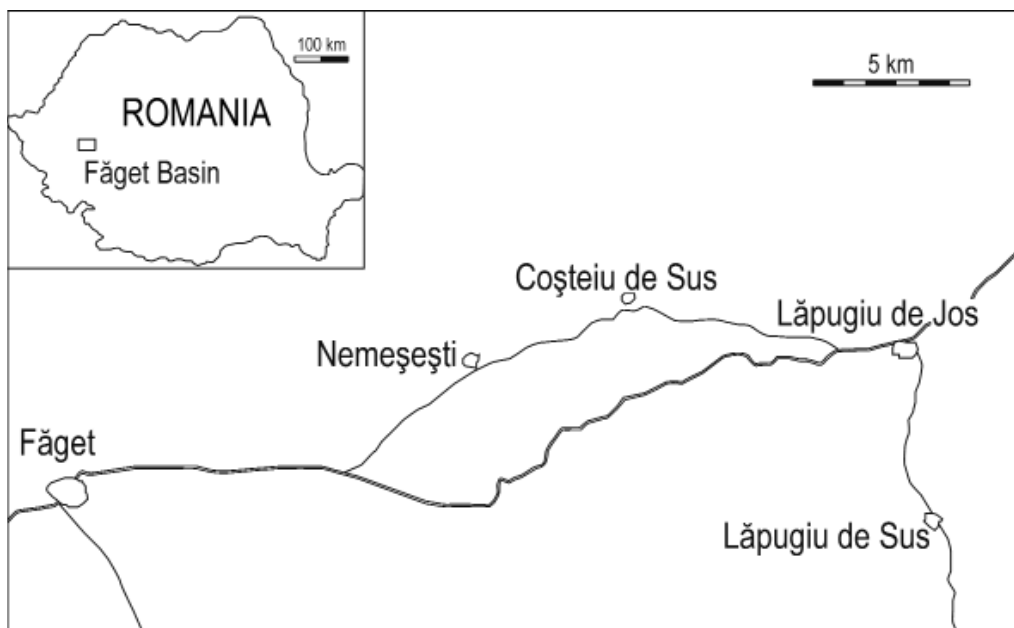


Fig. 1. The Făget Basin in Romania

SYSTEMATIC PALAEOLOGY

Clade Neogastropoda Wenz, 1938
Superfamily Muricoidea Rafinesque, 1815
Family Muricidae Rafinesque, 1815
Subfamily Muricinae Rafinesque, 1815
Genus *Murex* Linnaeus, 1758
Subgenus *Promurex* Ponder et Vokes, 1988
Murex (Promurex) spinicosta Bronn, 1831

1831 *Murex spinicosta* – BRONN, p. 34.

2013 *Murex (Promurex) spinicosta* Bronn in Michelotti – GORET *et al.*, p. 4, text-fig. 6, pl. 1, fig. 1
(*cum syn.*).

Material – 13 specimens; Lăpugiu: M.59.1853, M.59.1952A, M.60.7959, M.60.7962A–D, M.60.7964A–E, M.68.498A.

Remarks – The species is common and widespread in the Early Badenian Central Paratethys.

Genus *Siratus* Jousseume, 1880

Siratus hirmetzli Kovács, 2018
(Figs 2–3)

2018 *Siratus hirmetzli* n. sp. – KOVÁCS, p. 30, fig. 1A–K.

Material – 1 specimen; Lăpugiu: PAL 2017.57.1.

Remarks – The taxon was described from the Lower Badenian Leitha Limestone Formation of Letkés (Hungary). *Murex (Promurex) spinicosta* is distinguishable by lower spire, longer and less recurved siphonal canal, and well-developed P1, P3, P5, and MP spines. *Chicoreus (Triplex)* is characterized by a similar morphology with trivariate sculpture and slightly recurved siphonal canal. The *Triplex* species, however, differ by stronger apertural denticles, smooth columellar lip, deeper anal notch, broader pseudoumbilicus, well-developed parietal callus. Furthermore, all European fossil *Triplex* species have much weaker P1 and stronger ADP spines. *S. hirmetzli* is the first representative of the genus in the European Cenozoic. The occurrence at Lăpugiu shows a wider distribution in the Central Paratethys.

Genus *Bolinus* Pusch, 1837

Bolinus subtorularius (Hoernes et Auinger, 1885)

1885 *Murex (Rhynocantha) subtorularius* – HOERNES & AUINGER, p. 200.

2011 *Bolinus subtorularius* (Hoernes et Auinger) – MERLE *et al.*, pp. 77, 302, pl. 29, figs 2–4.

Material – 2 specimens; Lăpugiu: M.60.7980A, M.60.10196.

Remarks – Two *Bolinus* species, *B. subtorularius* and *B. submuticus* are common in the Early Badenian Central Paratethys.

Bolinus submuticus (Grateloup, 1845)

1845 *Murex rectispina* var. *submutica* – GRATELOUP, pl. 31, fig. 4.

1853 *Murex Partschii* – HÖRNES, p. 258, pl. 26, fig. 5.

2013 *Bolinus submuticus* (Grateloup) – LANDAU *et al.*, p. 144, pl. 21, figs 2–3 (*cum syn.*).

Material – 54 specimens; Coșteiu: M.59.1870B–C, M.59.1874(3), M.60.6954(3), M.60.6957A, M.60.6968(6), M.60.10084, M.60.10097, M.67.563, M.68.4; Lăpugiu: M.59.1849, M.59.1852(4), M.60.7936, M.60.7956(8), M.60.7973(5), M.60.7979(4), M.60.8470A–B, M.60.10566, M.68.498E–G, M.68.499A, M.68.501, M.68.502; Nemeșești: M.60.8109, M.60.8110A, M.60.8124A.

Remarks – According to the taxonomic revision of the species (MERLE *et al.* 2011), *M. partschi* Hörnes – that was frequently recorded in the Central Paratethys – is a synonym of *submuticus*.

Genus *Hexaplex* Perry, 1811

Subgenus *Trunculariopsis* Cossmann, 1921

Hexaplex (Trunculariopsis) austriacus (Tournouër, 1875)

(Fig. 4)

1875 *Murex Austriacus* – TOURNOUËR, p. 158.

2013 *Hexaplex (Trunculariopsis) austriacus* (Tournouër) – LANDAU *et al.*, p. 145, pl. 21, fig. 4 (*cum syn.*).

Material – 6 specimens; Coșteiu: M.60.6944; Lăpugiu: M.60.7976(3), M.60.7977, M.60.7984A.

Remarks – The well-known species is widespread in the Early Badenian Central Paratethys.

Hexaplex (Trunculariopsis) trunculus conglobatus (Michelotti, 1841)

(Figs 5–6)

1841 *Murex conglobatus* – MICHELOTTI, p. 16, pl. 4, fig. 7.

2013 *Hexaplex (Trunculariopsis) trunculus conglobatus* (Michelotti) – GORET *et al.*, p. 7, pl. 1, figs 4–5, pl. 2, fig. 1 (*cum syn.*).

Material – 1 specimen; Lăpugiu: M.59.1951A.

Remarks – A detailed taxonomic analysis of the Recent and fossil *H. (Trunculariopsis) trunculus* (Linnaeus) group was offered by LANDAU *et al.* (2007), and a Late Miocene–Middle Pliocene chronosubspecies, *H. (T.) trunculus conglobatus* (Michelotti) was considered. The subspecies is highly variable in morphology, the specimen figured here with scalate spire and long spines is close to that illustrated by MERLE *et al.* (2011, pl. 40, fig. 4). Nevertheless, the Early Badenian range of the taxon cannot be stated with certainty even now. On the one hand the taxon has never been mentioned in the Middle Miocene at other localities, on the other hand – being a donation – the origin of the specimen is not well-established, the circumstances of the collecting work are unknown. The donator was Rezső Streda (1883–1960; D. Theol., Roman Catholic priest) fossil collector. He donated and sold a great number of Miocene molluscs to the HNHM during the 1950s–60s, and he was regarded as a reliable collector.

Genus *Chicoreus* Montfort, 1810

Subgenus *Triplex* Perry, 1810

Chicoreus (Triplex) aquitanicus (Grateloup, 1833)

1833 *Murex aquitanicus* – GRATELOUP, p. 94.

2013 *Chicoreus (Triplex) aquitanicus* (Grateloup) – LANDAU *et al.*, p. 147, pl. 21, fig. 11 (*cum syn.*).

Material – 5 specimens; Coșteiu: M.60.6953, M.60.10115; Lăpugiu: M.59.1951B, M.60.7984B, M.68.498B.

Remarks – The species is abundant in the Early Badenian Central Paratethys.

Chicoreus (Triplex) borni (Hörnes, 1853)

(Figs 7–8)

1853 *Murex Borni* – HÖRNES, p. 253, pl. 25, fig. 18.

2015 *Chicoreus (Chicoreus) borni* (Hörnes) – POPA *et al.*, p. 14, pl. 4, fig. 4.

Material – 8 specimens; Lăpugiu: M.59.1851 (2), M.60.7963A, M.60.7978B, M.60.7980B, M.60.10126, M.68.496, M.68.497A.

Remarks – The species is typical of the Early Badenian Central Paratethys.

