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Sarmatian (Middle Miocene) ostracod fauna from the Zsámbék Basin, Hungary

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(with 2 figures, 1 table and 10 plates)

Abstract

Well preserved ostracod fauna derives from three boreholes of the Zsámbék Basin, from a small subbasin of the Central Paratethys. These drillings penetrated almost complete Sarmatian succession. Detailed descriptions and illustrations of the following 25 ostracoda taxa are provided: *Cnestocythere* aff. *truncata* (REUSS), *Amnicythere tenuis* (REUSS), *Amnicythere* (?) sp., *Euxinocythere (E.) diafana* (STANCHEVA), *E.* (*E.*) *naca* (MÉHES), *E.* (*E.*) *praebosqueti* (SUZIN), *Callistocythere egregia* (MÉHES), *C. incostata* PIETRZENIUK, *C. postvallata* PIETRZENIUK, *Cyamocytheridea dérii* (ZALÁNYI), *C. leptostigma leptostigma* (REUSS), *Hemicyprideis dacica dacica* (HÉJJAS), *Cytheridea hungarica* ZALÁNYI, *Miocyprideis janoscheki* KOLLMANN, *M. sarmatica* (ZALÁNYI), *Hemicytheria omphalodes* (REUSS), *Aurila mehesi* (ZALÁNYI), *A. merita* (ZALÁNYI), *A. notata* (REUSS), *Senesia vadaszi* (ZALÁNYI), *Loxoconcha kochi* MÉHES, *L. porosa* MÉHES, *L.* ex. gr. *punctatella* (REUSS), *Loxocorniculum hastatum* (REUSS), *Xestoleberis fuscata* SCHNEIDER. The studied Sarmatian ostracod fauna is most similar to that from the Vienna Basin. In general low diversity and great abundance of the r-strategist specimens are characteristic of both Sarmatian communities. Furthermore the representatives of Leptocytheridae, Cytherideidae and Hemicytheridae families are dominant in both area.

Introduction

The uplift of the Dinarids during the Middle Miocene caused a distinct change in the evolution of the Paratethys. This geodynamic process interrupted or limited the connection between the Central-Paratethys and the Mediterranean, but the seaway between the Eastern and Central Paratethys existed until the end of Sarmatian. Present days there is still a discussion about the changes of environmental factors in the basin of the Central Paratethys that caused faunal change at the Badenian/Sarmatian boundary. Almost the complete polyhaline fauna and microflora of the Late Badenian were eliminated, only few taxa persisted in the Sarmatian. The primary aim of this work is to give a detailed systematical description of the ostracods which is studied in the Central Paratethys, exactly in the Pannonian Basin. Detailed taxonomic work on the Hungarian Sarmatian ostracods has not been published since the first descriptions accomplished by

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ZALÁNYI in 1913 and my previous paper on the Lower Sarmatian ostracods from Budapest (TÓTH, 2004). Moreover a comparison with the other parts of the Central Paratethys are given on the basis of the fauna composition. For the present studies, the ostracod fauna from three boreholes, from the Zsámbék Basin (small subbasin of the Pannonian Basin) was collected.

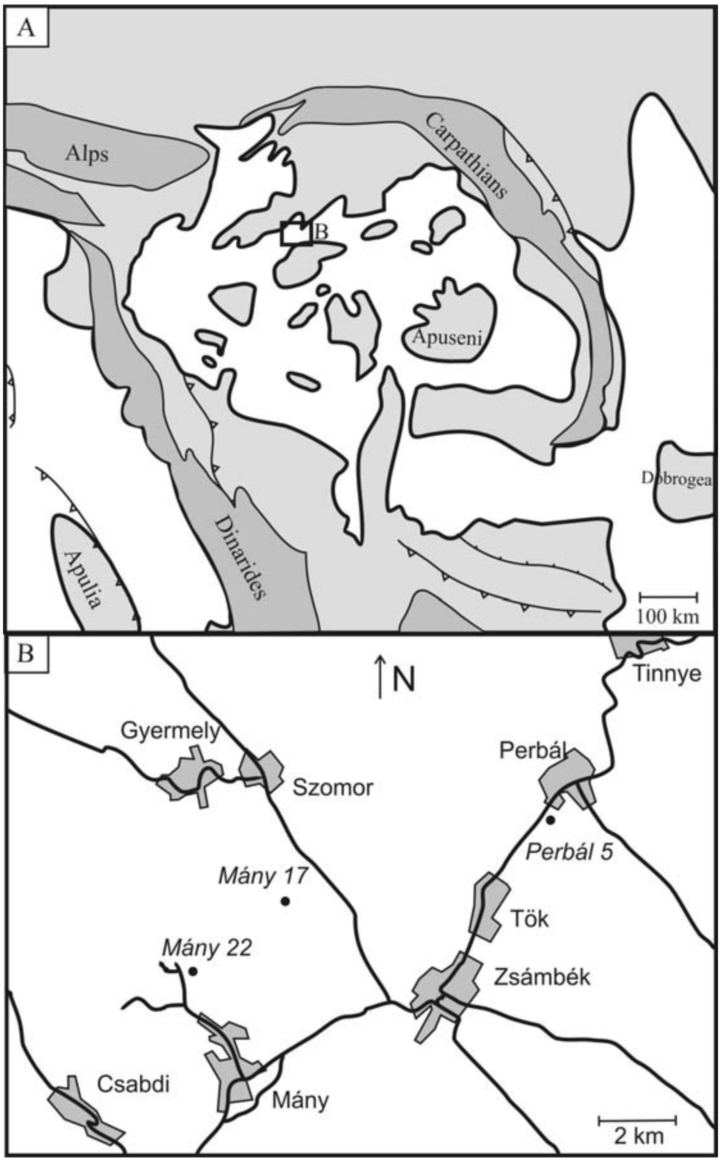

Fig. 1. Palaeogeographical map of the Central Paratethys based on POPOV et al. (2004) with the location of the Zsámbék Basin (A). The insert map (B) shows the position of the boreholes in the studied basin.

Previous work

First descriptions and illustrations of the Sarmatian ostracods were published by REUSS (1850) from the Vienna Basin. The great pioneers like MÉHES (1908) and ZALÁNYI (1913, 1929, 1956, 1959) studied Sarmatian ostracods from the region of Transylvania and Hungary. These taxonomic works are very important in the recognition of the Sarmatian ostracods, since they described numerous new species. Further studies from Hungary have been made by SZÉLES (1963), PIETRZENIUK (1973), SZUROMI-KORECZ, SZEGŐ (2001) and TÓTH (2004). Some papers including descriptions and/or illustrations of the Sarmatian ostracods applied to the other regions of the Central Paratethys, i.e. from Serbia and Croatia (KRSTIĆ, 1959; MITROVIĆ, RUNDIĆ, 1991), from Poland (CHOCZEWSKI, 1956; SZCZECHURA, 2000). From the Vienna Basin numerous studies dealt with the Sarmatian fauna: REUSS (1850), KOLLMANN (1958, 1971), CERNAJSEK (1971, 1972, 1974), GROSS et al. (2006). The Sarmatian ostracods from Slovakia and from the Czech Republic were investigated by DORNIČ, KHEIL (1963), JIŘIČEK (1974), ZELENKA (1989) and ZLINSKÁ, FORDINÁL (1994, 1995) and FORDINÁL et al. (2006).

Moreover several authors made ostracod zonations for the Sarmatian in the region of the Central Paratethys (JIŘIČEK, 1983; JIŘIČEK, RIHA, 1991; ZELENKA, 1990).

Material and methods

The investigated material is derived from three boreholes (Mány–17, Mány–22, Perbál–5) of Zsámbék Basin (20 km to west from Budapest) and they penetrated almost complete Sarmatian successions. Localities are shown in Fig. 1.

Sarmatian layers are underlain by the Badenian strata with similar lithology, but with sharp changes in biofacies as attested by a strong decrease in the diversity of the macro- and microfauna. The Sarmatian successions are overlain in Mány–22 and Mány–17 boreholes by Pleistocene, while in Perbál–5 boreholes by Lower Pannonian deposits. The lithology of the Sarmatian layers is varied; in the lower part of the Sarmatian series there are mainly grey, greenes-grey mollusc-bearing clays, clay marls, with intercalations of sandstones and calcareous marls. Moreover the clay marls contain diatomite, alginite and bentonite intercalations (SAS, 1977). This series is placed in the Kozardi Formation (HÁMOR, 1997). The upper part of the Sarmatian succession belongs to the Tinnyei Formation (HÁMOR, IVANCSICS, 1997) and consists of calcareous sandstones and oolithic limestones. There are sand infiltrations between these layers (Fig. 2).

In each borehole three foraminiferal zones (E. reginum Zone, E. hauerinum Zone, S. austriaca Zone) could be distinguished (GÖRÖG, 1992). The present study was based on 122 samples from 3 boreholes containing determinable ostracod fauna. For the paleontological analyses about 100 g of the air-dried sediments has been soaked in a dilute solution of hydrogen peroxide. Ostracods were picked and identified using the usual method for fossil ostracods. The terminology of the descriptions are following MORKHOVEN (1962). In this study detailed descriptions are not given for those species which were described in the previous work of the author (Tóth, 2004). The photos were made by scanning electron microscope.

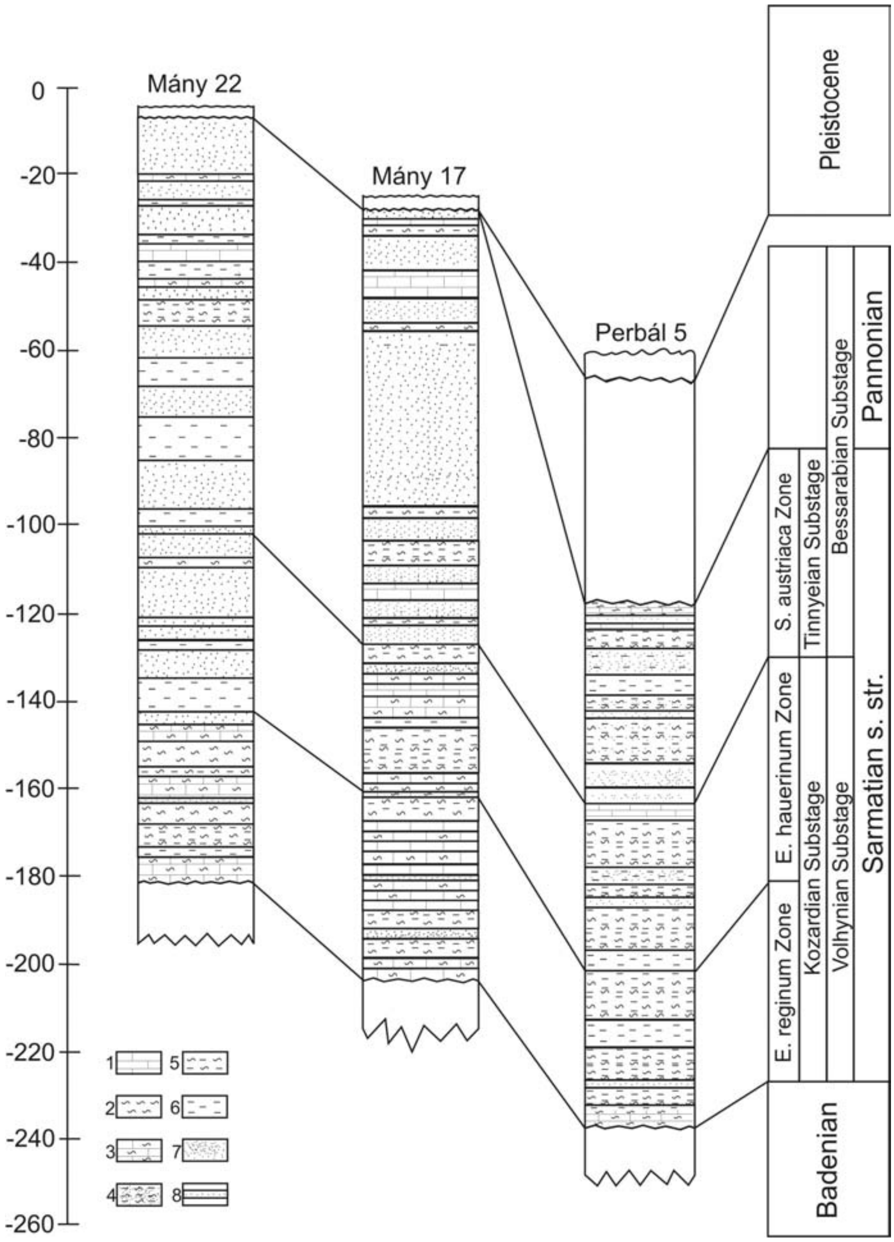

Fig. 2. Lithostratigraphical sections of the studied boreholes. 1 – limestone, 2 – marl, 3 –calcareous marl, 4 – silty clay marl, 5 – clay marl, 6 – clay, 7 – sandstone and sand, 8 – tuff (modified after Görög, 1992).

