Description of three new species of Muricidae (Neogastropoda) from the Miocene Paratethys

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ABSTRACT. Three new Muricidae species, *Siratus hirmetzli* n. sp., *Dermomurex* (*Gracilimurex*) *nemethi* n. sp., and *Menathais viciani* n. sp. are described from the Middle Miocene Sámsonháza Formation of Letkés (Hungary). The genus *Siratus* is recorded for the first time in Europe, the subgenus *Gracilimurex* is recorded for the first time in the Paratethys, and the genus *Menathais* is recorded for the first time with a fossil representative.

INTRODUCTION

New species of *Siratus*, *Dermomurex* (*Gracilimurex*), and *Menathais* are described herein based on newly collected Lower Badenian (Middle Miocene) gastropod assemblages from Letkés (W Börzsöny Mts, N Hungary), and the revision of the gastropod collection of the Hungarian Natural History Museum, Budapest (HNHM). The Börzsöny Mts region belongs to the Neogene Pannonian Basin of the Central Paratethys; Letkés, a small village is known for rich Badenian invertebrate assemblages (Csepreghy-Meznerics, 1956). A recently excavated section close to the village (47.888319° N, 18.784647° E) yielded a highly diverse mollusc assemblage. The locality is characterized by resedimented beds of clayey sand that represents the Lower Badenian Sámsonháza Formation. Four gastropod superfamilies have been described until now from the material: Conoidea (Kovács & Vicián, 2014; Harzhauser & Landau, 2016), Siphonarioidea (Harzhauser *et al.*, 2017), Tonnoidea and Ficoidea (Kovács & Vicián, *in press*); and seven Muricidae species were recorded as new in Hungary by Vicián *et al.* (2017).

The *Siratus* and *Menathais* species were completed with specimens from Lăpugiu de Sus (Făget Basin, Romania) housed in the HNHM. Badenian molluscs of Lăpugiu were recently discussed by Popa *et al.* (2015) and Kovács & Balázs (2016). The locality is characterized by tuffites, clays and silts (Lower Badenian Dej Formation), the *Siratus* specimen illustrated here originates from dark grey clayey layers. The occurrence of *Siratus* in the Badenian Central Paratethys is of great significance from a palaeobiogeographic point of view, as this genus was previously unknown not only from the Miocene Paratethys, but from the European Cenozoic as well. The presence of *Gracilimurex* in the Letkés assemblage confirms the extended stratigraphic and palaeogeographic ranges of the taxon recorded by Merle *et al.* (2011). *Menathais* was only known as an extant genus. Its presence in the Miocene contributes to the knowledge of the Rapaninae phylogeny.

Materials and methods

The specimens from Letkés were collected by Zoltán Vicián. The studied material is housed in the HNHM and in private collections (Tamás Hirmetzl, Fót; Tamás Németh, Balatonkenese, Hungary). The three holotypes and paratype 3 of *Siratus hirmetzli* n. sp. are deposited in the HNHM, Department of Palaeontology and Geology, the other paratypes belong to private collections. The description terminology follows Kool (1993), Merle *et al.* (2011) and Landau *et al.* (2013).

Abbreviations

ID: infrasutural apertural denticle; **P:** primary cord, **IP:** infrasutural primary cord; **ADP:** adapical siphonal primary cord; **MP:** median siphonal primary cord; **ABP:** abapical siphonal primary cord; **s:** secondary cord; **adis:** adapical infrasutural secondary cord; **abis:** abapical infrasutural secondary cord; **ads:** adapical siphonal secondary cord; **ms:** median siphonal secondary cord; **abs:** abapical siphonal secondary cord.

SYSTEMATICS

Superfamily **MURICOIDEA** Rafinesque, 1815
Family **MURICIDAE** Rafinesque, 1815
Subfamily **MURICINAE** Rafinesque, 1815
Genus ***Siratus*** Jousseaume, 1880
Type species: *Purpura sirat* Jousseaume, 1880, by original designation (= *Murex senegalensis* Gmelin, 1791), Recent, West Atlantic.

Siratus hirmetzli n. sp.
Fig. 1A–K

Type material. Holotype PAL 2017.53.1, Hungarian Natural History Museum, length 55 mm (Fig. 1A–B). Paratype 1 and paratype 2: Coll.H.2017.01–02, Collection Hirmetzl (Fig. 1E–F, I–K); paratype 3: PAL 2017.57.1, HNHM (Fig. 1C–D).