Genus *Timbellus* de Gregorio, 1885

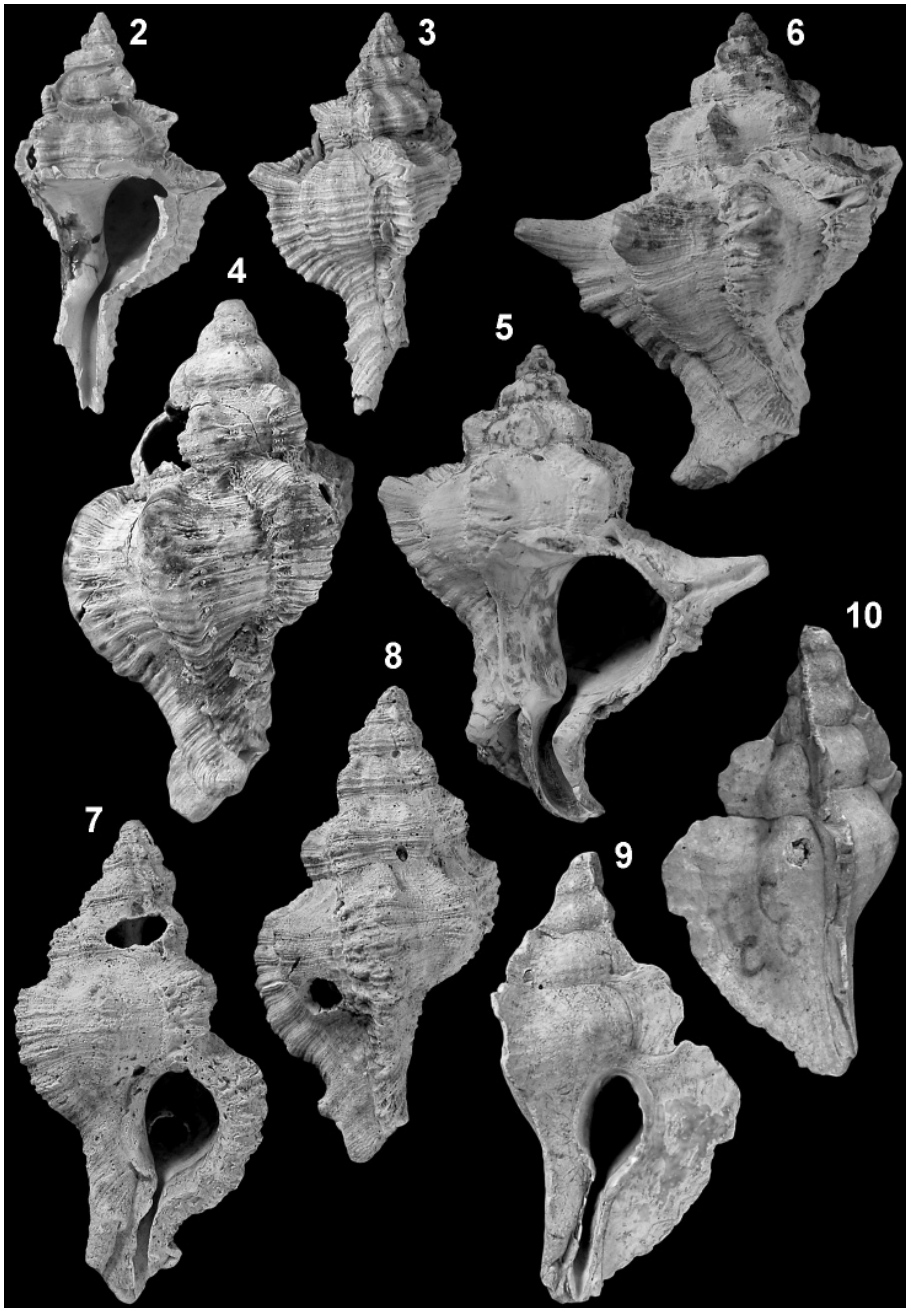
Timbellus swainsoni (Michelotti, 1841)

(Figs 9–10)

1841 *Murex Swainsonii* – MICHELOTTI, p. 9.

2011 *Timbellus swainsoni* (Michelotti) – MERLE *et al.*, p. 458, pl. 107, figs 6–8.

2015 *Pterynotus (Pterynotus) cf. perlongus* – PEKAŘ, p. 69, pl. 12, fig. 3 [non *Timbellus perlongus* (Bellardi, 1873)].



Figs 2–3. *Siratus hirmetzli* Kovács, PAL 2017.57.1., SL 37 (1.5×), apertural and abapertural views. – **Fig. 4.** *Hexaplex (Trunculariopsis) austriacus* (Tournouër), M.60.7984A, SL 48 (1.5×), abapertural view. – **Figs 5–6.** *Hexaplex (Trunculariopsis) trunculus conglobatus* (Michelotti), M.59.1951A, SL 44 (1.5×), apertural and abapertural views. – **Figs 7–8.** *Chicoreus (Triplex) borni* (Hörnes), M.60.7978B, SL 44 (1.5×), apertural and abapertural views. – **Figs 9–10.** *Timbellus swainsoni* (Michelotti), M.60.7966, SL 35 (1.8×), apertural and abapertural views

Material – 1 specimen; Lăpugiu: M.60.7966.

Remarks – The species was recorded in the Middle Miocene to Early Pliocene of Europe. In the Badenian Central Paratethys it occurs in Austria, Bulgaria, Czech Republic, Hungary, and Romania. *T. swainsoni* differs from *T. perlongus* in smaller size, and in morphology by rounded spire whorls, weakly denticulate aperture, thinner, wing-like varices, and finer spiral cords.

Timbellus perlongus (Bellardi, 1873)
(Figs 11–12)

1873 *Murex perlongus* – BELLARDI, p. 105, pl. 5, fig. 8.

2011 *Timbellus perlongus* (Bellardi) – MERLE *et al.*, p. 454, pl. 105, figs 1–6.

Material – 1 specimen; Lăpugiu: M.60.7985A.

Remarks – *T. perlongus* is typical of the Early Miocene in Italy and France. In the Badenian Central Paratethys it was known in Romania (Lăpugiu de Sus) and Poland (Korytnica Basin) (BAŁUK 1995), but new collecting works prove its occurrence in Hungary at Letkés (Pannonian Basin).

Genus *Pterynotus* Swainson, 1833

Pterynotus (Pterynotus) pseuderinaceus (Boettger, 1902)
(Figs 13–14)

1902 *Murex (Pteronotus) pseuderinaceus* – BOETTGER, p. 28.

1934 *Murex (Pterynotus) pseuderinaceus* – ZILCH, p. 251, pl. 15, fig. 76.

Material – 1 specimen; Coșteiu: M.60.6959.

Remarks – The specimen figured here is close in morphology to the type. It is characterized by small, worn shell (SL 6), eroded protoconch, four shouldered teleoconch whorls (last whorl 63% of the total length), wide, ovate aperture, smooth lips within, and wide, open siphonal canal. Spiral sculpture of strong primary cords (P1–P2 on the spire whorls, P1–P6 on the last whorl), axial sculpture of four varices on the spire whorls and three varices on the last whorl. New collecting works prove the occurrence of the species in the Lower Badenian deposits of Mecsekpölöske (Mecsek Mts, SW Hungary). The studied specimens are of similar size and identical morphology; the records confirm the validity of the taxon.

Genus *Purpurellus* Jousseau, 1880

Purpurellus cyclopterus (Millet, 1865)
(Figs 15–16)

1865 *Murex cyclopterus* – MILLET, p. 592.

2017 *Purpurellus cyclopterus* (Millet) – VICIÁN *et al.*, p. 268, pl. 2, figs 3–4.

Material – 3 specimens; Coșteiu: M.60.6967A–C.

Remarks – *P. cyclopterus* has long stratigraphical and wide palaeogeographical ranges, but it is very rare in the Middle Miocene gastropod assemblages of the Paratethys.

Genus *Poirieria* Jousseau, 1880

Subgenus *Pagodula* Monterosato, 1884

Poirieria (Pagodula) varicosissima (Michelotti, 1841)

(Figs 17–18)

1841 *Murex varicosissimus* Bonelli m.s. – MICHELOTTI, p. 9, pl. 5, figs 13–14.

1935 *Streptochetus (Pagodula) varicosissimus* (Bonelli) – MONTANARO, p. 59, pl. 4, figs 8–9.

? 1966 *Trophon varicosissimus* Bonelli – STRAUZ, p. 269, pl. 32, figs 5–6 (*cum syn.*).

1969 *Trophon varicosissimus spiniferus* n. sp. – CSEPREGHY-MEZNERICS, p. 81, pl. 4, figs 2–4.

1971–1972 *Trophon varicosissimus* Bonelli – CSEPREGHY-MEZNERICS, p. 27, pl. 9, figs 18, 25.

non 2011 *Trophon varicosissimus* Bonelli – CAPROTTI, p. 65, fig. 6Q–R (= ? *Turricula* sp.).

Material – 8 specimens; Coșteiu: M.59.1873A–B, M.59.2028, M.60.6928 B–C, M.60.6929, M.60.6992; Lăpugiu: M.59.1997.

Remarks – Two *Pagodula* species are known in the Middle Miocene Paratethys, *P. vaginata* (De Cristofori et Jan) and *P. varicosissima* (Michelotti). *P. varicosissima* differs from the former by paucispiral protoconch and less developed spines. The type of *Trophon varicosissimus spiniferus* (CSEPREGHY-MEZNERICS 1969, pl. 4, fig. 3) fits within the variability of *P. varicosissima*.

Genus *Paziella* Jousseau, 1880

Subgenus *Flexopteron* Shuto, 1969

Paziella (Flexopteron) goniostoma (Hörnes, 1853)

(Figs 19–20)

1853 *Murex goniostomus* Partsch – HÖRNES, p. 227, pl. 23, fig. 11.

2011 *Paziella (Flexopteron) goniostoma* Partsch in Hörnes – MERLE *et al.*, pl. 139, figs 1–2.

Material – 14 specimens; Coșteiu: M.60.6932 (5), M.60.6935, M.60.10351 (2); Lăpugiu: M.59.1949A, M.60.7955B–C, M.60.7982 (2), M.60.10321.

Remarks – Two *Flexopteron* species are known in the Middle Miocene Central Paratethys, *P. (F.) citima* (Bellardi) and *P. (F.) goniostoma*. The latter is characterized by slender shell, multispiral protoconch, narrow aperture, longer siphonal canal, and less developed spiral cords.

Genus *Aspella* Mörch, 1877*Aspella emmae* (Boettger, 1902)

(Figs 21–23, 24–25)

1902 *Ranella* (*Argobuccinum*) *emmae* – BOETTGER, p. 26.1934 *Argobuccinum emmae* (Boettger) – ZILCH, p. 250, pl. 14, fig. 72 [non fig. 73: ? *Aspella subanceps* (d'Orbigny, 1852)].1969 *Argobuccinum emmae* (Boettger) – CSEPREGHY-MEZNERICS, p. 79, pl. 3, figs 2, 4, 7.2011 *Aspella emmae* (Boettger) – MERLE *et al.*, text-fig. 71/G, p. 558, pl. 157, figs 4–5.

Material – 11 specimens; Coșteiu: M.60.6894 (4), M.60.6896 (3), M.60.10236 (2), M.60.10923 (2).