Tab. 1. Stratigraphical distribution of the ostracod species from the Zsámbék Basin in the Sarmatian.

Species of ostracod	*E. reginum* Zone	*E. hauerinum* Zone	*S. austriaca* Zone
Cnestocythere aff. *truncata* (REUSS, 1850)			x
Amnicythere sp.		x	x
Amnicythere tenuis (REUSS)	x	x	x
Euxinocythere (E.) diafana (STANCHEVA)	x	x	x
Euxinocythere (E.) naca (MÉHES)			x
Euxinocythere (E.) praebosqueti (SUZIN)			x
Callistocythere egregia (MÉHES)	x	x	x
Callistocythere incostata PIETRZENIUK	x		
Callistocythere postvallata PIETRZENIUK	x		
Cyamocytheridea dérii (ZALÁNYI, 1913)			x
Cyamocytheridea leptostigma leptostigma (REUSS)			x
Hemicyprideis dacica dacica (HÉJJAS)	x	x?	x
Cytheridea hungarica ZALÁNYI	x		
Miocyprideis janoscheki KOLLMANN			x
Miocyprideis sarmatica (ZALÁNYI)	x		
Hemicytheria omphalodes (REUSS)	x	x	x
Aurila méhesi (ZALÁNYI)	x		
Aurila merita (ZALÁNYI)	x		
Aurila notata (REUSS)		x	x
Senesia vadászi (ZALÁNYI)	x		
Loxoconcha kochi MÉHES			x
Loxoconcha porosa MÉHES		x	x
Loxoconcha ex gr. *punctatella* (REUSS)	x		
Loxocorniculum hastatum (REUSS)	x	x	x
Xestoleberis fuscata SCHNEIDER	x	x	x

Characteristics of the Sarmatian ostracod fauna

The Sarmatian successions from the studied boreholes (Mány–22, Mány–17, Perbál–5) show great abundance of the well preserved ostracods. It seems that this ostracod fauna represents the original biocenosis because the small-sized and large-sized forms coexist. The fauna does not show significant mechanical selection; the juvenile forms generally coexist together the adult forms. From the whole Sarmatian succession 25 ostracod taxons belonging to one order (Podocopida), 5 families (Cytheridae, Leptocytheridae, Cytherideidae, Hemicytheridae, Loxoconchidae, Xestoleberididae) and 13 genera could be distinguished (Tab. 1).

The stratigraphical distribution of the ostracod taxa in the studied sections is shown in Tab. 1. In the lower E. reginum Zone 15, in the E. hauerinum Zone 9 and in the S. austriaca Zone 17 species can be found. Only 6 species occur throughout the whole Sarmatian section. Presumably the species *H. dacica dacica* is also present in the entire Sarmatian succession, however it is rare in the middle zone. 8 species can be observed only in the lower zone, while 7 species are only in the upper foraminiferal zone. Species, which are limited only to the middle zone, have not been found yet, but 3 new species appear in the E. hauerinum Zone.

In the E. reginum Zone among the 15 species three species namely *Aurila mehesi*, *Cytheridea hungarica* and *Senesia vadaszi* are most frequent. The ostracod fauna in the E. hauerinum Zone is less diversified than in the lower zone. In these beds the so-called small-sized ostracods (*Amnicythere, Euxinocythere, Callistocythere, Loxoconcha, Xestoleberis*) became conspicuous beside the *Aurila notata* and *Hemicytheria omphalodes* which also appeared in great number. In some samples *Hemicytheria omphalodes* occurs in great abundance. At the boundary between the E. hauerinum and S. austriaca Zone a pronounced increasing of the diversity of ostracods can be observed. In the latter zone *Aurila notata* become dominant generally; except some samples where *Cyamocytheridea leptostigma leptostigma* is the prevalent species. Few Badenian species being absent in the Lower Sarmatian layers, i. e. *Cyamocytheridea dérii* (i. e. ZORN, 2004, KOLLMANN, 1958), *C. leptostigma leptostigma* (AIELLO, SZCZECHURA, 2004)*, Miocyprideis janoscheki* (BRESTENSKÁ, JIŘIČEK, 1978; JIŘIČEK, 1983) occur here.

The forms originated from Lower Miocene (*Callistocythere egregia, Hemicyprideis dacica dacica*, *Hemicytheria omphalodes*, *Senesia vadaszi, Loxoconcha* ex. gr. *punctatella*, *Loxocorniculum hastatum* and *Xestoleberis fuscata*) and the endemic fauna (*Cnestocythere* aff. *truncata*, *Amnicythere* sp., *A. tenuis, Callistocythere incostata*, *Euxinocythere (E.) praebosqueti*, *E. (E.) diafana*, *E. (E.) naca, Cytheridea hungarica*, *Miocyprideis sarmatica*, *Aurila merita, A. mehesi, Loxoconcha kochi, L. porosa*) evolved in the Sarmatian Paratethys are present in the studied ostracod assemblage. Only two species of the Mediterranean (*Hemicyprideis dacica dacica, Loxocorniculum hastatum*) are present in the Sarmatian fauna of the Zsámbék Basin. This fact supports that the connection between the Paratethys and the Mediterranean became very restricted or possibly stopped at Badenian/Sarmatian boundary. The presence of the seaway between the Central Paratethys and Eastern Paratethys during the Sarmatian is confirmed by the studied ostracod fauna. More than half of the determined species are present in both basins of the Paratethys (*Euxinocythere (E.) diafana*, *E. (E.) naca, E. (E.) praebosqueti, Amnicythere tenuis*, *Cyamocytheridea leptostigma leptostigma*, *Hemicyprideis dacica dacica*, *Miocyprideis sarmatica, Aurila mehesi, A. notata, Senesia vadászi, L. kochi, L. porosa, Xestoleberis fuscata*) (i. e. STANCHEVA, 1963, 1990; SCHNEIDER, 1953, SUZIN, 1956). The fauna in the Eastern Paratethys seems to be more diversified that one found in the Central Paratethys. However the comparison of the faunas in the basins is very difficult due to the poor records from the Eastern Paratehys that can be evaluated.

The comparison with the Sarmatian ostracods of the southwestern part of the Central Paratethys is also not easy because only some taxa were described and illustrated by KRSTIĆ (1959, 1972, 1980), MITROVIĆ, RUNDIĆ (1991) from Serbia. They belong to *Aurila mehesi, Miocyprideis sarmatica, Cytheridea hungarica, Loxoconcha kochi, L. porosa*. However other Sarmatian species (*Leptocythere naca, Hemicytheria omphalodes*) from Hungary were described from the Pannonian beds of Croatia and Serbia (Sokač, 1967, 1972).

Detailed taxonomic work from the Polish Sarmatian ostracod fauna has not been made yet. Only some forms were published by CHOCZEWSKI (1956) and SZCZECHURA (2000). *Aurila mehesi, A. merita* and *Senesia vadaszi* occur in Poland as well as in Hungary. *Cyamocytheridea leptostigma, Loxoconcha* ex gr. *punctatella* and *Loxocorniculum hastatum* were determined by AIELLO and SZCZECHURA (2004), and SZCZECHURA (2006) from older Miocene (Badenian) of the Western Carpathians.

Sarmatian ostracods from different localities of the Czech Republic and Slovakia were described in detail and illustrated by JIŘIČEK (1974) and were illustrated by ZLINSKÁ and FORDINÁL (1994, 1995, 2006). This Sarmatian ostracod fauna shows similarity to the ostracod fauna from the Zsámbék Basin. The latter one is more diversified.

My results comparing to the taxonomic works made by CERNAJSEK (1974) and GROSS et al. (2006) from the Vienna Basin can be stated that these faunas are very identical. The number of the common species is 20 (about 80%). Low diversity and an abundance of the r-strategist species are characteristic of both Sarmatian faunas. The representatives of the Leptocytherideidae, Cytherideidae and Hemicytheridae families are present in a great number in both ostracod communities.

The comparison of the studied ostracod fauna to the Sarmatian fauna from the eastern part of the Central Paratethys (Transylvania and southwestern Ukraine) is not possible because of the scarce reliable data.

Conclusions

The studied Sarmatian ostracod fauna from the Zsámbék Basin is less diversified than the fauna of the Badenian. Only 25 taxa belonging to the Podocopida could be distinguished in the Sarmatian successsions. It consists mainly of the endemic species (70 %). Only two Mediterranean species and the dominance of the endemic forms suggest the very restricted or interrupted connection between the Paratethys and the Mediterranean in the Sarmatian while the seaway between the Central and Eastern Paratethys existed until the end of Sarmatian. This latter is supported by the presence of more than 50 % of the ostracod species in both basins of the Paratethys. In the Central Paratethys the studied Hungarian Sarmatian fauna is most similar to the ostracod fauna from the Vienna Basin in comparison with the fauna of the surrounding region.

During the Sarmatian the taxonomic structure of the fauna shows a significant change in the middle (E. hauerinum) zone. In this zone the number of species is strongly reduced in comparison with the ostracod assemblage of the lower (E. reginum) zone. Numerous species (8) disappear at the upper boundary of the lower zone and three new species appear. After the decrease of the diversity in the E. hauerinum Zone many taxa appear in the upper S. austriaca Zone beside the extant forms. This significant change of the ostracod fauna coincides with the alteration of the foraminiferal assemblages studied by GÖRÖG (1992). This fact confirms that the Sarmatian in the studied area can be divided into three zones based on the microfauna.

Acknowledgements

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Systematical part

After HARTMANN and PURI, 1974

Phylum Arthropoda SIEBOLD et STANNIUS, 1845
Subphylum Crustacea PENNANT, 1777
Class Ostracoda LATREILLE, 1802
Order Podocopida G. W. MÜLLER, 1894
Suborder Podocopa SARS, 1866
Superfamily Cytheracea BAIRD, 1850
Family Cytheridae BAIRD, 1850
Subfamily Cytherinae BAIRD, 1850
Genus *Cnestocythere* TRIEBEL, 1950

Cnestocythere aff. *truncata* (REUSS, 1850)
Pl. 1, Figs 1–4.

1974. *Cnestocythere* sp. – CERNAJSEK, p. 481, pl. 3, fig. 10.
2006. *Cnestocythere* sp. – GROSS, PILLER, p. 24–25, pl. VI, figs 5, 6–9, Pl. 7, figs 5–6.