Type strata. Lower Badenian (Middle Miocene) clayey sand (Sámsonháza Formation).

Type locality. Letkés, Hungary.

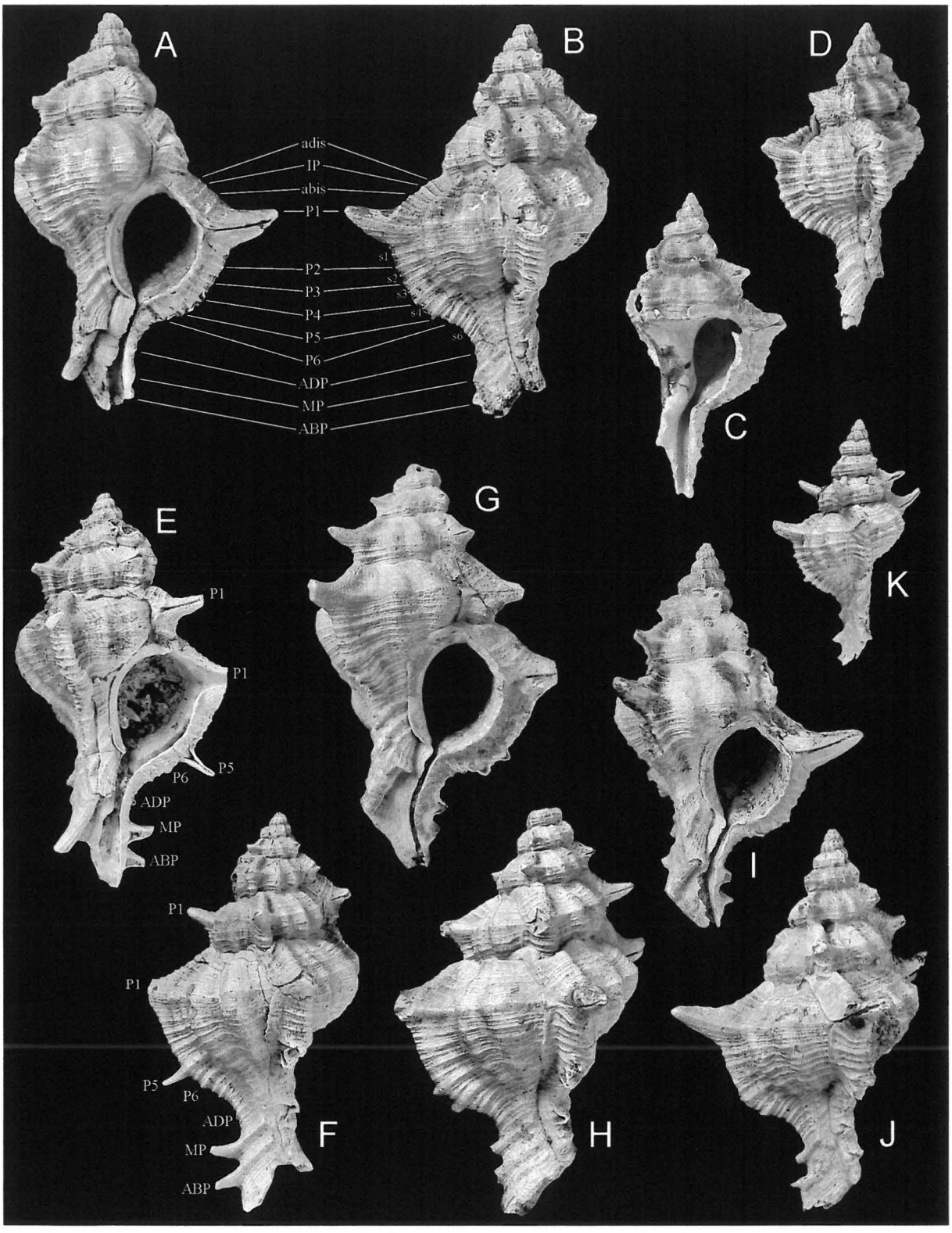
Material examined. 40 specimens from Letkés, one specimen from Lăpugiu de Sus (HNHM).

Diagnosis. Medium sized *Siratus* species with paucispiral protoconch, shouldered teleoconch whorls, moderately long siphonal canal, weak apertural dentition, three varices per whorl bearing long, strongly developed, abaxially recurved P1 spine placed at shoulder, three intervarical axial ribs on spire whorls, two ribs on last whorl.