Remarks – Two *Aspella* species occur in the Badenian Central Paratethys: *A. subanceps* (d'Orbigny) and *A. emmae* (Boettger). The latter differs from *A. subanceps* by paucispiral protoconch and smooth shell surface.

Genus *Dermomurex* Monterosato, 1890*Dermomurex* (*Dermomurex*) *distinctus* (De Cristofori et Jan, 1832)1832 *Murex distinctus* – DE CRISTOFORI & JAN, p. 11.2017 *Dermomurex* (s.s.) *distinctus* (Cristofori et Jan) – VICIÁN *et al.*, p. 268, pl. 2, figs 5–8.

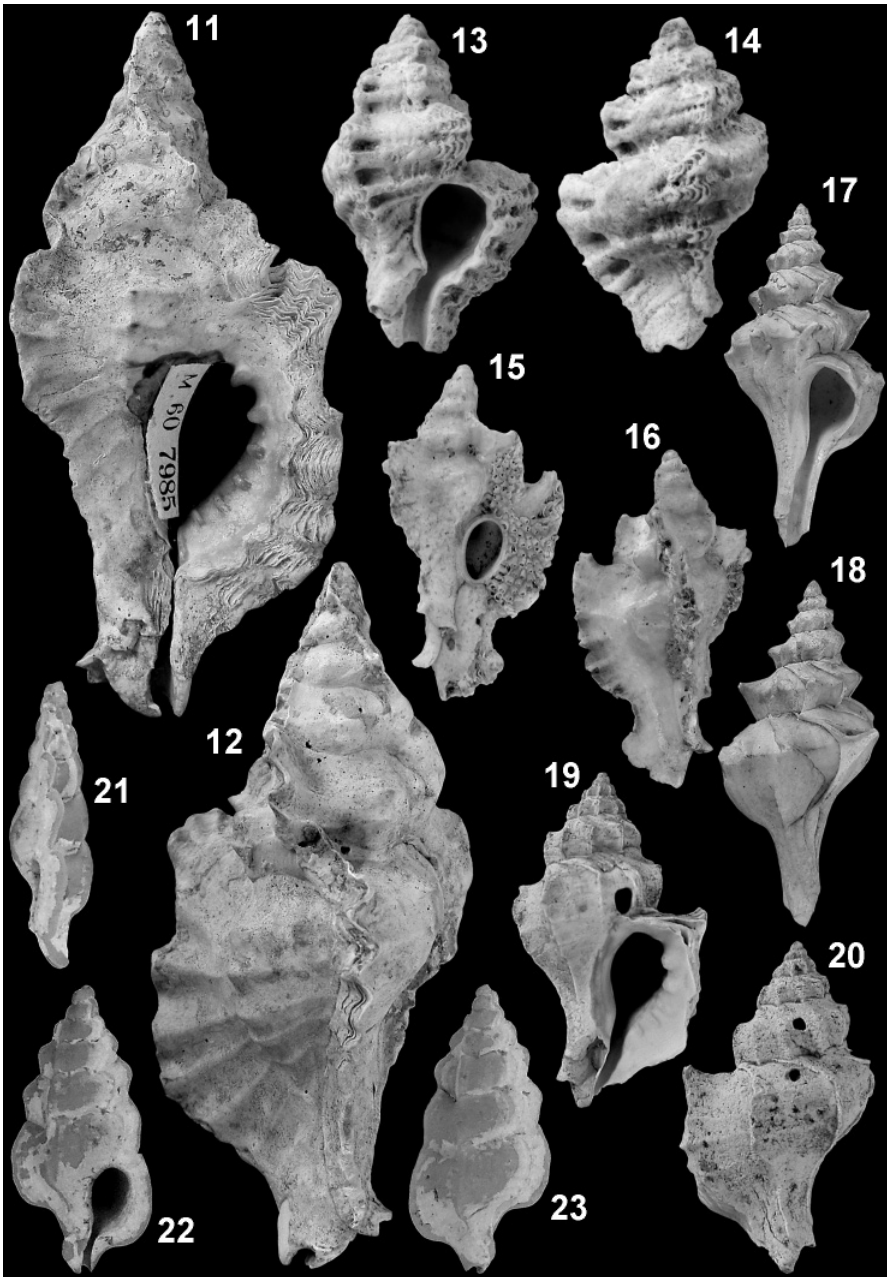
Material – 10 specimens; Coșteiu: M.59.1873C, M.60.6931 (6), M.60.10376, M.60.6972A; Nemeșești: M.60.8150.

Remarks – The taxonomic revision of the species was accomplished by MERLE *et al.* (2011). *D. distinctus* differs from the similar *D.* (s.s.) *scalaroides* (Blainville) by broader shell and strong spiral sculpture, and from the trivariate *D.* (*Trialatella*) *jani* by 4–5 varices on the last whorl.

Subgenus *Trialatella* Berry, 1964*Dermomurex* (*Trialatella*) *jani* (Doderlein, 1862)1862 *Murex jani* – DODERLEIN, p. 22.2013 *Dermomurex* (*Trialatella*) *jani* (Doderlein in Bellardi) – GORET *et al.*, p. 13, text-fig. 10, pl. 3, fig. 4 (*cum syn.*).

Material – 1 specimen; Coșteiu: M.60.6933.

Remarks – The species is the sole representative of the subgenus in the Middle Miocene of Europe. It differs in morphology from *D. distinctus* by trivariate shell.



Figs 11–12. *Timbellus perlongus* (Bellardi), M.60.7985A, SL 66 (1.5×), apertural and abapertural views. – **Figs 13–14.** *Pterynotus (Pterynotus) pseuderinaceus* (Boettger), M.60.6959, SL 6 (8×), apertural and abapertural views. – **Figs 15–16.** *Purpurellus cyclopterus* (Millet), M.60.6967A, SL 18 (2.5×). – **Figs 17–18.** *Poirieria (Pagodula) varicosissima* (Michelotti), M.59.1997, SL 22 (2.3×), apertural and abapertural views. – **Figs 19–20.** *Paziella (Flexopteron) goniostoma* (Hörnes), M.60.7955B, SL 28 (1.6×), apertural and abapertural views. – **Figs 21–23.** *Aspella emmae* (Boettger), M.60.6896A, SL 10 (4×), lateral, apertural and abapertural views

Genus *Crassimurex* Merle, 1990

Subgenus *Eopaziella* Gürs, 2001

Crassimurex (Eopaziella) capito (Philippi, 1844)
(Figs 26–27)

1844 *Murex Capito* – PHILIPPI, p. 60, pl. 4, fig. 19.

1966 *Trophon capito* Philippi – STRAUSZ, p. 269, text-fig. 123, pl. 32, figs 7–8.

2011 *Crassimurex (Eopaziella) capito* (Philippi) – MERLE *et al.*, pl. 144, figs 1–4.

Material – 1 specimen; Lăpuşiu: M.59.1949.

Remarks – The species is typical of the Oligocene in Belgium, Denmark, Germany, and Hungary, and rarely occurs in the Early Badenian localities of Austria, Hungary, and Romania.

Genus *Homalocantha* Mörch, 1852

Homalocantha heptagonata (Bronn, 1831)

1831 *Murex heptagonatus* – BRONN, p. 35.

2013 *Homalocantha heptagonata* (Bronn) – LANDAU *et al.*, p. 150, pl. 22, fig. 3 (*cum syn.*).

Material – 8 specimens; Coşteiu: M.60.6978, M.60.7372, M.60.10463A; Lăpuşiu: M.59.1850 (2), M.60.7955A, M.60.7962E, M.60.7978A.

Remarks – The suprageneric classification of the species is uncertain; the provisional arrangement proposed by LANDAU *et al.* (2013) is accepted herein. *H. heptagonata* is common in the Early Badenian Central Paratethys.

Subfamily Typhinae Cossmann, 1903

Genus *Typhis* Montfort, 1810

Subgenus *Hirtotyphis* Jousseume, 1880

Typhis (Hirtotyphis) horridus (Brocchi, 1814)

1814 *Murex horridus* – BROCCHI, p. 405, pl. 7, fig. 17.

2011 *Typhis (Hirtotyphis) horridus* (Brocchi) – LANDAU *et al.*, p. 24, pl. 11, fig. 16.

Material – 2 specimens; Coşteiu: M. 60.6937; Lăpuşiu: M.60.7970.

Remarks – Although the species is widely distributed in the Neogene of Europe, it is a rare element of the Early Badenian gastropod assemblages in the Central Paratethys.

Genus *Typhinellus* Jousseume, 1880

Typhinellus labiatus (De Cristofori et Jan, 1832)

1832 *Murex labiatus* – DE CRISTOFORI & JAN, p. 11.

1966 *Typhis* (*Typhinellus*) *tetrapterus* Bronn – STRAUSZ, p. 267, pl. 31, figs 7–8.

2016 *Typhinellus labiatus* (de Cristofori & Jan) – CEULEMANS *et al.*, p. 48, pl. 3, fig. 7.

Material – 1 specimen; Coșteiu: M.60.6940.

Remarks – *T. labiatus* was frequently recorded in the Miocene Paratethys but it is generally rare in the Pannonian Basin.

Genus *Siphonochelus* Jousseaume, 1880

Siphonochelus fistulosus (Brocchi, 1814)

1814 *Murex fistulosus* – BROCCHI, p. 394, pl. 7, fig. 12.

2007 *Siphonochelus fistulosus* (Brocchi) – LANDAU *et al.*, p. 59, text-fig. 16/1, pl. 15, fig. 3 (*cum syn.*).

Material – 98 specimens; Coșteiu: M.59.2008 (22), M.60.6936 (36), M.60.6938 (8), M.60.6939 (2), M.60.10275 (11), M.64.402 (18); Lăpugiu: M.60.7983.

Remarks – The species is widespread in the Paratethys, but it is usually a rare element of the mollusc assemblages. However, at two localities in the Central Paratethys, Coșteiu and Tekeres (Mecsek Mts, SW Hungary) it is extremely abundant.

Subfamily Muricopsinae Radwin et d'Attilio, 1971

Genus *Muricopsis* Bucquoy et Dautzenberg, 1882

Muricopsis (*Muricopsis*) *cristata* (Brocchi, 1814)

1814 *Murex cristatus* – BROCCHI, p. 394, pl. 7, fig. 15.

2013 *Muricopsis* (*Muricopsis*) *cristata* (Brocchi) – LANDAU *et al.*, p. 160, pl. 24, fig. 2 (*cum syn.*).