Material: Mány–22: 1 RV, Mány–17: 10 RV, 7 LV (?juveniles).
Dimensions (in mm): L= 0,6–0,64 mm, H= 0,36–0,39 mm, L/H= 1,54–1,78.
Description: The outline of valves subrectangular or elongated triangular in lateral view; anterior outline slightly asymmetrically rounded; dorsal outline gently concave and declined towards the posterior end; posterior margin with an elongated and pointed caudal process situated centrally; ventral outline almost straight and somewhat covered by the lateroventral inflation bordered by distinct rib, maximum height situated under the anterodorsal distinct eye-tubercle.

Ornamentation: numerous prominent ribs of which the most characteristic seem: the median rib extending from the anterior margin up to the posterodorsal corner, anterior rib parallel to the anterior margin, dorsal rib along the hinge margin and distinct rib bordering the lateroventral inflation, this latter is bordered in its lower part and the posterior part, where it reaches to the median rib.

Inner lamella narrow with a prominent flange and a selvage situated halfway beetwen outer and inner margin; normal pore canals numerous, large and sieve-type;

marginal pore canals few, straight and simple; hinge merodont with crenulated, elongated anterior and posterior teeth and a finely crenulated groove in the right valve with complementary elements are in the left valve; central muscle scars pattern consists of four scars and a V-shaped frontal scar.
Remarks: This species is very similar to the specimen described by REUSS (1850) as *Cytherina truncata* (now *Cnestocythere truncata*) that is common in the Badenian of the Central Paratethys (i. e. GROSS, PILLER, 2006; BRESTENSKÁ, JIŘIČEK, 1978). The major differences are details of ornamentation of these specimens. The Hungarian specimens are smaller and less ornamented, but they retain most of the characteristic features for the discussed species. These specimens may be juveniles or ecological variations.
Stratigraphical and geographical distribution: Upper Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974; GROSS, PILLER, 2006), Hungary (Zsámbék Basin) (this work).

Family Leptocytheridae HANAI, 1957
Subfamily Leptocytherinae HANAI, 1957
Genus *Amnicythere* DEVOTO, 1965

Amnicythere tenuis (REUSS, 1850) s. l.
Pl. 2, Figs 1–3, 5.

1850. *Cytherina tenuis* n. sp. – REUSS, pl. VIII, fig. 14.
1908. *Krithe paralella* n. sp. – MÉHES, p. 615, pl. 10, figs 1–3.
1967. *Cytherina tenuis* REUSS, 1850 – KLEIN, p. 615, fig. 1.
1974. *Amnicythere paralella* (MÉHES) – HANGANU, pl. III, figs 25–26.
1974. *Leptocythere tenuis* (REUSS) – CERNAJSEK, p. 475– 476, pl. II, fig. 6.
1990. *Amnicythere mironovi mironovi* (SCHNEIDER) – STANCHEVA, p. 55–56, pl. XIX, figs 1–2.
1990. *Amnicythere mironovi effigiata* (STANCHEVA) – STANCHEVA, p. 56, pl. XIX, figs 3–4.
1995. *Leptocythere* sp. – ZLINSKÁ, FORDINÁL, pl. XXVIII, fig. 6.
1998. *Amnicythere plana* (SCHNEIDER) – OLTEANU, pl. VIII, fig. 1.
1998. *Amnicythere* aff. *plana* (SCHNEIDER) – OLTEANU, pl. VIII, fig. 3.
2000. *Leptocythere* cf. *Leptocythere* sp. ZLINSKÁ, FORDINÁL – SZCZECHURA, pl. VII, fig. 14.
2004. *Leptocythere tenuis* (REUSS)– TÓTH, p. 133–134, pl. II, figs 1–3.

Material: Mány–22: 2 carapaces, 35 RV, 13 LV (2 juveniles, 48 adults), Perbál–5: 19 RV, 10 LV (1 juveniles, 28 adults), Mány–17: 840 RV, 342 LV (30 juveniles, 1152 adults).
Dimensions (in mm): L= 0,51–0,55 mm; H= 0,25–0,28 mm; L/H= 1,96–2,04.
Remarks: The almost smooth specimens with ripples at posterior end are characteristic in the Zsámbék Basin but some more ornamented specimens (with reticulation and few thiny ribs attained the the upper part of the sulcus) also present in the studied material. In my opinion these latter specimens also belong to the species described by REUSS (1850). both forms are probably ecological variations because of the presence of transitional forms, however STANCHEVA (1963) the ornamented specimens described as new subspecies.

Based on the details in the features of marginal pore canals and hinge elements the species belong to the *Amnicythere* DEVOTO, 1965 genus (STANCHEVA, 1968).
Stratigraphical and geographical distribution: Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974), Poland (Upper Silesia) (SZCZECHURA, 2000), Hungary (Zsámbék Basin, Budapest) (this work, TÓTH, 2004), Lower Sarmatian: eastern Slovakia (ZLINSKÁ, FORDINÁL, 1995), Romania (Transylvania) (OLTEANU, 1998), Bessarabian: northern Bulgaria (STANCHEVA, 1963, 1990), Pannonian: Hungary (MÉHES, 1908), Pontian: Romania (Dacian Basin) (HANGANU, 1974).

Amnicythere (?) sp. (REUSS, 1850)
Pl. 2, Figs 5,6.

1974. *Leptocythere* sp. – CERNAJSEK, p. 488– 489, pl. II, fig. 7.
1998. *Amnicythere* aff. *plana* (SCHNEIDER) – OLTEANU, p. 153, pl. VIII, fig. 7.

Material: Mány–22: 2 carapaces, 16 RV, 8 LV, Perbál–5: 4 RV, 3 LV, Mány–17: 48 RV, 24 LV (only adults).
Méret (mm): L= 0,54–0,65 mm; H= 0,24–0,31 mm; L/H= 2,07–2,25.
Description: The outline of valves subrectangular and slightly tapered posteriorly in lateral view, anterior outline nearly symmetrically rounded in the right valve while slightly asymmetrically rounded in the left valve; dorsal outline nearly straight; posterior outline narrowly and symmetrically rounded; ventral outline nearly straight, gently sinuous in front of the mid-length of valve; maximum height near the anterior end.

Ornamentation: the valve surface reticulated tend to be arranged in rows along the anterior, ventral and posterior margin, few thiny ribs attained the the upper part of the sulcus.
Remarks: The classification of the specimens from the Zsámbék Basin are uncertain because the internal features are not visible. The degree of ornamentation distinctly varies. The more ornamented specimens are more frequent in the Zsámbék Basin.
Stratigraphical and geographical distribution: Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974), Lower Sarmatian: Romania (Transylvania) (OLTEANU, 1998), Upper Sarmatian: Hungary (Zsámbék Basin) (this work).

Genus *Callistocythere* RUGGIERI, 1953

Callistocythere egregia (MÉHES, 1908)
Pl. 2, Fig. 4.

1908. *Cythere egregia* n. sp. – MÉHES, p. 546–548, pl. 9, figs 17–23.
1973. *Callistocythere pusztafaluensis* n. sp. – PIETRZENIUK, p. 716–718, pl. II, figs 7–8, pl. VI, fig. 1–6, fig. 11–12.
1974. *Callistocythere egregia* (MÉHES) – CERNAJSEK, p. 476– 477, pl. II, fig. 8.
1998. *Callistocythere* aff. *canaliculata* (REUSS) – ZORN, p. 184–185.
2004. *Callistocythere egregia* (MÉHES)– TÓTH, p. 135, pl. I, figs 1–4.

Material: Mány–22: 789 carapaces, 1421 RV, 1105 LV, Perbál–5: 13 carapaces, 24 RV, 18 LV, Mány–17: 70 carapaces, 126 RV, 98 LV (only adults).
Dimensions (in mm): L= 0,49–0,52 mm, H= 0,25–0,27 mm, L/H= 1,92–1,96.
Remarks: Most specimens only a week ornamentation, however it seems to be greatly variable in the studied samples.
Stratigraphical and geographical distribution: Karpatian: Lower Austria (ZORN, 1998) Sarmatian: Hungary (Tokaj Hill and Zsámbék Basin) (PIETRZENIUK, 1973, this work) Lower Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974), Pannonian: Hungary (MÉHES, 1908).

Callistocythere incostata PIETRZENIUK, 1973
Pl. 2, Figs 7,8.

1973. *Callistocythere incostata* n. sp. – PIETRZENIUK, p. 714–716, pl. II, figs 9–10, pl. VI, figs 7–9, fig. 10.
2006. *Callistocythere* sp. – FORDINÁL et al, p. 127, fig. 4/7.

Material: Mány–22: 3 RV, 2 LV, Perbál–5: 1 RV, 1 LV, Mány–17: 28 RV, 29LV (only adults).
Dimensions (in mm): L= 0,5–0,56 mm, H= 0,26–0,31 mm, L/H= 1,8–1,92.
Description: The outline of valves elongated and bean-shaped in lateral view; anterior outline broadly rather simmetrically rounded; dorsal outline nearly straight; posterior margin broadly rounded and indistinctly truncated in its upper part; ventral outline gently sinuous in front of the mid-length of the valve; maximum height located near the anterior end.

Ornamentation: prominent reticulation on the entire valve surface which tend to be arranged in rows along the ventral and posterior parts and more or less regular ribs of which obliquely running near the anterior margin, almost vertical rib parallel to the posterior margin and short posteroventral rib seem most characteristic; few thiny ribs near the dorsal margin tend to attain the upper part of the sulcus.
Variability: Some specimens are less ornamented whit less developed posterior rib.
Remarks: The holotype of this species is described by PIETRZENIUK (1973) from the Sarmatian of Hungary (from the Tokaj Hill).
Stratigraphical and geographical distribution: Lower Sarmatian: Hungary (Tokaj Hill, Zsámbék Basin) (PIETRZENIUK, 1973, this work), Slovakia (northern part of the Danube Basin) (FORDINÁL et al., 2006).

Callistocythere postvallata PIETRZENIUK, 1973
Pl. 3, Fig. 1.

1973. *Callistocythere postvallata* n. sp. – PIETRZENIUK, p. 714–716, pl. II, figs 9–10, pl. VI, figs 7–9, fig. 10.
?2006. *Callistocythere postvallata* PIETRZENIUK– GROSS, PILLER, p. 28, pl. IX, figs 1–10.

Material: Mány–22: 2 RV (only adults).
Dimensions (in mm): L= 0,52 mm, H= 0,28 mm, L/H= 1,85.

Description: Similar to *Callistocythere incostata*, except for the posterior outline, that is symmetrically rounded; eye-tubercle weakly developed.

Ornamentation: the valve surface finely reticulated, an irregular short rib extending downward from the eye-tubercle and few distinct knobs (nodes) of which those near the center of the posterior end, near the posteroventral and centroventral part as well in the anterocentral part appear most typical for this species.

Remarks: The holotype of the species is described by PIETRZENIUK (1973) from the Sarmatian of Hungary (from the Tokaj Hill). The forms illustrated by GROSS and PILLER (2006) are more strongly reticulated than the holotype and the specimens found in the studied samples.

Stratigraphical and geographical distribution: Lower Sarmatian: Hungary (Tokaj Hill, Zsámbék Basin) (PIETRZENIUK,1973, this work), (?) Upper Badenian: Austria (Vienna Basin) (GROSS, PILLER, 2006).

Genus *Euxinocythere* STANCHEVA, 1968

Euxinocythere (Euxinocythere) diafana (STANCHEVA, 1963)
Pl. 1, Figs 5,6.