Description. Medium sized shell (maximum length 62 mm), eroded paucispiral protoconch of 1.25 convex whorls, subfusiform teleoconch. Spire of five shouldered whorls with slightly concave, sloping sutural ramp. Last whorl 76% of the total length. Aperture ovate, 60% of length of last whorl including siphonal canal. Small, weakly developed anal notch, poorly developed parietal callus. Parietal lip smooth, columellar lip with four to six weak elongated denticles abapically, internal denticles on outer lip (visible only on paratypes 1 and 3) include ID and D1–D6. Labral varix moderately expanded, rounded, bearing a long, abaxially recurved spine at shoulder. Siphonal canal slightly dorsally recurved. Spiral sculpture of narrow primary, secondary and tertiary cords. First two whorls: P1–P2; third to fifth whorls: IP, P1–P3 and adis, s1–s3; body whorl: primary cords IP, P1–P6, ADP, MP and ABP, secondary cords adis, abis, s1–s6, ads, ms, abs, and tertiary cords. P4, P5, P6, MP and ABP are more strongly developed than ADP. Axial sculpture of three major varices per whorl, the varices are not foliose. Two or three rounded intervarical ribs on the spire whorls, and two intervarical ribs on the last whorl of adult specimens. Three well-developed P1 spines per whorl from the third whorl, P2–P3 spines atrophied, moderately developed P4, P5, MP and ABP spines, short ADP spine.

Remarks. Based on the generic diagnosis by Merle *et al.* (2011), the new species is assigned to genus *Siratus*. The morphological characters (subfusiform shell, paucispiral protoconch, rugate columellar lip, weak apertural denticles, recurved siphonal canal, sculpture with three spinose varices, strong P1, P5, MP and ABP spines) correspond to that of the type species, *S. senegalensis* (Gmelin) or other Recent species [e.g. *S. alabaster* (Reeve, 1845), *S. pliciferoides* (Kuroda, 1942)]. From the fossil record the recently described Early Miocene *S. harzhauseri* Landau & Houart, 2014 from Venezuela seems to be a closely allied form in the shell size and proportions.
Siratus hirmetzli n. sp. is abundant in the gastropod assemblage of Letkés. The occurrence of the new species at Lăpugiu de Sus (Făget Basin) (Fig. 1C–D) shows a wider distribution in the Central Paratethys.
Siratus hirmetzli n. sp. can be compared to species of two subgenera widespread in the Miocene of Europe. Species of *Murex* (*Promurex*) are distinguishable by longer and less recurved siphonal canal, and by a different sculpture. If varical spines are present —e.g. on the European Miocene–Pliocene *M.* (*P.*) *spinicosta* Bronn in Michelotti—, P1, P3, P5 and MP spines are dominant, while on *S. hirmetzli* P1, P4, P5, MP and ABP spines are strong, and P3 spine is absent. *Chicoreus* (*Triplex*) is a more closely allied subgenus. It is characterized by a similar morphology with trivaricate sculpture and slightly recurved siphonal canal. The species included in *Triplex*, however, differ by generally stronger apertural denticles, a smooth columellar lip, a deeper anal notch, a broader pseudoumbilicus, and a well-developed parietal callus. Although the development of spines is variable, all European fossil *Triplex* species have much weaker P1 and stronger ADP spines than that of *S. hirmetzli* n. sp.

Figure 1. *Siratus hirmetzli* n. sp. A–B. Holotype (PAL 2017.53.1, HNHM), length 55 mm (1.3x). C–D. Paratype 3 (PAL 2017.57.1, HNHM), length 37 mm (1.5x). E–F. Paratype 1 (Coll.H.2017.01), length 60 mm (1.2x). G–H. Coll.H.2017.04, length 62 mm (1.2x). I–J. Paratype 2 (Coll.H.2017.02), length 57.5 mm (1.2x). K. Coll.H.2017.03, length 30 mm (1.5x). A–B, E–K. Sámsonháza Formation, Letkés, Hungary, C–D. Dej Formation, Lăpugiu de Sus, Romania. Early Badenian (Middle Miocene) (photos by the author)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Recent species of *Siratus* occur in the Western Atlantic and Indo-Pacific regions, fossil specimens have been known also from these two regions only (Vokes, 1990; Houart, 1992; Merle *et al.*, 2011). The genus appeared first in the Lower Oligocene Red Bluff Formation (Mississippi, USA), ranged in the Early Oligocene–Plio-Pleistocene in the Western Atlantic (USA, Venezuela, Brazil, Dominican Republic, Jamaica, Mexico) and in the Early Miocene–Pliocene in the Indo-Pacific (New Zealand, Australia) regions.