Material – 35 specimens; Coșteiu: M.59.1875 (3), M.60.6949 (6), M.60.6951 (11); Lăpugiu: M.59.1845 (5), M.59.1999 (3), M.60.7954A–C, M.60.7958A, M.60.10167, M.68.500 (2).

Remarks – The species is common in the Middle Miocene localities of the Paratethys and the Proto-Mediterranean Sea.

Muricopsis (*Muricopsis*) *moravica* (Hoernes et Auinger, 1885)
(Figs 28–29)

1885 *Murex* (*Muricidea*) *moravicus* – HOERNES & AUINGER, p. 206, pl. 24, figs 14–16.

1912 *Murex tarnopolensis* – FRIEDBERG, p. 170, pl. 11, fig. 2.

Material – 2 specimens; Lăpugiu: M.60.7957, M.60.10556.

Remarks – The occurrence of *M. moravicus* at Lăpugiu was already recorded by BOETTGER (1906: 31). As it is a poorly known species, a revised description is provided here. Shell length max. 22 mm, protoconch of 1.5 smooth, rounded whorls, teleoconch of five shouldered whorls. Last whorl 73.7% of total length of the teleoconch. Ovate aperture, five strong denticles within the outer lip, two folds on the columella, siphonal canal open and slightly dorsally recurved. Scabrous shell surface, spiral sculpture of strong primary cords (first whorl: appearance of P1 and P2; third and fourth teleoconch whorls: P1–P3, last whorl: strong P1–P5, weakly developed P6 and ADP, MP and ABP). Axial sculpture of eight varices on the penultimate and six varices on the last whorl, small P1 spinelets on the varices.

The specimen figured here agrees well in morphology with the type. The species was assigned to *Orania* by VOKES (1971), the morphology, however, is not typical of this genus. Based on the paucispiral protoconch, the strong sculpture, and the two columellar folds the species is assigned to subgenus *Muricopsis*. *Murex tarnopolensis* Friedberg differs only in size, hence it is considered as a juvenile representative of *M. (M.) moravica*. The Early Pliocene specimen figured by GORET *et al.* (2013, pl. 1, fig. 1) as *M. (M.) alternicosta* (Michelotti) is distinguishable from the type of *alternicosta* (MICHELOTTI 1841, pl. 5, figs 4–5) by gradate spire and long siphonal canal, it is very close in size and morphology to *moravica*.

Genus *Murexsul* Iredale, 1915

Murexsul sandbergeri (Hörnes, 1856) (Figs 30–31)

1856 *Murex Sandbergeri* – HÖRNES, p. 674, pl. 51, fig. 5.

2017 *Murexsul sandbergeri* (Hörnes) – VICIÁN *et al.*, p. 270, pl. 2, figs 15–16.

Material – 3 specimens; Coșteiu: M.60.6965; Lăpugiu: M.60.7943 (2).

Remarks – The taxonomic arrangement by LANDAU *et al.* (2013) is accepted herein, and *sandbergeri* is assigned to genus *Murexsul*. The species is widely distributed in the Early Badenian Central Paratethys but is a rare element of the mollusc assemblages.

Genus *Favartia* Jousseume, 1880

Favartia (Favartia) czjzeki (Hoernes et Auinger, 1885) (Figs 32–33)

1885 *Murex* (*Muricidea*) *Czjzeki* – HOERNES & AUINGER, p. 205.

1906 *Murex* (*Muricidea*) *collega* – BOETTGER, p. 42.

1995 *Aspella* (*Favartia*) *czjzeki* (Hörnes) – BAŁUK, p. 220, pl. 26, fig. 1 (*cum syn.*).

2016 *Favartia collega* (Boettger) – STEIN *et al.*, p. 95, text-figs 49/a–g (*cum syn.*).

Material – 26 specimens; Coșteiu: M.60.6934, M.60.6956 (3), M.60.6964 (9), M.60.6972B–C, M.60.6976A–D, M.60.10434, M.60.10463B–C, M.60.10862 (4).

Remarks – Three *Favartia* (s.s.) species are known in the Early Badenian Central Paratethys: *F. absona* (De Cristofori et Jan), *F. suboblonga* (d'Orbigny) (= *M. kostejanus* Boettger), and *F. czjzeki* (Hoernes et Auinger) (= *M. collega* Boettger) (LANDAU *et al.* 2007). *F. czjzeki* is characterized by strong variability in the development of the spire, the length of the siphonal canal, and the number of varices on the last whorl (BAŁUK 1995).

Favartia (*Favartia*) *suboblonga* (d'Orbigny, 1852)
(Figs 34–35)

1852 *Murex suboblongus* – D'ORBIGNY, p. 73.

2016 *Favartia suboblonga* (d'Orbigny) – CEULEMANS *et al.*, p. 40, pl. 1, figs 8–9.

Material – 5 specimens; Coșteiu: M.60.6943, M.60.6976E–F, M.60.10869; Lăpugiu: M.60.10185.

Remarks – *F. absona* differs from *F. suboblonga* by lower spire, and sharp and spinose varices, while the *F. czjzeki* group contains more elongate forms with scalate spire and different spiral and axial sculpture. New collecting works prove the wide distribution of *F. suboblonga* in the Pannonian Basin (Mecsekpölöske and Letkés, Hungary, and Rohožník – Konopiská, Slovakia).

Subgenus *Pygmaepterys* Vokes, 1978

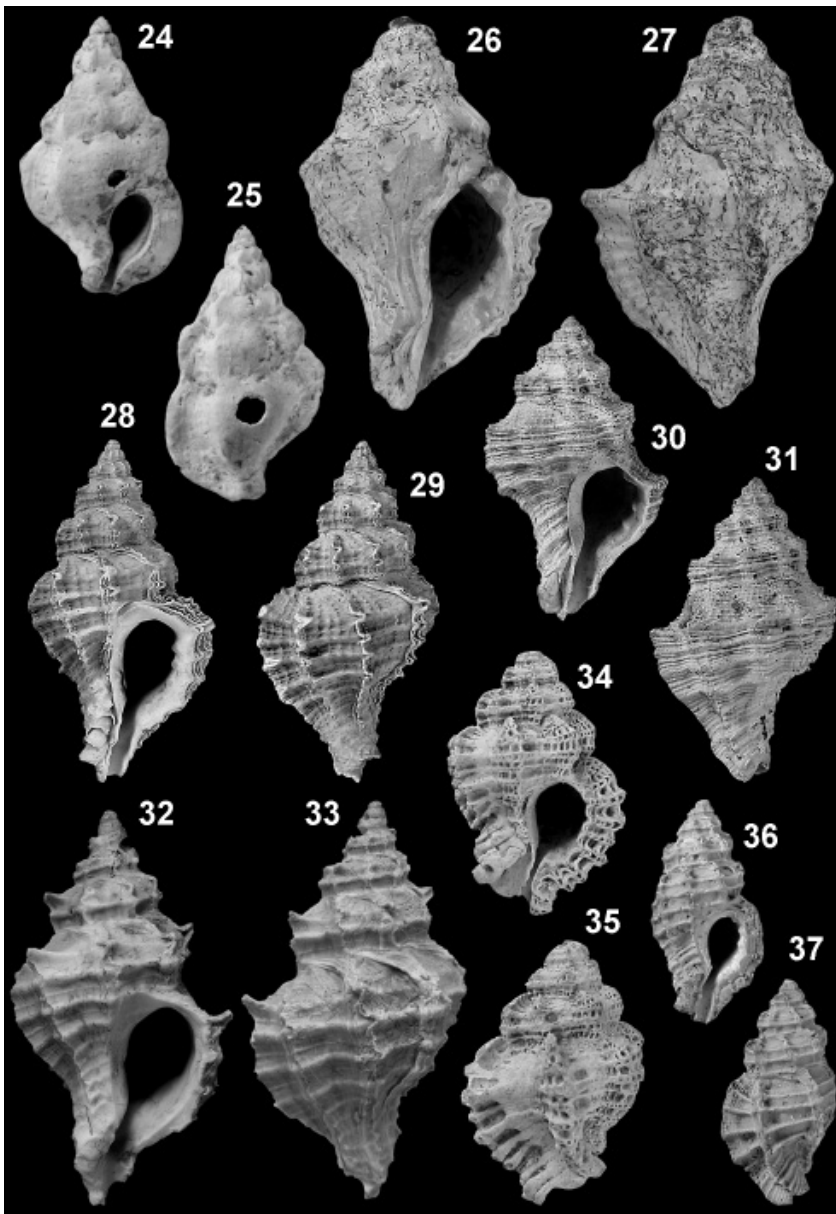
Favartia (*Pygmaepterys*) *transsylvanica* (Hoernes et Auinger, 1885)
(Figs 36–37)

1885 *Murex* (*Muricidea*) *transsylvanicus* – HOERNES & AUINGER, p. 207, pl. 24, fig. 12.

2017 *Favartia* (*Pygmaepterys*) *transsylvanica* (Hoernes et Auinger) – VICIÁN *et al.*, p. 268, text-fig. 2, pl. 2, figs 9–10.

Material – 13 specimens; Coșteiu: M.60.6945 (6), M.60.6946, M.60.10459 (2), M.60.10471 (2), M.60.10792; Lăpugiu: M.60.7950.

Remarks – *P. transsylvanica* is a rare species: beside the type area (Lăpugiu and Coșteiu), it is known only at two Pannonian Basin localities (Bánd, Bakony Mts, and Letkés, Börzsöny Mts, Hungary).



Figs 24–25. *Aspella emmae* (Boettger), M.60.6894, SL 6.8 (6×), apertural and abapertural views. – **Figs 26–27.** *Crassimurex* (*Eopaziella*) *capito* (Philippi), M.59.1949B, SL 41 (1.4×), apertural and abapertural views. – **Figs 28–29.** *Muricopsis* (*Muricopsis*) *moravica* (Hoernes et Auinger), M.60.10556, SL 19 (2.7×), apertural and abapertural views. – **Figs 30–31.** *Murexsul sandbergeri* (Hörnes), M.60.7943, SL 25 (1.8×), apertural and abapertural views. – **Figs 32–33.** *Favartia* (*Favartia*) *czjzeki* (Hoernes et Auinger), M.60.10862A, SL 11 (5.4×), apertural and abapertural views. – **Figs 34–35.** *Favartia* (*Favartia*) *suboblunga* (d’Orbigny), M.60.10185, SL 14.4 (2.6×), apertural and abapertural views. – **Figs 36–37.** *Favartia* (*Pygmaeapterys*) *transsylvanica* (Hoernes et Auinger), M.60.7950, SL 11 (3×), apertural and abapertural views

Favartia (Pygmaepterys) giselae (Boettger, 1902)
(Figs 38–41)

1902 *Murex (Muricidea) giselae* – BOETTGER, p. 30.