1963. *Leptocythere diafana* n. sp. – STANCHEVA, p. 21, 44, 54, pl. III, fig. 11.
1974. *Leptocythere diafana* STANCHEVA – JIŘIČEK, p. 442, pl. III, figs 3–4.
1990. *Euxinocythere (Euxinocythere) diafana* (STANCHEVA) – STANCHEVA, p. 63, pl. XXIV, fig 6.

Material: Mány–22: 3 RV, Mány–17: 26 RV, 6 LV (only adults).
Dimensions (in mm): L= 0,47–0,48 mm, H= 0,25–0,27 mm, L/H= 1,74–1,92.
Description: The outline of valves elongated and bean-shaped in lateral view; anterior outline rather broadly somewhat obliquely and asymmetrically rounded; dorsal margin nearly straight in the right valve, slightly arched in the left valve and declined slightly towards the posterior end; posterior margin narrowly and symmetrically rounded; ventral outline weakly sinuous in front of the mid-length; maximum height near the anterior end; eye spot absent.

Ornamentation: the valve surface sparsely but coarsely pitted. Three slight ripples occur along the anterior margin of both valves and one ripple along the posterior end in the left valve.

Sexual dimorphism: the male forms are more elongated than females.

Remarks: The specimens of the Zsámbék Basin are very related to the original description from Bulgaria (STANCHEVA, 1963).

Stratigraphical and geographical distribution: Sarmatian: northern Bulgaria (STANCHEVA, 1963, 1990), Slovakia (Vienna Basin and eastern region) (JIŘIČEK, 1974), Hungary (Zsámbék Basin) (this work).

Euxinocythere (Euxinocythere) naca (MÉHES, 1908)
Pl. 1, Fig. 7.

1908. *Cythere naca* n. sp. – MÉHES, p. 548–549, pl. X, figs 8–12.
?1961. *Leptocythere naca* (MÉHES) – AGALAROVA, p. 122, pl. LXX, figs 8–9.

?1965. *Leptocythere naca* (MÉHES) – STANCHEVA, p. 26, pl. IV, fig. 3.
?1966. *Leptocythere naca* (MÉHES) – SCHEIDAJEVA-KULCEVA, p. 85, pl. III, fig. 3ab.
1967. *Leptocythere naca* (MÉHES) – AGALAROVA, p. 105–106, pl. XV, figs 5–6.
1967. *Leptocythere naca* (MÉHES) – SOKAČ, pl. III, fig. 1.
1972. *Leptocythere naca* (MÉHES) – SOKAČ, p. 66, pl. XXX, figs 11–13.
1973. *Leptocythere (Amnicythere) naca* (MÉHES) – KRSTIĆ, p. 85–86, figs 112–115, pl. II, figs 3–6, pl. V, figs 4–7, pl. VI, fig. 9.
1974. *Callistocythere naca* (MÉHES) – CERNAJSEK, p. 477–478, pl. II, fig. 9.
1975. *Leptocythere naca* (MÉHES) – IONESI, CHINTĂUAN, pl. I, fig. 16.
1982. *Leptocythere naca* (MÉHES) – SZÉLES, p. 252, pl. XI, fig. 7.
1985. *Leptocythere naca* (MÉHES) – IONESI, CHINTĂUAN, pl. II, fig. 2.
1986. *Leptocythere naca* (MÉHES) – IONESI, CHINTĂUAN, pl. II, fig. 1.
1990. *Leptocythere naca* (MÉHES) – ZELENKA, pl. I, fig. 10.
1990. *Euxinocythere (Euxinocythere) spinulosa* (VOROSHILOVA) – STANCHEVA, p. 75–76, pl. XXIV, fig 1.
2000. *Leptocythere naca* (MÉHES) – SZCZECHURA, pl. VII, figs 7–10.

Material: Mány–22: 2 RV, 4 LV, Perbál–5: 2 LV, Mány–17: 17 RV, 51 LV (only adults).
Dimensions (mm): L= 0,47–0,51 mm; H= 0,25–0,26 mm; L/H= 1,88–1,92.
Description: The outline of valves subrectangular in lateral view; anterior outline slightly asymmetrically rounded; dorsal margin nearly straight; posterior end nearly symmetrical, ventral outline gently sinuous in front of the mid-length of valve; maximum height at one third of the length; eye spot absent.

Ornamentation: the valve surface heavily and densely ornamented by spines and small tubercles.
Remarks: The specimens illustrated by AGALAROVA (1961), STANCHEVA (1965) and SCHEIDAJEVA- KULCEVA (1966) are similar in their outlines and general appearance to the holotype of *Euxinocythere (Euxinocythere) naca* described by MÉHES (1908) and to the studied specimens, but their ornamentation seems different. The valves of the species presented by these authors seem to bear large knobs. It is difficult to decide whether the presence of these knobs is due to their true lateral features or results of inaccuracy of the drawings. In my opinion based on the details in the features of marginal pore canals and hinge elements the species can be classify in the *Euxinocythere (Euxinocythere)* subgenus described by STANCHEVA (1968).
Stratigraphical and geographical distribution: Sarmatian: Austria (Vienna Basin, Danube Basin) (CERNAJSEK, 1974, ZELENKA, 1990), Romania (Moldavian Platform, Dobrogea) (IONESI, CHINTĂUAN, 1975, 1985, 1986), Poland (Upper Silesia) (SZCZECHURA, 2000), Sarmatian (Volhynian): northern Bulgaria (STANCHEVA, 1990), Upper Sarmatian: Slovakia (Vienna Basin, Danube Basin) (ZELENKA, 1990), Hungary (Zsámbék Basin) (this work), Pannonian: Hungary (MÉHES, 1908; SZÉLES, 1982), Serbia (KRSTIĆ, 1973), Croatia (southwestern Pannonian Basin) (SOKAČ, 1967, 1972), Pontian: Azerbaijan (AGALAROVA, 1967), Serbia (KRSTIĆ, 1973), Croatia (southwestern Pannonian Basin) (SOKAČ, 1967, 1972)

Euxinocythere (Euxinocythere) praebosqueti (SUZIN, 1956)
Pl. 3, Figs 2–5.

1956. *Leptocythere praebosqueti* n. sp. – SUZIN, p. 83, pl. III, figs 2–4.
1972. *Euxinocythere (E.) praebosqueti praebosqueti* (SUSIN) – STANCHEVA, pl. I, fig 1.
1972. *Euxinocythere (E.) praebosqueti traessae* (SUSIN) – STANCHEVA, pl. II, figs 12–13.
1990. *Euxinocythere (Euxinocythere) praebosqueti praebosqueti* (SUZIN) – STANCHEVA, p. 70–71, pl. XXIII, figs 9–10.
1990. *Euxinocythere (Euxinocythere) praebosqueti traessae* (SUZIN) – STANCHEVA, p. 73, pl. XXVI, figs 1,2.

Material: Mány–22: 8 RV, 11 LV (mainly adults), Perbál–5: 1 carapaces, 9 RV, 11 LV (mainly adults), Mány–17: 23 carapaces, 351 RV, 445 LV (82 juveniles, 737 adults).
Dimensions (in mm): L= 0,49–0,5 mm, H= 0,2–0,26 mm, L/H= 1,9–2,1.
Description: The outline of valves elongated and bean-shaped in lateral view; anterior outline broadly asimmetrically rounded; dorsal outline nearly straight; posterior margin broadly rounded and indistinctly truncated in its upper part; ventral outline gently sinuous in front of the mid-length of the valve; maximum height located near the anterior end; eye tubercle well developed.

Ornamentation: irregularly reticulation and irregularly running numerous ribs; the most characteristic the posterior prominent rib parallel and close to the posterior margin as well as proximally running less distinct rib attending the weakly developed adventral rib; both are joining together at the dorsal margin; two weakly ribs also occur along the hinge margin, moreover rather well developed rib situated obliquely below the eye-tubercle. Thiny rib runs parallely to the latest one.

Sexual dimorphism: The male forms are more elongated than females.
Variability: The degree of ornamentation varies, mainly the distinctness of ribs.
Remarks: The most characteristic features of the studied specimens are very related to the holotype described by SUZIN (1956) despite of the inaccuracy of the original drawing.
S*ratigraphical and geographical distribution:* Sarmatian: northern Bulgaria (STANCHEVA, 1972, 1990), Upper Sarmatian: Hungary (Zsámbék Basin) (this work), Bessarabian: Russia (Caucasus) (SUZIN, 1956).

Family Cytherideidae SARS, 1925
Subfamily Cytherideinae SARS, 1925
Genus *Cyamocytheridea* OERTLI, 1956

Cyamocytheridea derii (ZALÁNYI, 1913)
Pl. 4, Fig. 5.

1913. *Cytheridea dérii* n. sp. – ZALÁNYI, p. 103–105, pl. VI, figs 12–14, fig. 18.
1958. *Cyamocytheridea derii* (ZALÁNYI) – KOLLMANN, p. 155, pl. X, figs 9–10, 17–25.
1967. *Cyamocytheridea derii* (ZALÁNYI) – KHEIL, p. 216, pl. 1c, fig. 2.
1998. *Cyamocytheridea derii* (ZALÁNYI) – ZORN, p. 187, pl. III, figs 1–3, pl. XV, fig. 3.
2003. *Cyamocytheridea derii* (ZALÁNYI) – ZORN, pl. II, fig. 4.

2004. *Cyamocytheridea derii* (ZALÁNYI) – ZORN, p. 183, pl. II, figs 10–11.

Material: Mány–22: 2 LV, Mány–17: 2 LV (adults).
Dimensions (in mm): L= 0,92 mm, H= 0,56 mm, L/H= 1,64.
Description: the outline of valve subovate in lateral view; anterior outline is widely, almost symmetrically rounded; dorsal margin gently arched; posterior outline rather narrowly and also symmetrically rounded; ventral margin nearly straight, slightly sinuous in front of the mid-length; greatest height situated approximately centrally; eye-spot absent.

Ornamentation: the valve surface distinctly and rather densely pitted.
Remarks: The specimens of the Zsámbék Basin are very related to the original description from Hungary (ZALÁNYI, 1913).
Stratigraphical and geographical distribution: Karpatian: Lower Austria (ZORN, 1998, 2003), Eastern Austria (KOLLMANN, 1958), Czech Republic (KHEIL, 1967), Lower Badenian: Lower Austria (ZORN, 2004), Eastern Austria (KOLLMANN, 1958), Upper Sarmatian: Hungary (ZALÁNYI, 1913, this work).

Cyamocytheridea leptostigma leptostigma (REUSS, 1850)
Pl. 4, Figs 1–4, 6.

1850. *Cytherina leptostigma* n. sp. – REUSS, p. 57, pl. VIII, fig. 28.
1958. *Cyamocytheridea leptostigma leptostigma* (REUSS) – KOLLMANN, p. 157, pl. X, figs 11–12.
1963. *Cyamocytheridea leptostigma leptostigma* (REUSS) – DORNIČ, KHEIL, pl. III, figs 3–4.
1969. *Cyamocytheridea leptostigma leptostigma* (REUSS) – BURYNDINA, p. 63, pl. I, figs 5–7.
1974. *Cyamocytheridea leptostigma leptostigma* (REUSS) – CERNAJSEK, p. 471–472, pl. II, figs 3–4.
1990. *Cyamocytheridea leptostigma leptostigma* (REUSS) – STANCHEVA, p. 36–37, pl. X, fig. 10.
2004. *Cyamocytheridea leptostigma* (REUSS) – AIELLO, SZCZECHURA, p. 23, pl. II, fig. 7.