Siratus has never been recorded in the European Cenozoic until now. The phylogenetic relationships between the Paratethys species described herein, and the species in the above mentioned regions require further research. It must be emphasized that the relationships between the W Atlantic and Indo-Pacific *Siratus* species are also unknown. This problem concerns other muricid genera as well, e.g. genus *Ocenebra* that occurs in the Early Miocene of the tropical W Atlantic with a species that resembles NE Atlantic species from the French Aquitaine Basin (Landau & Houart, 2014).

Etymology. Named in honour of Tamás Hirmetzl, Hungarian fossil collector.

Genus ***Dermomurex*** Monterosato, 1890
Subgenus ***Gracilimurex*** Thiele, 1929
Type species: *Murex bicolor* Thiele, 1929, by original designation (= *Aspella bakeri* Hertlein & Strong, 1951), Recent, Gulf of California.

Dermomurex (Gracilimurex) nemethi n. sp.
Fig. 2A–D

Type material. Holotype PAL 2017.55.1, Hungarian Natural History Museum, length 12.6 mm (Fig. 2A–B).
Paratype Coll.N.2017.01, Collection T. Németh (Fig. 2C–D).

Type strata. Lower Badenian (Middle Miocene) clayey sand (Sámsonháza Formation).

Type locality. Letkés, Hungary.

Material examined. Three specimens from Letkés.

Diagnosis. *Gracilimurex* species with elevated spire, shouldered teleoconch whorls, short siphonal canal, weakly dentate outer lip, expanded labral varix, four primary spiral cords, three to five varices on the spire whorls, bivaricate last whorl.

Description. Small shell (maximum length 12.6 mm), eroded protoconch and early teleoconch whorls. Spire of shouldered whorls, incised suture, slightly concave, sloping sutural ramp. Last whorl 67% of the total length. Aperture ovate, 71% of length of last whorl including siphonal canal. Absence of anal notch and parietal callus. Weakly developed inner apertural denticles on outer lip include D1–D4. Labral varix expanded, siphonal canal broad, short, open. Spiral sculpture of primary cords and fine threads. Second to fourth teleoconch whorls with P1–P2; body whorl with P1–P4, and spiral threads on convex part below P2. Axial sculpture of varices, and high, narrow, rounded axial ribs. Five major varices and three intervarical ribs on antepenultimate whorl, three varices and four ribs on penultimate whorl, two varices and six ribs on last whorl. P1–P3 nodose at intersection with axial varices.

Remarks. As discussed by Vokes (1985) and Merle *et al.* (2011), the bivaricate last whorl is the main distinctive character of the subgenus *Gracilimurex*. Other subgenera of the genus *Dermomurex*: *Takia*, *Trialatella* and *Viator* are all characterized by more varices on the body whorl. The bivaricate morphology is also typical of *Aspella*, however, it already appears on the spire whorls in this genus, while it is characteristic only on the last whorl in *Gracilimurex*. Based on these characters, the new species is assigned to the latter taxon.

Dermomurex (*Gracilimurex*) *nemethi* n. sp. is distinguishable from the type species *D.* (*G.*) *bakeri* by its lower spire and broader last whorl. It is closely allied in morphology to the Middle Miocene *Gracilimurex* sp. specimens figured by Merle *et al.* (2011, pl. 173, figs 1–2), but differs by shouldered teleoconch whorls. *Gracilimurex* is known from the NE Atlantic (Middle Miocene), W. Atlantic (Pleistocene–Recent) and E Pacific (Recent). It is a new record in the Paratethys. The occurrence in the Letkés assemblage confirms the extended stratigraphic and palaeogeographic ranges of the taxon which was recorded by Merle *et al.* (2011).

Etymology. Named in honour of Tamás Németh Hungarian fossil collector.

Subfamily **RAPANINAE** Gray, 1853
Genus ***Menathais*** Iredale, 1937
Type species: *Purpura pica* Blainville, 1832, by original designation (= *Galeoda tuberosa* Röding, 1798), Recent, Indo-West Pacific.