1934 *Muricidea giselae* Boettger – ZILCH, p. 251, pl. 15, fig. 79.

Material – 9 specimens; Coşteiu: M.60.6948 (3), M.60.10434B–E, M.60.10460 (2).

Remarks – As *P. giselae* is a very rare, endemic species, a revised description is provided here. Shell length max. 10.5 mm, protoconch of about 2 smooth, rounded whorls, teleoconch of five whorls. Last whorl 80% of total length of the teleoconch. Ovate aperture, six denticles within the outer lip (ID, D1–D5), three folds on the columella, siphonal canal open and slightly dorsally recurved. Crenulate axial growth lamellae, spiral sculpture of strong primary cords (first whorl: appearance of P1 and P2; last whorl: strong P1–P5). Axial sculpture of 6–7 varices on the last whorl, small P1–5 spinelets on the varices.

The classification of the species is discussed in the literature. I follow VOKES (1994) who underlined the presence of characteristic growth lamellae on the shell surface and assigned *giselae* to subgenus *Pygmaepterys*.

Subfamily Ocenebrinae Cossmann, 1903

Genus *Ocenebrina* Jousseau, 1880

Ocenebrina credneri (Hoernes et Auinger, 1885)
(Figs 42–43)

1885 *Murex (Occenebra) Credneri* – HOERNES & AUINGER, p. 218, pl. 26, figs 16–17.

2002 *Ocenebra credneri* (Hoernes et Auinger) – HARZHAUSER, p. 96 (*cum syn.*).

Material – 19 specimens; Lăpugiu: M.59.1864 (3), M.60.7952 (7), M.60.7958A–B, M.60.7974 (3), M.60.10317, M.64.394 (2), M.68.498C.

Remarks – *O. credneri* differs in morphology from the Early Miocene *O. sublavata* (Basterot) by narrower shell, weaker denticles within the outer lip, and finer spiral sculpture. As the axial sculpture lacks true varices that are typical of genus *Ocenebra*, I follow STRAUSZ (1966), and classify *credneri* within *Ocenebrina*.

Ocenebrina dertonensis (Bellardi, 1873)
(Figs 44–45)

1873 *Murex dertonensis* – BELLARDI, p. 107, pl. 7, fig. 12.

2013 *Ocenebrina dertonensis* (Bellardi) – LANDAU *et al.*, p. 151, pl. 22, fig 5 (*cum syn.*).

Material – 3 specimens; Lăpugiu: M.60.10329, M.68.504 (2).

Remarks – The species is common in the Early Badenian Central Paratethys.

Ocinebrina imbricata (Brocchi, 1814)

(Figs 46–47)

1814 *Murex imbricatus* – BROCCHI, p. 408, pl. 7, fig. 13.

1885 *Murex (Occenebra) imbricatus* Brocchi – HOERNES & AUINGER, p. 223, pl. 27, fig. 4.

2007 *Ocinebrina imbricata* (Brocchi) – LANDAU *et al.*, p. 33, pl. 8, figs 9–10, pl. 9, figs 1–2 (*cum syn.*).

Material – 3 specimens; Coșteiu: M.60.6969, M.60.10821; Lăpușiu: M.60.10197.

Remarks – *O. imbricata* was revised in detail by LANDAU *et al.* (2007), and the distribution was restricted to the Pliocene NE Atlantic and Mediterranean. However, HOERNES & AUINGER (1885) already recorded the species at Lăpușiu, and the specimen figured here also confirms the Middle Miocene occurrence. Size and morphology agree well with the revised description except the labral tooth for the fragmentary preservation. The closest form is the specimen illustrated by LANDAU *et al.* (2007, pl. 9, fig. 2). The specimen figured by KOJUMDIEVA (1960, pl. 40, fig. 9) as *Tritonalia (Ocinebrina) imbricata* differs from the type in development of the spire and the spiral sculpture, it probably represents *O. recognita* Bałuk, 2006.

Ocinebrina kojumdievae (Bałuk, 1995)

(Figs 48–49)

1995 *Purpura (Tritonalia) kojumdievae* nom. n. – BAŁUK, p. 228, pl. 30, fig. 8.

2017 *Ocinebrina kojumdievae* (Bałuk) – VICIÁN *et al.*, p. 60, pl. 3, fig. 3 (*cum syn.*).

Material – 1 specimen; Coșteiu: M.60.6941.

Remarks – The morphological differences between *O. lassaignei* (Basterot) and *O. kojumdievae* were discussed in detail by LANDAU *et al.* (2007).

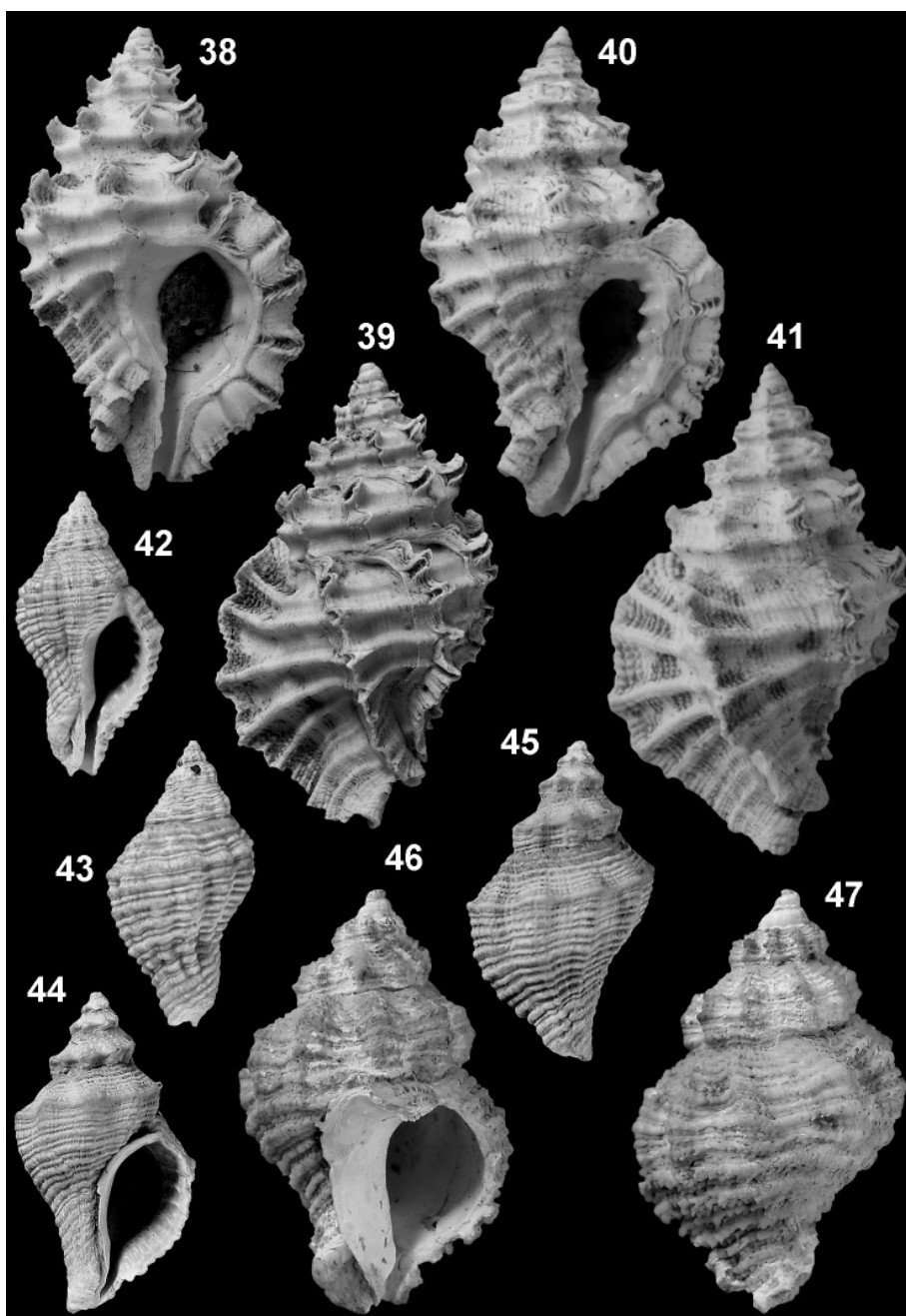
Ocinebrina recognita Bałuk, 2006

(Fig. 50)

2006 *Ocinebrina recognita* – BAŁUK, p. 209, pl. 11, figs 8–9 (*cum syn.*).

Material – 2 specimens; Coșteiu: M.60.6957B–C.

Remarks – The specimen represented here agrees well in morphology with the holotype (BAŁUK 2006, pl. 11, fig. 8). The species is close to *O. grundensis* (Hoernes et Auinger) in size, but differs by higher spire and much sharper primary spiral cords.



Figs 38–41. *Favartia (Pygmaeptyrys) giselae* (Boettger). – **Figs 38–39.** M.60.6948A, SL 10.2 (6×), apertural and abapertural views. – **Figs 40–41.** M.60.6948B, SL 9.5 (7×), apertural and abapertural views. – **Figs 42–43.** *Ocinebrina credneri* (Hoernes et Auinger), M.68.498C, SL 23 (1.7×), apertural and abapertural views. – **Figs 44–45.** *Ocinebrina dertonensis* (Bellardi), M.60.10329, SL 28 (1.6×), apertural and abapertural views. – **Figs 46–47.** *Ocinebrina imbricata* (Brocchi), M.60.10197, SL 36 (1.6×), apertural and abapertural views

Ocinebrina landaui n. sp.
(Figs 51–55)

2013 *Coralliophila* sp. – LANDAU *et al.*, p. 163, pl. 24, fig. 12.

Holotype – M.60.6975, Hungarian Natural History Museum, Department of Palaeontology and Geology, SL 23 (Figs 51–53).