Material: Mány–22: 6 RV, 1 LV (1 juvenile, 6 adults), Perbál–5: 260 RV, 244 LV (82 juveniles, 422 adults), Mány–17: 5 RV, 4 LV (adults).
Dimensions (in mm): L= 0,72–0,75 mm, H= 0,4–0,43 mm, L/H= 1,74–1,8.
Description: the outline of valves elongated subovate in lateral view; anterior outline almost symmetrically and narrowly rounded; dorsal outline weakly arched; posterior margin gently asymmetrically rounded; ventral outline nearly straight, slightly sinuous in front of the the mid-length (in the left valve is less incised than in the right valve); maximum height situated nearly centrally; eye spot absent.

Ornamentation: the valve surface coarsely and sparsely pitted.
Variability: Juveniles have a more triangular in outline than adults.
Remarks: Mostly adult forms (few juveniles) of this subspecies can be found in the Upper Sarmatian beds. They are very similar to those of *Cyamocytheridea dérii* (Zalányi, 1913), but they differ in some details of ornamentation mostly its distinctness and number of the pits as well as the dorsal outline in lateral view.
Stratigraphical and geographical distribution: Upper Badenian: Poland (Silesian Basin) (AIELLO, SZCZECHURA, 2004), Sarmatian: Slovakia (Vienna Basin) (DORNIČ,

KHEIL, 1963), southwestern Ukraine (BURYNDINA, 1969), Bulgaria (the northwestern region) (STANCHEVA, 1990). Upper Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974), Eastern Austria (KOLLMANN, 1958), Hungary (Zsámbék Basin) (this work).

Genus *Hemicyprideis* SARS, 1925

Hemicyprideis dacica dacica (HÉJJAS, 1895)
Pl. 4, Figs 7,8.

1895. *Cytheridea dacica* n. sp. – HÉJJAS, p. 59–60, 103, pl. IV, fig. 10a–c.
1913. *Cytheridea dacica* HÉJJAS – ZALÁNYI, p. 97–99, textfig. 15.
1929. *Cytheridea dacica* HÉJJAS – ZALÁNYI, p. 107–112, pl. I, fig. 1, textfigs 47–48.
1953. *Haplocytheridea dacica dacica* (HÉJJAS) – GOERLICH, p. 138–139, pl. 6, fig. 43–49.
1956. *Haplocytheridea dacica dacica* (HÉJJAS) – OERTLI, p. 45–46, pl. 4, figs 94–103.
1958. *Haplocytheridea dacica dacica* (HÉJJAS) – KOLLMANN, p. 140, pl. 2, fig. 3, pl. 9, figs 7–17.
1963. *Haplocytheridea dacica dacica* (HÉJJAS) – DORNIČ, KHEIL, pl. 3, fig. 5.
1963. *Haplocytheridea dacica* (HÉJJAS) – STANCHEVA, p. 13, pl. II, fig. 11.
1969. *Haplocytheridea dacica dacica* (HÉJJAS) – CARBONNEL, p. 86–87, textfig. 8, pl. 4, fig. 19–20.
1973. *Haplocytheridea dacica dacica* (HÉJJAS) – IONESI, CHINTĂUAN, p. 95–96, pl. I, fig. 5, pl. III, fig. 3.
1974. *Haplocytheridea dacica dacica* HÉJJAS – CERNAJSEK, p. 472–473.
1975. *Haplocytheridea dacica dacica* (HEJJAS) – IONESI, CHINTĂUAN, pl. 1, fig. 6.
1975. *Hemicyprideis dacica dacica* (HÉJJAS) – BRESTENSKÁ, p. 397. pl. 2, fig. 15–16.
1976. *Haplocytheridea dacica dacica* (HÉJJAS) – CHINTĂUAN, NICORICI, p. 13, pl. II, figs 7–9.
1979. *Hemicyprideis dacica dacica* (HÉJJAS) – BASSIOUNI, p. 58–59, pl. 13, fig. 11–12.
1985. *Hemicyprideis dacica dacica* (HÉJJAS) – MÜLLER, p. 22–24, pl. 3, figs 15–17, pl. 4., figs 1–4, non pl. 3, figs 10–14.
non 1985. *Hemicyprideis dacica* (HÉJJAS) – CARBONNEL *et al*, p. 224, Pl. II, fig. 10–12.
1990. *Haplocytheridea dacica* (HÉJJAS) – STANCHEVA, p. 37–38, pl. XI, fig. 10.
non 1992. *Hemicyprideis dacica dacica* (HÉJJAS) – APOSTOLESCU, GUERNET, p. 108–109, pl. 2, Fig. 10.
1995. *Hemicyprideis dacica* (HÉJJAS) – ZLINSKÁ, FORDINÁL, pl. XXVIII, fig. 2.
2004. *Hemicyprideis dacica* (HÉJJAS) – ZORN, p. 183, pl. II, fig. 9.
2004. *Hemicyprideis dacica dacica* (HÉJJAS) – TÓTH, p. 135–136, pl. II, figs 4–8.

Material: Mány–22: 24 carapaces, 185 RV, 87 LV (60 juveniles, 236 adults), Mány–17: 30 carapaces, 222 RV, 118 LV (74 juveniles, 296 adults).
Dimensions (in mm): L= 0,81–0,85 mm; H= 0,45–0,48 mm; L/H= 1,69–1,88.
Sexual dimorphism: Male forms are more elongated than females. The dorsal outline of males is slightly rounded on the left valve opposite to the dorsal outline of females.
Juveniles: The carapace of the juveniles are more acute in the posterior part and more triangular in lateral view.
Remarks: The specimens of the Zsámbék Basin are very related to the original description (HÉJJAS, 1895).
Stratigraphical and geographical distribution: Upper Oligocene: Slovakia (BRESTENSKÁ, 1975), Switzerland (Swiss Molasse) (OERTLI, 1956), Germany (north-alpine Molasse) (GOERLICH, 1953; MÜLLER, 1985), Hungary (ZALÁNYI, 1929), Lower

Miocene: Slovakia (BRESTENSKÁ, 1975), Turkey (BASSIOUNI, 1979), Karpatian: eastern Austria (KOLLMANN, 1958), Badenian: Romania (Transylvania) (CHINTĂUAN, NICORICI, 1976), Hungary (ZALÁNYI, 1913), Lower Badenian: Lower Austria (Molasse Basin) (KOLLMANN, 1958), Serravallian: France (Rhone Basin) (CARBONNEL, 1969), Sarmatian: Slovakia (Vienna Basin) (DORNIČ, Kheil, 1963), eastern Austria (KOLLMANN, 1958), Switzerland (Vienna Basin) (OERTLI, 1956), Bulgaria (STANCHEVA, 1963, 1990), Hungary (ZALÁNYI, 1913, this work), Lower Sarmatian: eastern Slovakia (ZLINSKÁ, FORDINÁL, 1995), Bosnia-Hercegovina (ZALÁNYI, 1913), Romania (Moldavian Platform) (IONESI, CHINTĂUAN, 1973, 1975).

Genus *Cytheridea* BOSQUET, 1852

Cytheridea hungarica ZALÁNYI, 1913
Pl. 5, Figs 1–4.

1913. *Cytheridea hungarica* n. sp.– ZALÁNYI, p. 92–94, pl. V, fig. 11–14, textfigs 3. et 11.
1941. *Cytheridea hungarica* ZALÁNYI – MÉHES, p. 74–75, pl. III, figs 1–2, textfigs 99, 100, 141.
1958. *Cytheridea hungarica* ZALÁNYI – KOLLMANN, p. 150, pl. 1, fig. 1, pl. 6, figs 17–18, pl. 8, fig. 1–9.
1959. *Cytheridea hungarica* ZALÁNYI – KRSTIĆ, p. 203–204, pl. I, fig. 1–3.
1963. *Cytheridea hungarica* ZALÁNYI – SZÉLES, pl. IV, fig. 5.
1974. *Cytheridea hungarica* ZALÁNYI – CERNAJSEK, p. 470– 471, pl. II, fig. 1–2.
1983. *Cytheridea hungarica* ZALÁNYI – JIŘIČEK, pl. IV, fig. 20.
1989. *Cytheridea hungarica* ZALÁNYI – ZELENKA, pl. 1, fig. 1.
1994. *Cytheridea hungarica* (ZAL.) – FORDINÁL, ZLINSKÁ, pl. XIV, fig. 8–9.
1995. *Cytheridea hungarica* ZAL. – ZLINSKÁ, FORDINÁL, pl. XXVIII, fig. 1.
2001. *Cytheridea hungarica* (ZALÁNYI) – SZUROMI–KORECZ, SZEGŐ, pl. V, fig 1.
2004. *Cytheridea hungarica* ZALÁNYI – TÓTH, p. 136–137, pl. III, figs 1–6.
2005. *Cytheridea hungarica* ZALÁNYI – JANZ, VENNEMANN, pl. I, fig. 5.
2006. *Cytheridea hungarica* ZALÁNYI – FORDINÁL et al., p. 127, fig. 4/1–2.

Material: Mány–22: 158 carapaces, 563 RV, 432 LV, Perbál–5: 64 carapaces, 225 RV, 173 LV, Mány–17: 76 carapaces, 270 RV, 207 LV (mainly adults).
Dimensions (in mm): H= 0,53–0,6 mm, L= 0,98–1,01mm, L/H= 1,63–1,91.
Variability: Some specimens from the Zsámbék Basin are more pointed, more triangular in their lateral posterior outline than others (sexual dimorphism?). The degree of ornamentation (the density of the pits) also varies.
Remarks: The specimens of the Zsámbék Basin are very related to the original description from Hungary (ZALÁNYI, 1913).
Stratigraphical and geographical distribution: Lower Sarmatian: Slovakia (the eastern region, Danube Basin, Transcarpathian Basin) (ZLINSKÁ, FORDINÁL, 1995; FORDINÁL, ZLINSKÁ, 1994, FORDINÁL et al., 2006, JIŘIČEK, 1983), Austria (Vienna Basin) (CERNAJSEK, 1974, JANZ, VENNEMANN, 2005, KOLLMANN, 1958), Czech Republic (ZELENKA, 1989), Serbia (KRISTIĆ, 1959) and western Romania (ZALÁNYI, 1913), Hungary (ZALÁNYI, 1913; Széles, 1963; SZUROMI-KORECZ, SZEGŐ, 2001; this work).

Genus *Miocyprideis* KOLLMANN,1960

Miocyprideis janoscheki KOLLMANN, 1958
Pl. 5, Figs 5,6.

1958. *Miocyprideis janoscheki* n. sp. – KOLLMANN, p. 178, pl. III, fig. 3, pl. XII, figs 6–7, pl. XVIII, figs 1–6, 9–11, 14–17, pl. XIX, fig. 18, pl. XX, fig. 14.
1963. *Miocyprideis janoscheki* KOLLMANN – DORNIČ, KHEIL, pl. III, fig. 6.
1963. *Miocyprideis janoscheki* KOLLMANN – SZÉLES, pl. IV, fig. 6.
1969. *Miocyprideis janoscheki* KOLLMANN – BURYNDINA, p. 65–66, pl. II, figs 1–3.
1970. *Miocyprideis janoscheki* KOLLMANN – TRELEA-PAGHIDA et al., p. 112, pl. III, figs 11a–c.
1974. *Miocyprideis janoscheki* KOLLMANN – JIŘIČEK, p. 438, pl. IV, figs 5–6.
1974. *Miocyprideis kollmanni* n. sp. – JIŘIČEK, p. 438, pl. IV, figs 7–8.
1978. *Neocyprideis (Miocyprideis) sarmatica elongata* JIŘIČEK – BRESTENSKÁ, JIŘIČEK, p. 417–418, pl. III, figs 4–6.
1983. *Neocyprideis (Miocyprideis) sarmatica elongata* JIŘIČEK – JIŘIČEK, pl. III, fig. 17.
?1983. *Neocyprideis (Miocyprideis) janoscheki* KOLLMANN – JIŘIČEK, pl. V, fig. 25.
1990. *Miocyprideis janoscheki* KOLLMANN – ZELENKA, pl. II, figs 8–9.
1995. *Miocyprideis* sp. – ZLINSKÁ, FORDINÁL, pl. XXVIII, fig. 7.