Menathais viciani n. sp.
Fig. 2E–L

Type material. Holotype PAL 2017.56.1, Hungarian Natural History Museum, length 26 mm (Fig. 2E–F).
Paratype 1: Coll.V.2017.01, Collection Vicián (Fig. 2G–H); paratype 2: Coll.H.2017.10, Collection Hirmetzl (Fig. 2I–J); paratype 3: Coll.N.2017.02, Collection Németh (Fig. 2K–L).

Type strata. Lower Badenian (Middle Miocene) clayey sand (Sámsonháza Formation).

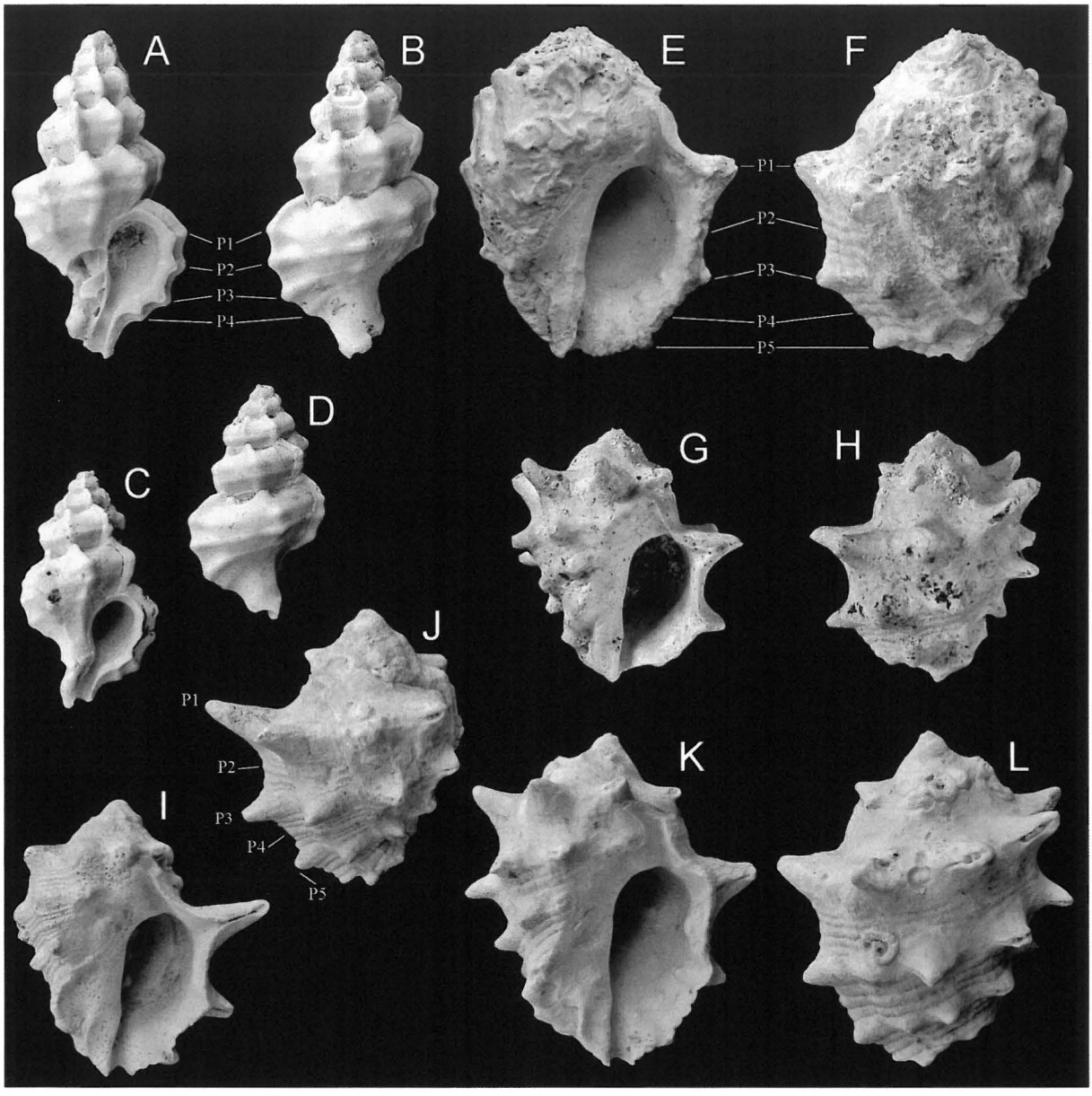

Figure 2. *Dermomurex* (*Gracilimurex*) *nemethi* n. sp. A–B. Holotype (PAL 2017.55.1, HNHM), length 12.6 mm (4x). C–D. Paratype (Coll.N.2017.01), length 9.4 mm (4x). *Menathais viciani* n. sp. E–F. Holotype (PAL 2017.56.1, HNHM), length 26 mm (2x). G–H. Paratype 1 (Coll.V.2017.01), length 20 mm (2x). I–J. Paratype 2 (Coll.H.2017.10), length 21.5 mm (2x). K–L. Paratype 3 (Coll.N.2017.02), length 26 mm (2x). Sámsonháza Formation, Letkés, Hungary, Early Badenian (Middle Miocene) (photos by Péter Balázs, Budapest)

Type locality. Letkés, Hungary.

Material examined. 15 specimens from Letkés, one specimen from Lăpugiu de Sus (HNHM).

Diagnosis. Small *Menathais* species with spire of medium length, shouldered, globose last whorl, short siphonal canal, dentate outer apertural lip, two spiral rows of high spines and a third row of tubercles, slightly expanded labral varix, low, rounded axial ribs on spire whorls.

Description. Small, robust shell (maximum length 26 mm), eroded protoconch (visible only on paratype 3), spire of about four shouldered whorls with slightly concave sutural ramp. Globose last whorl, 91% of the total length, slightly constricted at the base. Wide, ovate aperture 57–58% of the length of last whorl including siphonal canal. Well-developed anal notch, weak parietal callus. Four denticles within outer lip, columella smooth on juvenile specimens but adults (e.g. the holotype) bear two very weak wrinkles abapically, columellar lip slightly angulate above

siphonal canal. Labral varix slightly expanded and rounded, siphonal canal short, moderately deep, slightly recurved. Sculpture on spire whorls usually indistinct. Spiral sculpture of five basal primary cords with narrow secondary cords on last whorl. First and third cords bearing strong spines, fifth cord bearing strong tubercles, second and fourth cords faintly stronger than secondary cords. First row of spines on shoulder strongly developed with 8–10 long, sharp spines, spines of third cord less projected. Fourth spiral cord bearing small tubercles in holotype and in paratype 2 (Fig. 2E–F, I–J).