Paratypes – 1: M.60.6957D, SL 17 (Figs 54–55), 2: M.60.6957E, SL 20, 3: M.60.6957F, SL 18.

Type strata and locality – Lower Badenian (Middle Miocene) Dej Formation, Coşteiu de Sus, Romania.

Derivation of name – In honour of Bernard M. Landau palaeontologist (Naturalis Biodiversity Center, Leiden, the Netherlands).

Diagnosis – Medium size shell, paucispiral protoconch, five slightly convex teleoconch whorls, sealed siphonal canal, broad, rounded axial ribs, numerous narrow, rounded and scabrous primary and secondary cords, short labral tooth.

Description – Robust shell of medium size, protoconch of about 1.5 smooth, rounded whorls. Teleoconch of five slightly convex whorls, suture shallow, undulating. Last whorl 76% of the total length. Aperture ovate, outer lip erect, seven denticles within, bearing a short labral tooth abapically. Anal notch moderately developed, columellar lip thin and smooth, siphonal canal straight, short, narrow and sealed, siphonal fasciole recurved, rounded, forming lateral wall of pseudo-umbilicus. Axial sculpture of seven broad, rounded, slightly prosocline ribs on the penultimate and last whorls of the holotype. Spiral sculpture of numerous narrow, rounded, and slightly scabrous primary and secondary cords; a strong basal spiral band on the last whorl is formed by labral teeth.

Remarks – Based on morphology the new species is assigned to genus *Ocinebrina*. The labral tooth appears on some species of the genus, e.g. on *O. imbricata* known in the region. The latter, however, differs from *O. landaui* n. sp. by larger, fusiform shell, more convex teleoconch whorls, deeper and bordered anal notch, and finer axial ribs.

New collecting works prove the occurrence of the new species in the Pannonian Basin at two localities: Letkés and Bárd (Hungary). The specimen from Turkey illustrated by LANDAU *et al.* (2013, pl. 24, fig. 22) as *Coralliophila* sp. is a closely allied form. It is characterized by identical size, labral tooth, and similar spiral and axial sculpture, but slightly differs by somewhat higher spire. Nevertheless, it is regarded herein as a Serravallian representative of *O. landaui* n. sp.

The online International Fossil Shell Museum (<http://www.fossilshells.nl>) represents a specimen as *Ocenebra avitensis* Cossmann et Peyrot from the Tortonian of Karaman. The morphology differs from that of *avitensis* (paratype MNHN.

F.J05986 illustrated by the Muséum National d'Histoire Naturelle, Paris: https://science.mnhn.fr/institution/mnhn/collection/f/item/j05986?lang=fr_FR) by less rounded whorls, broader base, and presence of labral tooth. On the other hand its size and morphology agree well with that of *O. landaui* n. sp., so the specimen is regarded as another representative of the new species in the Miocene of Turkey.

Genus *Ocenebra* Gray, 1847

Ocenebra vindobonensis vindobonensis (Hörnes, 1853)

1853 *Murex Vindobonensis* – HÖRNES, p. 252, pl. 25, fig. 17 only.

2016 *Ocenebra vindobonensis vindobonensis* (Hörnes) – LANDAU *et al.*, p. 224, pl. 1, fig. 4 (*cum syn.*).

Material – 1 specimen; Coșteiu: M.59.1872.

Remarks: The taxonomy of the species and the differences of the two subspecies: *O. vindobonensis vindobonensis* (Hörnes) and *O. vindobonensis ligeriana* (Tournouër) were recently discussed in detail by GORET & PONS (2013) and LANDAU *et al.* (2016). The species is relatively common in the Central Paratethys. The Pannonian Basin records show moderate intraspecific variability in the sculpture.

Genus *Jaton* Pusch, 1837

Jaton sowerbyi (Michelotti, 1841)

(Figs 56–58)

1841 *Murex Sowerbyi* – MICHELOTTI, p. 8, pl. 1, figs 14–15.

1967 *Ocenebrina erinacea* (L.) – KÓKAY, p. 90, pl. 1, fig. 75 [non *Ocenebra erinaceus* (Linnaeus, 1758)].

2007 *Jaton sowerbyi* (Michelotti) – LANDAU *et al.*, p. 38, text-fig. 9/2, pl. 10, figs 3–4 (*cum syn.*).

2016 *Jaton sowerbyi* (Michelotti) – CEULEMANS *et al.*, p. 44, pl. 3, fig. 1.

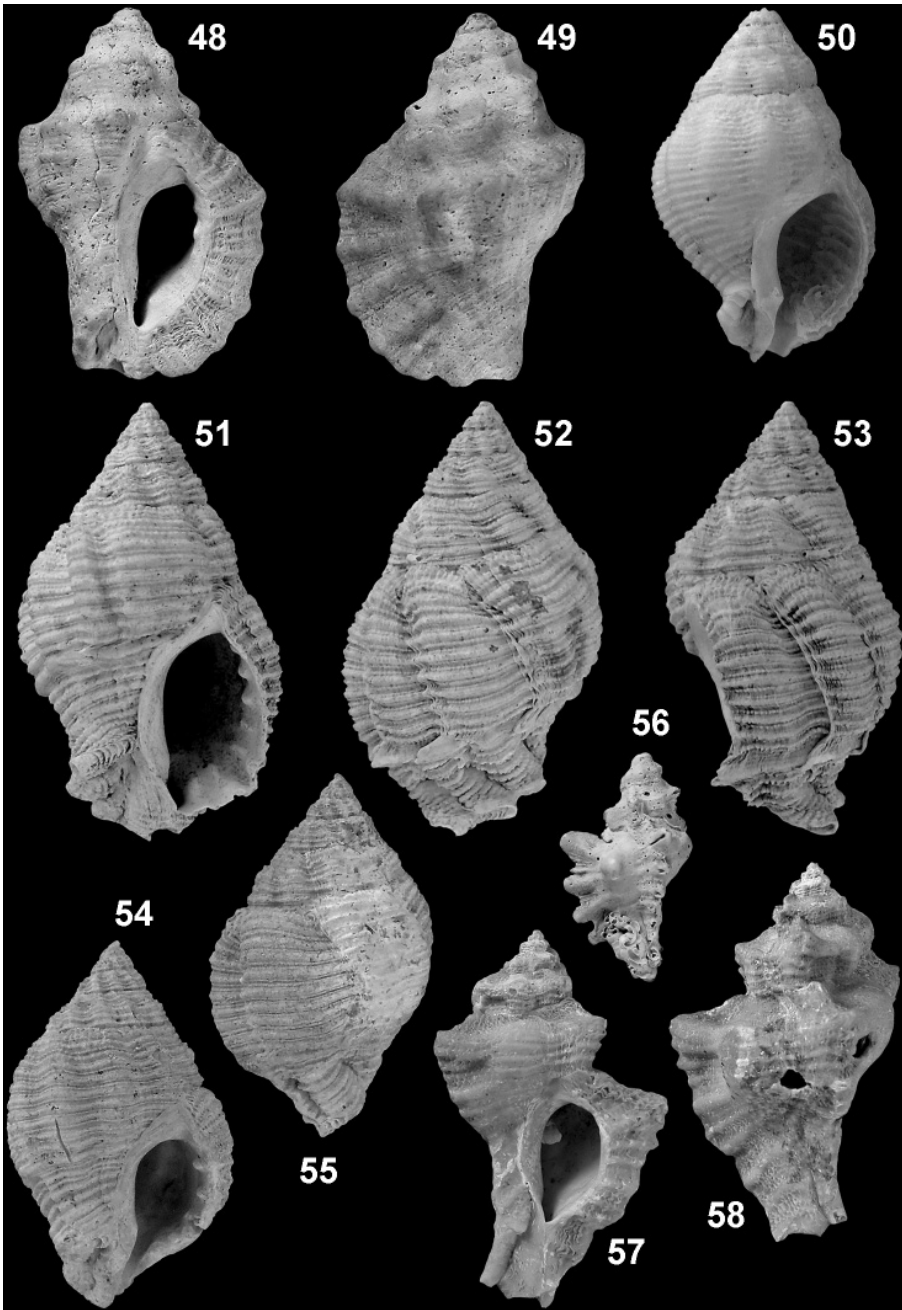
Material – 6 specimens; Coșteiu: M.60.10110; Lăpugiu: M.59.1854, M.60.7985B, M.60.10154, M.68.497B, M.68.498D.

Remarks – The specimens recorded earlier as *erinaceus* Linnaeus in the Hungarian literature actually represent *J. sowerbyi*. The species differs in morphology from the Pliocene–Recent *O. erinaceus* by more elongated shell, smaller and rounded aperture, and finer sculpture. The Early Miocene *J. dufrenoyi* (Grateloup) is similar in overall morphology but differs by dentate outer lip.

Genus *Pteropurpura* Jousseau, 1880

Pteropurpura delbosiana (Grateloup, 1845)

1845 *Murex Delbosianus* – GRATELOUP, pl. 30, figs 7, 10.



Figs 48–49. *Ocinebrina kojumdievae* (Baluk), M.59.1950, SL 30 (1.7×), apertural and abapertural views. – **Fig. 50.** *Ocinebrina recognita* Baluk, M.60.6957B, SL (2×), apertural view. – **Figs 51–55.** *Ocinebrina landaui* n. sp. – **Figs 51–53.** Holotype, M.60.6975, SL 23 (2.6×), apertural, abapertural and lateral views. – **Figs 54–55.** Paratype 1, M.60.6957D, SL 17 (3×), apertural and abapertural views. – **Figs 56–58.** *Jaton sowerbyi* (Michelotti). – **Fig. 56.** M.68.497B, SL 21.5 (1.5×), abapertural view. – **Figs 57–58.** M.60.10154, SL 35 (1.5×), apertural and abapertural views

1966 *Murex (Pterynotus) latilabris* – STRAUSS, p. 261, pl. 55, figs 5–10 [non *Purpurellus latilabris* (Bellardi et Michelotti, 1841)].

2013 *Pteropurpura delbosiana* (Grateloup) – LANDAU *et al.*, p. 153, pl. 22, figs 13–14, pl. 23, fig. 1 (*cum syn.*).

Material – 5 specimens; Coşteiu: M.60.6952, M.60.6961 (4).