Material: Mány–22: 8 RV, 4 LV (1 juveniles, 11 adults), Perbál–5: 7 RV, 8 LV, (3 juveniles, 12 adults), Mány–17: 6 RV (adults).
Dimensions (in mm): L= 0,67–0,8 mm, H= 0,4–0,48 mm, L/H= 1,66–1,78.
Description: The outline of valves subrectangular in lateral view; anterior outline almost symmetrical and broadly rounded; dorsal outline slightly and evenly convex; posterior outline broadly and asymmetrically rounded in the right valve while nearly symmetrically rounded in the left valve; ventral outline nearly straight; maximum height behind the mid-length; subcentral vertical sulcus weakly marked; eye spot absent.

Ornamentation: the valve surface coarsely and densely pitted except the admarginal parts where they are arranged concentrically; anterior and posterior margins with marginal denticulations.
Variability: The degree of ornamentation and the size as well as the number of denticles along the anterior and posterior margins are varying.
Remarks: In comparison with the holotype of this species (KOLLMANN, 1958) and the studied specimens, the form described and illustrated by JIŘIČEK (1983) as *Neocyprideis (Miocyprideis) janoscheki* KOLLMANN has more reduced ornamentation, as it is pitted only anteriorly.
Stratigraphical and geographical distribution: Upper Badenian: Slovakia (Vienna Basin, Danube Basin) (BRESTENSKÁ, JIŘIČEK, 1978; DORNIČ, KHEIL, 1963; JIŘIČEK, 1983), Sarmatian: eastern Austria (KOLLMANN, 1958), eastern Romania (TRELEA-PAGHIDA *et al*, 1970) and southwestern Ukraine (BURYNDINA, 1969), Lower Sarmatian: Slovakia (Zlinská, FORDINÁL, 1995), Upper Sarmatian: Slovakia (the eastern region, Vienna Basin) (JIŘIČEK, 1974; ZELENKA, 1990), Hungary (SZÉles, 1963, this work).

Miocyprideis sarmatica (ZALÁNYI, 1913)
Pl 6., Fig. 1.

1913. *Cytheridea punctillata* G. S. Brady var. sarmatica n. var. – ZALÁNYI, p. 101–102, pl. VI, figs 9–11, textfig.16.
1974. *Miocyprideis sarmatica* (ZALÁNYI) – JIŘIČEK, p. 436–137, pl. 4, figs 3–4.
1980. *Miocyprideis sarmatica* (ZALANYI) – KRSTIĆ, pl. III, fig. 1–4, 14, 16, pl. V, fig. 6–8.
1985. *Miocyprideis sarmatica* (ZALÁNYI) – IONESI, CHINTĂUAN, pl. I, fig. 1.
1990. *Miocyprideis sarmatica* (ZALÁNYI) – ZELENKA, pl. II, figs 9–10.
1994. *Miocyprideis* sp. – FORDINÁL, ZLINSKÁ, pl. XV, fig. 5–6.
2004. *Miocyprideis sarmatica* (ZALÁNYI). – TÓTH, p. 136–137, pl. III, figs 7–8.

Material: Mány–22: 1 RV, 3 LV (1 juvenile, 3 adults), Mány–17: 33 RV, 55 LV (11 juveniles, 77 adults).
Dimensions (in mm): L= 0,77–0,81 mm, H= 0,46–0,48 mm, L/H= 1,67–1,69.
Variability: The degree of ornamentation is varying. The marginal part of the valve surface is smooth or finely pitted.
Remarks: The specimens of the Zsámbék Basin are very related to the original description from Hungary (ZALÁNYI, 1913).
S*ratigraphical and geographical distribution:* Lower Sarmatian: Slovakia (Vienna Basin and the eastern region) (ZALÁNYI, 1913; JIŘIČEK, 1974; ZELENKA, 1990; FORDINÁL, ZLINSKÁ, 1994), Serbia (KRISTIĆ, 1980), Romania (Dobrogea) (IONESI, CHINTĂUAN, 1985), Hungary (Zsámbék Basin) (this work).

Family Hemicytheridae PURI, 1953
Subfamily Hemicytherinae PURI, 1953
Genus Hemicytheria POKORNÝ, 1952

Hemicytheria omphalodes (REUSS, 1850)
Pl. 6, Figs 2–6.

1850. *Cypridina omphalodes* n. sp. – REUSS, p. 75, pl. 10, fig. 7.
1972. *Hemicytheria omphalodes* (REUSS) – SOKAČ, p. 73, pl. XXXIII, fig. 1–5.
1974. *Hemicytheria omphalodes* (REUSS) – JIŘIČEK, pl. 1, fig. 3–4.
1974. *Hemicytheria omphalodes omphalodes* (REUSS) – CERNAJSEK, p. 468– 470, pl. I, fig. 7–8.
1985. *Hemicytheria omphalodes* (REUSS) – JIŘIČEK, pl. 56, fig. 7–9.
1990. *Hemicytheria omphalodes* (REUSS) – ZELENKA, pl. I, fig. 3–4.
1994. *Hemicytheria omphalodes omphalodes* (REUSS) – FORDINÁL; ZLINSKÁ, pl. XV, fig. 1.
1995. *Hemicytheria omphalodes* (REUSS) – ZLINSKÁ; FORDINÁL, pl. XXVIII, fig. 5.
2001. *Hemicytheria omphalodes* (REUSS) – OLTEANU, pp. 94, 97, 100, pl. VII, fig. 7–8.
2004. *Hemicytheria omphalodes* (REUSS) – TÓTH, p. 137–138, pl. IV, fig. 1–3
?2006. *Hemicytheria omphalodes omphalodes* (REUSS) – FORDINÁL et al., p. 127, fig. 4/6.

Material: Mány–22: 19 carapaces, 27 RV, 50 LV (34 juveniles, 62 adults) Perbál–5: 134 carapaces, 193 RV, 356 LV (240 juveniles, 443 adults), Mány–17: 14 carapaces, 21 RV, 38 LV (25 juveniles, 48 adults).

Dimensions (in mm): L= 0,8–0,82 mm, H= 0,47–0,48 mm, L/H= 1,7–1,73.
Description: The lateral outline of valves ear-shaped; anterior outline asymmetrically rounded, slightly oblique in the anterodorsal part; dorsal outline slightly convex (that of right valve more convex than of the left valve) and declined towards the posterior end; upper part of the posterior end slightly concave while lower part obliquely truncated; ventral margin sinuous in front of the mid-length; maximum height near the anterior end; smooth eye tubercle in the anterodorsal corner.

Ornamentation: prominent reticulation on the entire valve surface (except the muscle scars field) which tend to be arranged in rows along the ventral and posterior parts; two ribs running along the anterodorsal and ventral margins; an anterodorsal rib attaining the eye tubercle; small ribs (up to six) extending almost radially behind the muscle scar field, less distinct and short ribs in front of the muscle scar field seem the most characteristic.
Sexual dimorphism: Male forms are more elongated than females.
Juveniles: The valves of the juveniles are more acute posteriorly and more triangular in lateral view. The ornamentation of juveniles is less distinct.
Variability: Ornamentation of some specimens is not well expressed.
Remarks: It might be possible that specimens described by the author (TÓTH, 2004) from Budapest are juveniles. Adult specimens occuring in the Zsámbék Basin are similar to the the specimens illustrated and described by JIŘIČEK (1974) and CERNAJSEK (1974). The specimens published by SOKAČ (1972) are likely larval forms. The form illustrated by FORDINÁL et al. (2006) is more elongated than forms studied by the author. It is possible that specimen illustrated by FORDINÁL et al. (2006) represents male form.
Stratigraphical and geographical distribution: Upper Badenian: Romania (Transylvanian Basin) (OLTEANU, 2001), Sarmatian: Slovakia (Vienna Basin) (JIŘIČEK, 1974, ZELENKA, 1990), Hungary (Zsámbék Basin) (this work), Lower Sarmatian: Slovakia (Danube Basin and the eastern region) (FORDINÁL et al., 2006; FORDINÁL, ZLINSKÁ, 1994, 1995), Upper Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974), Pannonian: Romania (Transylvanian Basin) (OLTEANU, 2001), Croatia (Pannonian Basin) (Sokač, 1972).

Genus *Aurila* POKORNÝ, 1955

Aurila mehesi (ZALÁNYI, 1913)
Pl. 7, Figs 5–7.

1913. *Cythereis méhesi* n. sp. – ZALÁNYI, p. 109–111, pl. VII, figs 4–10, textfig. 2., 22.
1913. *Cythereis sarmatica* n. sp. – ZALÁNYI, p. 112–113, pl. IX, figs 9–11.
1939. *Cythereis sarmatica* ZALÁNY – SCHNEIDER, p. 198, pl. IV, fig. 3.
1949. *Cythereis sarmatica* ZALÁNYI – SCHNEIDER, p. 163–164, pl. IX, fig. 4.a,b
1956. *Cythereis méhesi* ZALÁNYI – CHOCZEWSKI, p. 70–71, pl. II, fig. 14.a,b
1956. *Cythereis sarmatica* ZALÁNYI – CHOCZEWSKI, p. 72–73, pl. III, fig. 4.a,b
?1956. *Cythereis sarmatica* ZALANYI – SUZIN, p. 150–151, pl. VII, fig. 18.
1959. *Hemicytheria mehesi* (ZALÁNYI) – KRSTIĆ, p. 204, pl. I, figs 4–6.
?1962. *Mutilus (Aurila) mehesi* (ZALÁNYI) – STANCHEVA, p. 37, pl. IV, fig. 6.
1963. *Mutilus (Aurila)?* aff. *mehesi* (ZALÁNYI) – STANCHEVA, p. 31, pl. IV, fig. 3.

1974. *Aurila mehesi* (ZALÁNYI) – CERNAJSEK, p. 465– 466, pl. I, fig. 3.
1974. *Aurila kollmanni* n. sp. – CERNAJSEK, p. 463– 465, pl. I, fig. 2.
1980. *Aurila mehesi* (ZALÁNYI) – IONESI, CHINTĂUAN, pl. 2, fig. 3.
1983. *Aurila mehesi* (ZALÁNYI) – JIŘIČEK, pl. IV, fig. 21.
1983. *Aurila sarmatica* (ZALÁNYI) – JIŘIČEK, pl. IV, fig. 22.
1990. *Aurila mehesi* (ZALÁNYI) – STANCHEVA, p. 42, pl. XIII, fig. 10.
1990. *Aurila kollmanni* (ZALÁNYI) – STANCHEVA, p. 41, pl. XIV, figs 1–2.
2000. *Aurila mehesi* (ZALÁNYI) – SZCZECHURA, pl. VIII, fig. 13.
1994. *Aurila mehesi* (ZAL.) – FORDINÁL, ZLINSKÁ, pl. XV, fig. 2.
2004. *Aurila méhesi* (ZALÁNYI). – TÓTH, p. 138–139, pl. IV, figs 4–7.
2005. *Aurila kollmanni* CERNAJSEK – JANZ, VENNEMANN, pl. II, fig. 3.
2006. *Aurila mehesi* (ZALÁNYI) – FORDINÁL et al., p. 127, fig. 4/3.