Remarks. The specimens with spiral rows of well-developed spines, and lack of strong columellar folds clearly differ from the species of the Badenian Ergalataxinae genera *Janssenia* and *Cathymorula*, and the Rapaninae genus *Stramonita* that are widespread in the Central Paratethys. The most closely allied form in morphology is the Recent *Menathais bimaculata* (Jonas, 1845) in the South Arabia region that is characterized by a globose shell, low spire, wide aperture, smooth columella and similar sculpture with three rows of tubercles. Based on these characters, the new species is assigned to genus *Menathais*. Nevertheless, this classification is provisional as the taxonomy of the Rapaninae is under revision in the recent literature. *Menathais* was revised by Claremont *et al.* (2013), and accorded full generic status including *M. tuberosa* (Röding, 1798), *M. intermedia* (Kiener, 1836) and *M. bimaculata*. *Menathais* has been known only in the Indo-West Pacific region as a Recent genus. The phylogeny shows that Rapaninae appeared in the Late Eocene and diversified in the Early Miocene. However, as the rapanines are rocky-bottom animals their fossil records are rather sparse (Vermeij & Carlson 2000), and fossil *Menathais* species have not been described. If the supraspecific classification presented here is correct, then the Early Badenian *M. viciani* n. sp. is the first fossil representative of the genus.

The material from Letkés is completed with a specimen from Lăpugiu de Sus in the collection of the HNHM (M60.10129). As with *Siratus hirmetzli* n. sp., the occurrence of *Menathais viciani* in the Făget Basin (Romania) confirms a wider distribution in the Central Paratethys. In addition, the poorly preserved specimen from Turkey illustrated by Landau *et al.* (2013, pl. 23, fig. 11) as *Cathymorula sismondai* has a broad shell and low spire, and it seems to possess a smooth columella and three tuberculate rows. These morphological features are close to those of *M. viciani* n. sp.

Etymology. Named in honour of Zoltán Vicián, Hungarian fossil collector.

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