Remarks – *P. delbosiana* is closely allied to *P. friedbergi* (Cossmann et Peyrot) in morphology, but differs by larger size, strong labral varix, and lack of spines on the siphonal canal.

Pteropurpura friedbergi (Cossmann et Peyrot, 1924)
(Figs 59–60)

1924 *Murex friedbergi* – COSSMANN & PEYROT, p. 98.

1995 *Murex (Tubicauda) friedbergi* Cossmann et Peyrot – BAŁUK, p. 212, pl. 22, figs 6–8 (*cum syn.*).

2016 *Murex friedbergi* Cossmann et Peyrot – WYSOCKA *et al.*, text-fig. 11/C.

Material – 11 specimens; Coşteiu: M.59.1869, M.59.1871, M.60.6930B, M.60.6958E–F, M.60.6993D–F; Nemeşşti: M.60.8110B–D.

Remarks – The species is widely distributed in the Badenian Central Paratethys. It is known in Austria, Bulgaria, Poland, Romania, and new field works prove its abundance in Hungary at Tekeres (Mecsek Mts).

Genus *Vitularia* Swainson, 1840

Vitularia linguabovis (Basterot, 1825)

1825 *Murex Lingua-Bovis* – BASTEROT, p. 59, pl. 3, fig. 10.

2013 *Vitularia linguabovis* (de Basterot) – LANDAU *et al.*, p. 154, pl. 23, figs 2–3 (*cum syn.*).

Material – 5 specimens; Coşteiu: M.60.6963, M.60.7393, M.60.10092; Lăpugiu: M.60.7969, M.60.7971.

Remarks – The suprageneric classification follows LANDAU *et al.* (2013). *V. linguabovis* is characterized by highly variable shell morphology. The species is widespread in the Early Badenian Paratethys.

Subfamily Rapaninae Gray, 1853

Genus *Menathais* Iredale, 1937

Menathais viciani Kovács, 2018
(Figs 61–62)

2018 *Menathais viciani* n. sp. – KOVÁCS, p. 32, fig. 2E–L.

Material – 1 specimen; Lăpugiu: M.60.10129.

Remarks – The species was described from the Lower Badenian deposits of Letkés (Börzsöny Mts, Hungary). The occurrence in the Făget Basin proves a close connection between different parts of the Central Paratethys.

Subfamily Ergalataxinae Kuroda, Habe et Oyama, 1971

Genus *Muricodrupa* Iredale, 1918

Muricodrupa? *styriaca* (Hilber, 1879)

(Figs 63–64)

1879 *Purpura styriaca* Stur – HILBER, p. 431, pl. 2, figs 9–10.

1966 *Drupa styriaca* (Stur in Hilber) – STRAUSZ, p. 284, text-fig. 130 (*cum syn.*).

Material – 1 specimen; Coșteiu: M.60.6985.

Remarks – The generic classification of the species is unclear. The morphology of *Drupa* species differs by strong columellar teeth. Based on the paucispiral protoconch, the sculpture, and the presence of one columellar fold, *styriaca* is assigned herein to genus *Muricodrupa* provisionally. The species is a rare element of the Central Paratethys gastropod assemblages, it is known only from Austria (Gamlitz), Hungary (Bánd, Sámsonháza), and Romania (Coșteiu).

Genus *Orania* Pallary, 1900

Orania cheilotoma (Hoernes et Auinger, 1890)

1890 *Pollia cheilotoma* Partsch – HOERNES & AUINGER, p. 234, pl. 30, figs 1–2.

2013 *Orania cheilotoma* (Hoernes & Auinger) – LANDAU *et al.*, p. 156, pl. 23, figs 5–6 (*cum syn.*).

Material – 24 specimens; Coșteiu: M.60.6966, M.60.6971 (2), M.60.6972D–E, M.60.7014 (2), M.60.10841 (16), M.60.10883.

Remarks – Two *Orania* species are known in the Early Badenian Central Paratethys: *O. cheilotoma* and *O. fusulus*. The validity of the former is discussed in the literature; it was confirmed recently by LANDAU *et al.* (2013). *O. cheilotoma* is widespread and abundant in the Central Paratethys.

Orania fusulus (Brocchi, 1814)

(Figs 65–66)

1814 *Murex fusulus* – BROCCHI, p. 409, pl. 8, fig. 9.

2007 *Orania fusulus* (Brocchi) – LANDAU *et al.*, p. 50, text-fig. 13, pl. 13, figs 7–10 (*cum syn.*).

Material – 5 specimens; Coșteiu: M.60.6962, M.60.7010; Lăpugiu: M.60.7958D, M.60.10323, M.60.10402.

Remarks – The species is rare in the Badenian Pannonian Basin. *O. cheilotoma* differs from *O. fusulus* by scalate spire and stronger spiral cords.

Genus *Janssenia* Landau, Harzhauser, İslamoğlu et Silva, 2013

Janssenia echinulata (Pusch, 1837)

1837 *Ricinula echinulata* – PUSCH, p. 140, pl. 11, fig. 27.

2013 *Janssenia echinulata* (Pusch) – LANDAU *et al.*, p. 157, pl. 23, figs 7–8 (*cum syn.*).

Material – 12 specimens; Coşteiu: M.60.7016; Lăpugiu: M.59.2082 (3), M.59.2083, M.59.2085, M.60.7951 (2), M.60.8482, M.62.6180 (2), M.64.227.

Remarks – The species was taxonomically revised and assigned to genus *Janssenia* by LANDAU *et al.* (2013). The *Stramonita haemastomoides* (Hoernes et Auinger) specimens recorded in the literature from the Central Paratethys actually represent *J. echinulata*. The species is characterized by strong intraspecific variability in height of the spire, strength of the spiral rows of tubercles, and development of the columellar folds.

Janssenia spinosa (Kojumdieva, 1960)

1960 *Thais (Stramonita) spinosa* – KOJUMDIEVA, p. 153, pl. 41, fig. 3.

1981 *Thais (Stramonita) austriaca* – KRACH, pl. 22, fig. 10 [non *Morula (Habromorula) austriaca* (Hoernes & Auinger, 1882)].

Material – 5 specimens; Coşteiu: M.59.2157, M.60.6986 (3), M.60.6988.

Remarks – The generic arrangement of *spinosa* was uncertain in LANDAU *et al.* (2013). Based on the presence of two weakly developed folds on the columella abapically, the species is assigned herein to *Janssenia*. *J. spinosa* differs in morphology from *J. echinulata* by slender shell with only two rows of spines on the last whorl. The species is a rare element of the Central Paratethyan gastropod assemblages.

Genus *Cathymorula* Landau, Houart et Silva, 2007

Cathymorula exilis (Hörnes, 1852)

1852 *Purpura exilis* – HÖRNES, p. 169, pl. 13, figs 20–23.

2015 *Thais (Stramonita) exilis* (Partsch in Hörnes) – POPA *et al.*, p. 14, pl. 4, fig. 5.

Material – 10 specimens; Coşteiu: M.60.6989, M.60.6991, M.60.10274; Lăpugiu: M.59.2086 (2), M.60.7949 (2), M.60.8469, M.60.10141 (2).

Remarks – The species is widespread in the Early Badenian Central Paratethys.

Genus *Morula* Schumacher, 1817*Morula (Morula) bellardii* (Hoernes et Auinger, 1890)
(Figs 67–68)

1890 *Pollia bellardii* – HOERNES & AUINGER, p. 237, pl. 27, fig. 15.

2001 *Morula* (s.l.) cf. *bellardii* (Hoernes & Auinger) – LOZOUET *et al.*, p. 59, pl. 24, fig. 5 (*cum syn.*).

Material – 77 specimens; Coșteiu: M.59.2049 (18), M.60.6997 (55), M.60.7011 (3), M.60.10802.

Remarks – The species has been known only in the mollusc assemblages of Lăpugiu de Sus and Coșteiu de Sus in the Central Paratethys, but new field works prove the presence in the Pannonian Basin (Letkés and Bánd, Hungary) (Kovács *et al.* 2018).

Subgenus *Habromurula* Houart, 1995*Morula (Habromorula) austriaca* (Hoernes et Auinger, 1882)
(Figs 69–70)

1882 *Purpura (Sistrum) austriaca* – HOERNES & AUINGER, p. 153, pl. 16, figs 14–17.

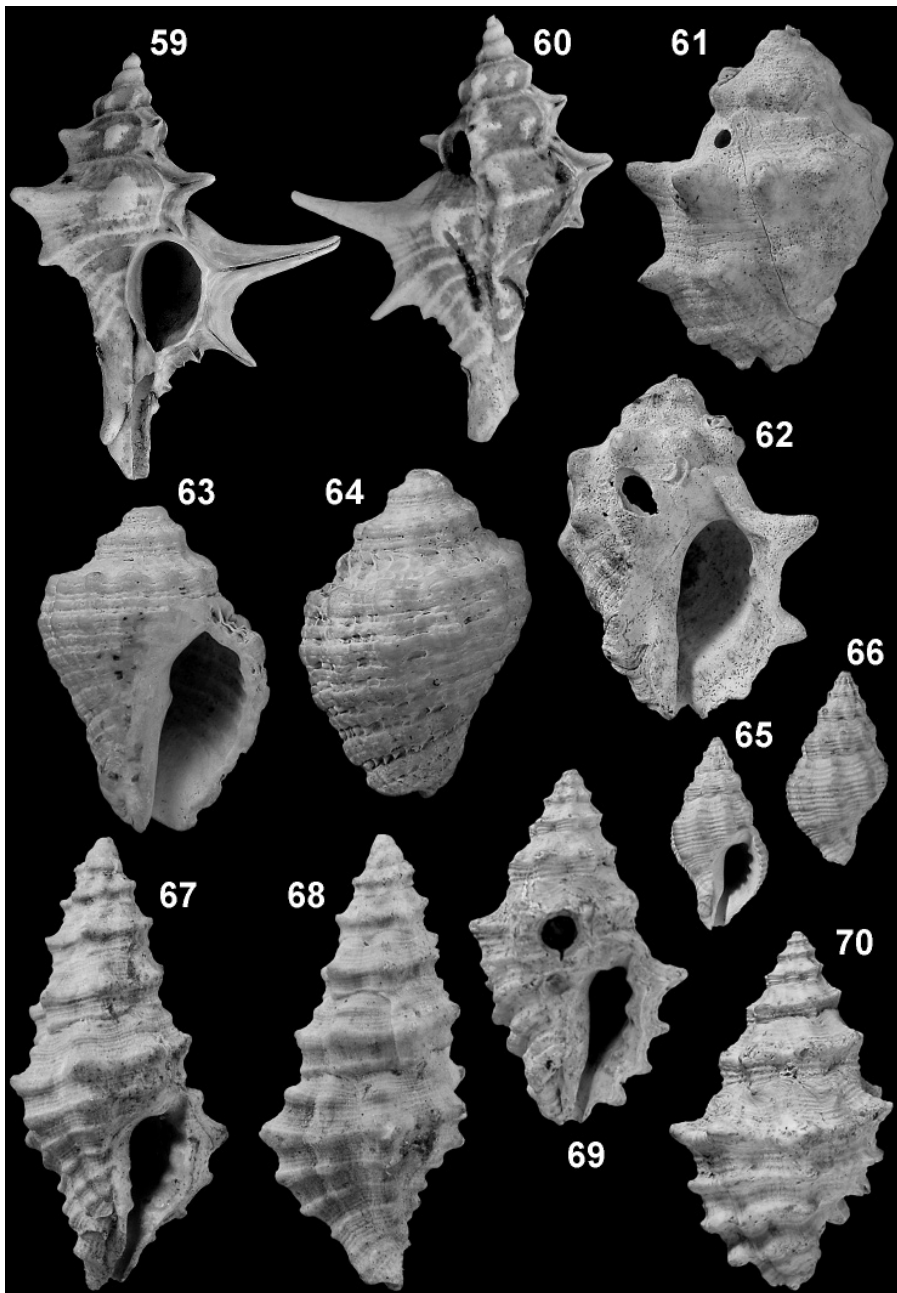
1966 *Thais (Stramonita) austriaca* Hoernes & Auinger – STRAUSS, p. 283, pl. 35, figs 4–5, 10–12 (*cum syn.*).