Material: Mány–22: 501 carapaces, 3721 RV, 2862 LV (3435 juveniles, 3148 adults), Perbál–5: 20 carapaces, 147 RV, 113 LV (135 juveniles, 147 adults), Mány–17: 191 carapaces, 1424 RV, 1095 LV (1314 juveniles, 1396 adults).
Dimensions (in mm): L= 0,92–1,21 mm, H= 0,57–0,75 mm, L/H= 1,6–1,62.
Variability: Adult forms show great variation of size. Juveniles are abundant and have a more triangular shape.
Remarks: In my opinion the species *Aurila kollmanni* described by CERNAJSEK (1974) seems identical with the holotype of this species (ZALÁNYI, 1913) because only their size of adults are different. Both forms occur in the studied samples.
Stratigraphical and geographical distribution: Lower Sarmatian: Slovakia (the eastern region, Transcarpathian Basin and Danube Basin, Vienna Basin) (FORDINÁL, ZLINSKÁ, 1994; JIŘIČEK, 1983; FORDINÁL et al., 2006; JIŘIČEK, 1974), Hungary (ZALÁNYI, 1913; TÓTH, 2004, this work), Bosnia-Hercegovina (ZALÁNYI, 1913), Serbia (ZALÁNYI, 1913; KRISTIĆ, 1959), Poland (the southeastern region) (CHOCZEWSKI, 1956; SZCZECHURA, 2000), Austria (Vienna Basin) (CERNAJSEK, 1974; JANZ, VENNEMANN, 2005), Bulgaria (STANCHEVA, 1963, 1990), Romania (Moldavian Platform) (IONESI, CHINTĂUAN, 1980), (Russia) Caucasus (SCHNEIDER, 1939, 1949).

Aurila merita (ZALÁNYI, 1913)
Pl. 8, Figs 1,2.

1913. *Cythereis merita* n. sp. – ZALÁNYI, p. 117–118, pl. VII, fig. 4–10, textfig 2, 22.
1956. *Cythereis merita* (ZALÁNYI) – CHOCZEWSKI, p. 75, pl. III, fig. 8.
1974. *Aurila merita* (ZALÁNYI) – CERNAJSEK, p. 466– 467, pl. I, fig. 4.
1989. *Aurila merita* (ZALÁNYI) – ZELENKA, pl. II, fig. 1.
1990. *Aurila merita* (ZALÁNYI) – ZELENKA, pl. I, fig. 5.
2001. *Aurila merita* (ZALÁNYI) – SZUROMI-KORECZ, SZEGŐ, pl. IV, fig 2.
?2006. *Aurila merita* (ZALÁNYI) – FORDINÁL et al., p. 127, fig. 4/4.
2006. *Aurila (Aurila?) merita* (ZALÁNYI) – GROSS, PILLER, p. 50–51, pl. XXIII, figs 1–13.

Material: Mány–22: 4 RV, 7 LV (8 juveniles, 3 adults), Perbál–5: 3 LV (adults), Mány–17: 19 carapaces, 105 RV, 115 LV (163 juveniles, 76 adults).
Dimensions (in mm): L= 0,86–1,04 mm, H= 0,52–0,67 mm, L/H= 1,56–1,65.
Description: The outline of valves ear-shaped or subtrapezoidal in lateral view; anterior outline almost asymmetrically rounded; dorsal outline slightly convex and slightly

sloping towards the posterior end; upper part of the posterior end oblique or slightly concave while adventral part rounded and pointed in its most distal part; ventral margin moderately sinuous in front of the mid-length; maximum height anteriorly; well marked eye tubercle in the anterodorsal corner.

Ornamentation: the valve surface densely and coarsely pitted; the anteroventral and posteroventral margins decorated by radial striae.

Variability: The species shows a great variation of ornamentation, which is sometimes less distinct near the muscle-scars field.

Remarks: the specimens studied by the author are less elongated than the form illustrated by FORDINÁL et al. (2006). It is possible that the specimen illustrated by FORDINÁL et al (2006) represents male form.

Stratigraphical and geographical distribution: Lower Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974; GROSS, PILLER, 2006), Slovakia (Vienna Basin, Danube Basin) (ZELENKA, 1989, 1990; FORDINÁL *et al*, 2006), Poland (the southeastern region) (CHOCZEWSKI, 1956), Romania (the southwestern region) (ZALÁNYI, 1913), Hungary (SZUROMI-KORECZ, SZEGŐ, 2001; this work).

Aurila notata (REUSS, 1850)
Pl. 8, Figs 3–7.

1850. *Cypridina notata* n. sp. – REUSS, pl. IX, fig. 16.
1956. *Cythereis notata* (REUSS) – SUZIN, p. 149–150, pl. VII, fig. 16.
?1974. *Aurila notata* (REUSS) – CERNAJSEK, p. 467– 468, pl. I, figs 5–6.
1983. *Aurila notata* (REUSS) – JIŘIČEK, pl. IV, fig. 23.
1990. *Aurila notata* (REUSS) – ZELENKA, p. 266, pl. I, fig. 12.
1990. *Aurila notata* (REUSS) – STANCHEVA, p. 43, pl. XII, figs 1–6.
2005. *Aurila notata* (REUSS) – JANZ, VENNEMANN, pl. II, fig. 4.
2006. *Aurila (Euaurila?) notata* (REUSS) – GROSS, PILLER, p. 54–55, pl. XXIX, figs 1–9.

Material: Mány–22: 5 carapaces, 146 RV, 132 LV (121 juveniles, 162 adults), Perbál–5: 6 carapaces, 182 RV, 164 LV (150 juveniles, 202 adults) Mány–17: 81 carapaces, 2219 RV, 2002 LV (1840 juveniles, 2462 adults).

Dimensions (in mm): L= 0,9–0,95 mm, H= 0,54–0,58 mm, L/H= 1,6–1,7.

Description: The lateral outline of valves ear-shaped; anterior outline asymmetrically rounded, dorsal outline slightly convex and very slightly sloping towards the posterior end; upper part of posterior end obliquely truncated while its lower part rounded attaining the pointed or narrowly rounded caudal process; ventral margin moderately sinuous in front of the mid-length; maximum height anteriorly; smooth and distinct eye tubercle in the anterodorsal corner.

Ornamentation: the valve surface densely and coarsely pitted.

Sexual dimorphism: Male forms are more elongated than females.

Variability: Juveniles are more triangular in lateral outline than adults.

Remarks: The studied specimens are less rectangular in lateral view than the specimens described by CERNAJSEK (1974) from the Vienna Basin.

Stratigraphical and geographical distribution: Upper Sarmatian: Slovakia (Vienna Basin, Transcarpathian Basin) (ZELENKA, 1990; JIŘIČEK, 1983); Austria (Vienna Basin)

(CERNAJSEK, 1974; JANZ, VENNEMANN, 2005; GROSS, PILLER, 2006), Hungary (Zsámbék Basin) (this work); Russia (Caucasus) (SUZIN, 1956).

Genus *Senesia* JIŘIČEK, 1974

Senesia vadaszi (ZALÁNYI, 1913)
Pl. 7, Figs 1–4.

1913. *Cythereis vadaszi* n. sp. – ZALÁNYI, p. 123–124, pl. VIII, figs 16–18, textfigs 4.e, 30.
1956. *Cythereis vadaszi* ZALÁNYI – CHOCZEWSKI, p. 72, pl. III, fig. 3.
1963. *Mutilus (Aurila) vadaszi* (ZALÁNYI) – STANCHEVA, p. 29, pl. IV, fig. 8.
1974. *Senesia vadaszi* (ZALÁNYI) – JIŘIČEK, p. 446, pl 1, figs 7–8.
1976. *Aurila vadaszi* (ZALÁNYI) – CHINTĂUAN, NICORICI, p. 17, pl. V, fig. 6.
1978. *Senesia vadaszi* (ZALÁNYI) – BRESTENSKÁ, JIŘIČEK, pl. 8, fig. 12.
1983. *Senesia vadaszi* (ZALÁNYI) – JIŘIČEK, pl. II, fig. 7.
1984. *Senesia limpida* n. sp. – STANCHEVA, p. 38–40, pl. 2, fig. 5.
1990. *Senesia vadaszi* (ZALÁNYI) – ZELENKA, pl. I, figs 6–7.
1990. *Senesia vadaszi* (ZALÁNYI) – STANCHEVA, pl. XIII, figs 6–7.
1990. *Senesia limpida* (STANCHEVA) – STANCHEVA, pl. XIII, fig. 9.
1995. *Senesia vadaszi* (ZAL.) – ZLINSKÁ, FORDINÁL, pl. XXVIII, figs 3–4.
2001. *Senesia vadaszi* (ZALÁNYI) – SZUROMI-KORECZ, SZEGŐ, pl. IV, fig 4.
2004. *Senesia vadaszi* (ZALÁNYI) – ZORN, p. 187, pl. IV, fig. 7.
2004. *Senesia vadaszi* (ZALÁNYI) – AIELLO, SZCZECHURA, p. 31, pl. V, figs 9–10.
2004. *Senesia vadászi* (ZALÁNYI) – TÓTH, p. 138–139, pl. V, figs 3–6.
2006. *Senesia vadaszi* (ZALÁNYI) – GROSS, PILLER, p. 59–60, pl. XXXII, figs 6–10.

Material: Mány–22: 978 carapaces, 489 RV, 768 LV (209 juveniles, 2026 adults), Perbál–5: 18 carapaces, 9 RV, 14 LV (4 juveniles, 37 adults), Mány–17: 322 carapaces, 161 RV, 253 LV (69 juveniles, 667 adults).
Méret (mm): L= 0,91–0,96 mm, H= 0,57–0,59 mm, H/L= 1,6–1,63.
Variability: The degree of ornamentation varies; in some specimens it is less distinct.
Remarks: In my opinion the specimens described and illustrated by STANCHEVA (1984) are probably juvenile forms of this species.
Stratigraphical and geographical distribution: Karpatian: Slovakia (Vienna Basin) (JIŘIČEK, 1983), Badenian: Czech Republic (BRESTENSKÁ, JIŘIČEK, 1978); Romania (Transylvania) (CHINTĂUAN, NICOROCI, 1976), Lower Badenian: Lower Austria (ZORN, 2004), Upper Badenian: Poland (Upper Silesia) (AIELLO, SZCZECHURA, 2004), Lower Sarmatian: Poland (the southeastern region) (CHOCZEWSKI, 1956); Slovakia (the eastern region, Vienna Basin) (ZLINSKÁ, FORDINÁL, 1995; JIŘIČEK, 1974, ZELENKA, 1990); Austria (Vienna Basin) (GROSS, PILLER, 2006), Bulgaria (STANCHEVA, 1963, 1984, 1990); Hungary (SZUROMI-KORECZ, SZEGŐ, 2001; TÓTH, 2004, this work).

Family Loxoconchidae SARS, 1925
Genus *Loxoconcha* SARS, 1866

Loxoconcha kochi MÉHES, 1908
Pl. 9, Fig. 6.

1908. *Loxoconcha kochi* n. sp. – MÉHES, p. 543–544, pl. IX, figs 5–9.
?1972. *Loxoconcha kochi* MÉHES, 1908 – KRSTIĆ, p. 252–253, pl. I, fig. 9, pl. 5, fig. 4, pl. 7, figs 7–9.
1974. *Loxoconcha kochi* MÉHES, 1908 – CERNAJSEK, p. 478, pl. II, figs 10–11.
1978. *Loxoconcha kochi* MÉHES, 1908 – CARBONNEL, p. 114, pl. I, figs 5, 9– 10.
1985. *Loxoconcha kochi* MÉHES, 1908 – IONESI, CHINTĂUAN, pl. II, fig. 3.