non 1981 *Thais (Stramonita) austriaca* Hoernes & Auinger – KRACH, p. 69, pl. 22, fig. 10 [= *Janssenia spinosa* (Kojumdjieva, 1960)].

Material – 3 specimens; Lăpugiu: M.60.7948, M.60.7954D–E.

Remarks – As the supraspecific classification of the species is uncertain, a revised description is provided here. Shell length max. 25 mm, protoconch of two smooth and rounded whorls, high spire, teleoconch of five shouldered whorls with slightly concave sutural ramp. Last whorl 68.7% of the total length. Narrow, ovate aperture, well-developed anal notch, six denticles within outer lip, columella smooth, siphonal canal short, open, slightly recurved. Spiral sculpture of four primary cords with narrow secondary cords on the last whorl, axial sculpture of 8–9 rounded ribs on the spire whorls, 7 ribs on the last whorl.

The size and morphology of *austriaca* are closely allied to *Habromorula*. Fossil species of the subgenus are known in the Middle Miocene Paratethys (Poland) and the Proto-Mediterranean Sea (S France). *H. austriaca* is rare but widespread in the Early Badenian Central Paratethys. It was described from the Vienna Basin and Lăpugiu de Sus, later recorded from Várpalota (Hungary), and new collecting works prove wide geographical range in the Pannonian Basin (Bánd, Letkés, Márkháza; Hungary).



Figs 59–60. *Pteropurpura friedbergi* (Cossmann et Peyrot), M.59.1871, SL 23.5 (2.5×), apertural and abapertural views. – **Figs 61–62.** *Menathais viciani* Kovács, M.60.10129, SL 29 (1.6×), abapertural and apertural views. – **Figs 63–64.** *Muricodrupa? styriaca* (Hilber), M.60.6985, SL 23 (2×), apertural and abapertural views. – **Figs 65–66.** *Orania fusulus* (Brocchi), M.60.7958D, SL 13.6 (2×), apertural and abapertural views. – **Figs 67–68.** *Morula (Morula) bellardii* (Hoernes et Auinger), M.60.6997A, SL 7 (9×), apertural and abapertural views. – **Figs 69–70.** *Morula (Habromorula) austriaca* (Hoernes et Auinger), M.60.7948, SL 20.5 (2×), apertural and abapertural views

Subfamily Coralliophilinae Chenu, 1859
Genus *Coralliophila* H. Adams et A. Adams, 1853

Coralliophila burdigalensis Tournouër, 1874
(Figs 71–76)

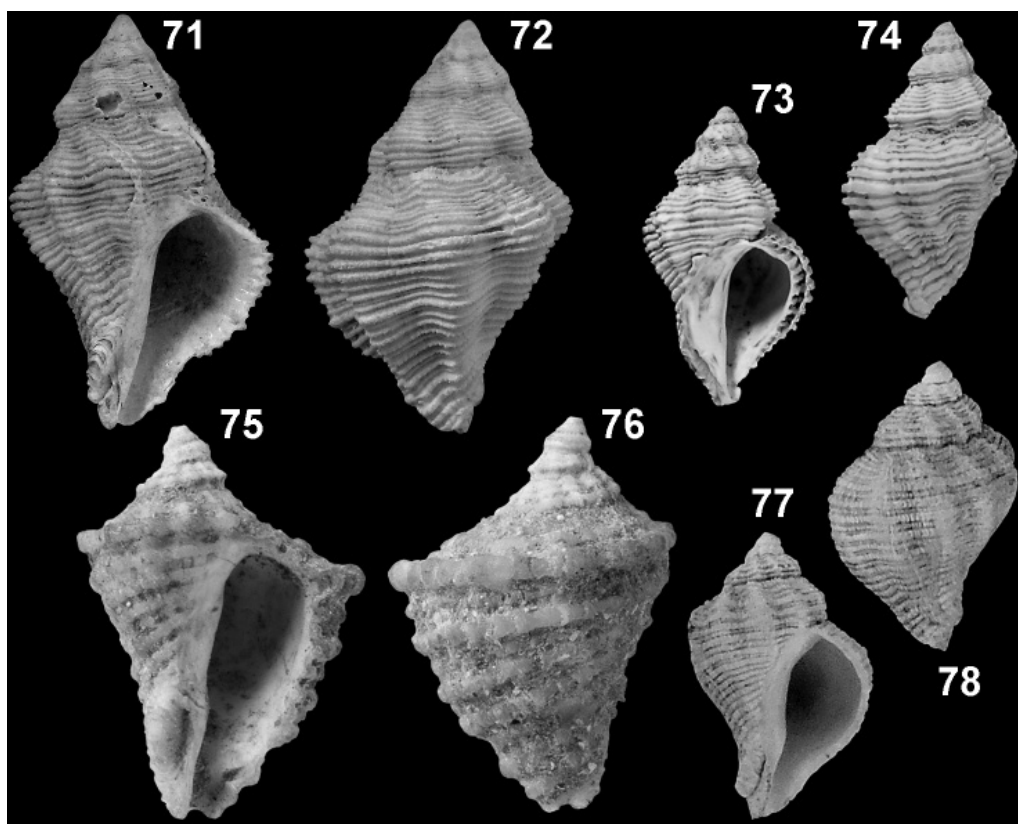
1874 *Coralliophila burdigalensis* – TOURNOUËR, p. 296, pl. 9, fig. 6.

1998 *Coralliophila burdigalensis* Tournouër – LOZOUET & RENARD, p. 173, fig. 2/1–10 (*cum syn.*).

2001 *Coralliophila burdigalensis* (Tournouër) – LOZOUET *et al.*, p. 60, pl. 25, figs 1–10 (*cum syn.*).

Material – 16 specimens; Coşteiu: M.60.6955, M.60.6990 (4), M.60.6994A–B (juv.), M.60.7009, M.60.7015 (2), M.60.7376A, M.60.10454, M.60.10711 (2); Lăpugiu: M.60.10363, M.68.503.

Remarks – The specimens represented here are closely allied in morphology to those figured by LOZOUET & RENARD (1998) from the Early Miocene of



Figs 71–76. *Coralliophila burdigalensis* Tournouër – **Figs 71–72.** M.60.6979A, SL 20 (2.5×), apertural and abapertural views. – **Figs 73–74.** M.60.10363., SL 12.2 (3×), apertural and abapertural views. – **Figs 75–76.** M.60.6994A, SL 4.8 (10×), apertural and abapertural views. – **Figs 77–78.** *Coralliophila granifera* (Michelotti), M.60.6980A, SL 10 (3.5×), apertural and abapertural views

France. The other two *Coralliophila* species described by HOERNES & AUINGER (1885) at Lăpugiu de Sus: *C. alternata* (Bellardi) and *C. hochstetteri* (Hoernes et Auinger) are distinguishable by rounded spire whorls. *C. burdigalensis* differs from *C. gracilispira* Boettger by lower spire and broader last whorl. The specimen figured on Figs 75–76 represents a juvenile shell.

Coralliophila granifera (Michelotti, 1847)
(Figs 77–78)

1847 *Pyrula graniferus* – MICHELOTTI, p. 266, pl. 17, fig. 6.

1966 *Coralliophila granifera* Michelotti – STRAUZ, p. 286, pl. 36, figs 6–7 (*cum syn.*).

2016 *Coralliophila granifera* (Michelotti) – STEIN *et al.*, p. 92, pl. 40, fig. 4 (*cum syn.*).

Material – 4 specimens; Coșteiu: M.60.6980 (3), M.60.10959.

Remarks – The shell morphology of the rare species is highly variable. The Coșteiu material with low spire and broad last whorl agrees well with the type.

CONCLUSION

The documentation of the muricid assemblages studied in the present paper completes the knowledge of the diversity, as well as the stratigraphical and palaeobiogeographical ranges of the Muricidae in the Early Badenian Central Paratethys. The data confirm the Middle Miocene occurrence of *Ocinebrina imbricata* (recorded already by HOERNES & AUINGER 1885), and the extended geographical distribution of *Dermomurex distinctus* (De Cristofori et Jan), *D. jani* (Doderlein), *Muricopsis moravica* (Hoernes et Auinger), *Ocinebrina kojumdgievae* (Bałuk), *O. recognita* Bałuk, *Orania fusulus* (Brocchi), and *Coralliophila burdigalensis* Tournouër. The number of the species corresponds to the fauna list of KOCH (1900), and it can be stated that the muricid material of the Făget Basin is one of the richest in the Miocene Paratethys.

*

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