Material: Mány–22: 4 RV, 3 LV, Perbál–5: 1 RV, Mány–17: 12 RV, 9 LV (adults).
Dimensions (in mm): L= 0,64–0,85 mm, H= 0,4–0,5 mm, L/H=1,58–1,75.
Description: The lateral outline of valves oblong-rhomboideal; anterior outline asymmetrically rounded, somewhat truncated in its upper part; dorsal outline nearly straight; upper part of the posterior end obliquely truncated while its lower part rounded; ventral outline sinuous in front of the mid-length; maximum height nearly centrally, eye tubercle smooth and well-developed.

Ornamentation: distinct reticulation arranged in concentric rows on the lateral valve surface.
Stratigraphical and geographical distribution: Sarmatian: Austria (Vienna Basin) (CERNAJSEK, 1974); Romania (Dobrogea) (IONESI, CHINTĂUAN, 1985), Upper Sarmatian: Hungary (Zsámbék Basin) (this work), Lower Pannonian (?): Hungary (MÉHES, 1908), Messinian and Pliocene (?): France (the Rhône Valley, Corsica) (CARBONNEL, 1978).

Loxoconcha porosa MÉHES, 1908
Pl. 9, Figs 3–5.

1908. *Loxoconcha porosa* n. sp. – MÉHES, p. 542–543, pl. VIII, figs 10–14.
1972. *Loxoconcha porosa* MÉHES, 1908 – KRSTIĆ, p. 244–245, pl. I, figs 2–3.
1972. *Loxoconcha porosa* MÉHES, 1908 – SOKAČ, p. 85, pl. XLIV, figs 8–11.
?1980. *Loxoconcha porosa* MÉHES, 1908 – IONESI, CHINTĂUAN, pl. II, fig. 7.
1985. *Loxoconcha porosa* MÉHES, 1908 – IONESI, CHINTĂUAN, pl. I, fig. 4.
1986. *Loxoconcha porosa* MÉHES, 1908 – IONESI, CHINTĂUAN, pl. III, fig. 5.
1990. *Loxoconcha porosa* MÉHES – ZELENKA, pl. I, figs 8–9.

Material: Mány–22: 12 LV (adults), Perbál–5: 3 LV (adults), Mány–17: 189 RV, 237 LV (47 juveniles, 379 adults).
Dimensions (in mm): L= 0,61–0,7 mm, H= 0,42–0,47 mm, L/H= 1,45–1,5.
Description: The lateral outline of valves oblong-rhomboideal; anterior outline asymmetrically rounded, somewhat truncated in its upper part; dorsal outline nearly straight; upper part of the posterior end obliquely truncated while its lower part rounded; ventral outline sinuous in front of the mid-length; maximum height nearly centrally, eye tubercle smooth and well-developed.
Ornamentation: the valve surface densely, coarsely and concentrically pitted in lateral view.
Variability: The degree of the ornamentation is strongly varying (the distinctness of the pits). Numerous specimens is less ornamented.

Remarks: The anterior margin of the specimens described and illustrated by IONESI and CHINTĂUAN (1980) is almost symmetrically rounded contrary to the holotype (MÉHES, 1908) and the studied specimens.
Stratigraphical and geographical distribution: Sarmatian: Serbia (KRSTIĆ, 1972), Romania (Dobrogea) (IONESI, CHINTĂUAN, 1985, 1986), Upper Sarmatian: Slovakia (Vienna Basin) (ZELENKA, 1990), Hungary (Zsámbék Basin) (this work), Lower Pannonian (?): Hungary (MÉHES, 1908), Upper Pannonian: Croatia (Pannonian Basin) (SOKAČ, 1972).

Loxoconcha ex gr. *punctatella* (REUSS, 1850)
Pl. 10, Figs 1,2.

2004. *Loxoconcha* ex gr. *punctatella* (REUSS) – TÓTH, p. 140–141, pl. 6, figs 1–2.
2006. *Loxocorniculum* cf. *punctatella* (REUSS) – SZCZECHURA, fig. 10/3.

Material: Mány–22: 17 carapaces, 17 RV, 68 LV, Perbál–5: 1 carapaces, 2 RV, Mány–17: 8 carapaces, 8 RV, 32 LV (adults).
Dimensions (in mm): L= 0,54–0,57 mm, H= 0,37–0,38 mm, L/H= 1,42–1,54.
Variability: Some specimens are less ornamented in the studied samples.
Remarks: Only the ornamentation of the studied specimens is similar to the those described by DUCASSE and CAHUZAC (1996). The major differences concern the lateral outline of specimens; in the studied specimens the dorsal and ventral margin are less parallel moreover the carapace is more elongated.
Stratigraphical and geographical distribution: Badenian: Poland (Upper Silesia) (SZCZECHURA, 2006), Lower Sarmatian: Hungary (Zsámbék Basin) (this work).

Genus *Loxocorniculum* BENSON and COLEMAN, 1963

Loxocorniculum hastatum (REUSS, 1850)
Pl. 9, Figs 1,2.

1850. *Cytherina hastata* REUSS – REUSS, pl. IX, fig. 26.
1941. *Loxoconcha hastata* (REUSS) – TRIEBEL, pl. VIII, figs 83–84.
1962. *Loxoconcha hastata* (REUSS) – STANCHEVA, p. 43–44, pl. VI, fig. 5.
1967. *Loxoconcha hastata* (REUSS) – KHEIL, p. 225–226, pl. XX, fig. 9.
1969. *Loxoconcha hastata* (REUSS) – CARBONNEL, p. 171–172, pl. VIII, figs 14–15.
1971. *Loxoconcha* aff. *hastata* (REUSS) – KOLLMANN, p. 653–654, pl. XV, figs 1–7.
1974. *Loxoconcha hastata* (REUSS) – CERNAJSEK, p. 463– 465, pl. III, figs 1–2.
1978. *Loxoconcha hastata* (REUSS) – BRESTENSKÁ, JIŘIČEK, tabl. 9, fig. 10.
1985. *Loxoconcha hastata* (REUSS) – ZELENKA, pl. III, fig. 5–6.
1991. *Loxocorniculum hastata* (REUSS), morphe "crêtée" – BEKAERT et al., pl. II, fig. 9.
1991. *Loxocorniculum hastata* (REUSS), morphe "crêtée" – DUCASSE et ali, p. 451–452, pl. III, fig. 1–5.
1992. *Loxoconcha hastata* (REUSS) – PARUCH-KULCZYCKA, p. 268, pl. IV, fig. 1.
1996. *Loxocorniculum hastata* (REUSS) – DUCASSE, CAHUZAC, pl. I, fig. 8.
1998. *Loxocorniculum hastata* (REUSS) – ZORN, p. 206–207, pl. IX, figs 9–11.
2001. *Loxoconcha hastata* (REUSS) – SZUROMI-KORECZ, SZEGŐ, pl. IV, fig 1.
2003. *Loxocorniculum hastatum* (REUSS) – ZORN, pl. I, fig. 13.

2004. *Loxocorniculum hastatum* (REUSS) – ZORN, p. 187, pl. V, fig. 4.
2004. *Loxocorniculum hastata* (REUSS) – TÓTH, p. 141–142, pl. 6, figs 3–7.
2004. *Loxocorniculum hastatum* (REUSS) – AIELLO, SZCZECHURA, p. 35–36, pl. 7, figs 4–5.
2005. *Loxocorniculum hastatum* (REUSS) – JANZ, VENNEMANN, pl. II, fig. 8.
2006. *Loxocorniculum* cf. *hastatum* (REUSS) – SZCZECHURA, figs 10/13–15.

Material: Mány–22: 2 RV, 1 LV, Perbál–5: 8 RV, 15 LV, Mány–17: 61 RV, 31 LV (adults).
Dimensions (in mm): L= 0,62–0,64 mm, H= 0,39–0,41 mm, L/H= 1,51–1,64.
Stratigraphical and geographical distribution: Oligocene to Miocene (Aquitanian, Burdigalian, Langhian): France (Aquitaine Basin), (DUCASSE et al, 1991; BEKAERT et al., 1991; DUCASSE, CAHUZAC, 1996), Burdigalian: France (Rhône Basin) (CARBONNEL, 1969), Eggenburgian: Lower Austria (KOLLMANN, 1971), Karpatian: Czech Republic (KHEIL, 1967, ZORN, 2003), Lower Austria (Molasse Basin) (ZORN, 1998, 2003, 2004),
Badenian: Lower Austria (Molasse Basin) (ZORN, 1998, 2004), Poland (the southwestern region) (PARUCH-KULCZYCKA, 1992, SZCZECHURA, 2006), Austria (Vienna Basin) (CERNAJSEK, 1974; BRESTENSKÁ, JIRICEK, 1978; JANZ, VENNEMANN, 2005), Czech Republic (ZELENKA, 1985), Bulgaria (STANCHEVA, 1962), Upper Badenian: Poland (Upper Silesia) (AIELLO, SZCZECHURA, 2004), Sarmatian: Hungary (SZUROMI-KORECZ, SZEGŐ, 2001; this work).

Family Xestoleberididae SARS, 1928
Genus *Xestoleberis* SARS, 1866

Xestoleberis fuscata SCHNEIDER, 1953
Pl. 10, Figs 3–5.

1953. *Xestoleberis fuscata* SCHNEIDER – SCHNEIDER, p. 108–109, pl. IV, fig. 7.
non 1956. *Xestoleberis fuscata* SCHNEIDER – POBEDINA, p. 150, pl. XXI, fig. 11.
1963. *Xestoleberis fuscata* SCHNEIDER – STANCHEVA, p. 38–39, pl. VI, fig. 5.
2004. *Xestoleberis* sp. – ZORN, p. 187, pl. V, figs 14–15.
2004. *Xestoleberis fuscata* SCHNEIDER – TÓTH, p. 142–143, pl. 7, figs 3–5. cum. syn.

Material: Mány–22: 2 RV, 1 LV (juveniles), Perbál–5: 3 carapaces, 20 RV, 9 LV (27 juveniles, 5 adults), Mány–17: 74 carapaces, 611 RV, 268 LV (761 juveniles, 192 adults).
Dimensions (in mm): L= 0,57–0,71 mm, H= 0,33–0,41 mm, L/H=1,72–1,73.
Remarks: The specimens of the Zsámbék Basin are very related to the original description (SCHNEIDER, 1953).
Stratigraphical and geographical distribution: Lower Badenian: Lower Austria (ZORN, 2004), Sarmatian: Russia (Caucasus) (SCHNEIDER, 1953), Bulgaria (STANCHEVA, 1963), Hungary (Zsámbék Basin) (this work).

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Plate 1

Figs 1–4 *Cnestocythere* aff. *truncata* (REUSS, 1850).
Fig. 1 RV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.
Fig. 2 LV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.
Fig. 3 Hinge of LV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.
Fig. 4 Central muscle scars of RV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 50 µm.

Figs 5–6 *Euxinocythere (Euxinocythere) diafana* (STANCHEVA, 1963).
Fig. 5 RV. Mány–22 borehole, depth 139,2–141,4 m. Scale bar: 200 µm.
Fig. 6 LV. Mány–17 borehole, depth 133–134,2 m. Scale bar: 200 µm.

Fig. 7 *Euxinocythere (Euxinocythere) naca* (MÉHES, 1908).
LV. Mány–22 borehole, depth 84,8–85,1 m. Scale bar: 200 µm.

Plate 1

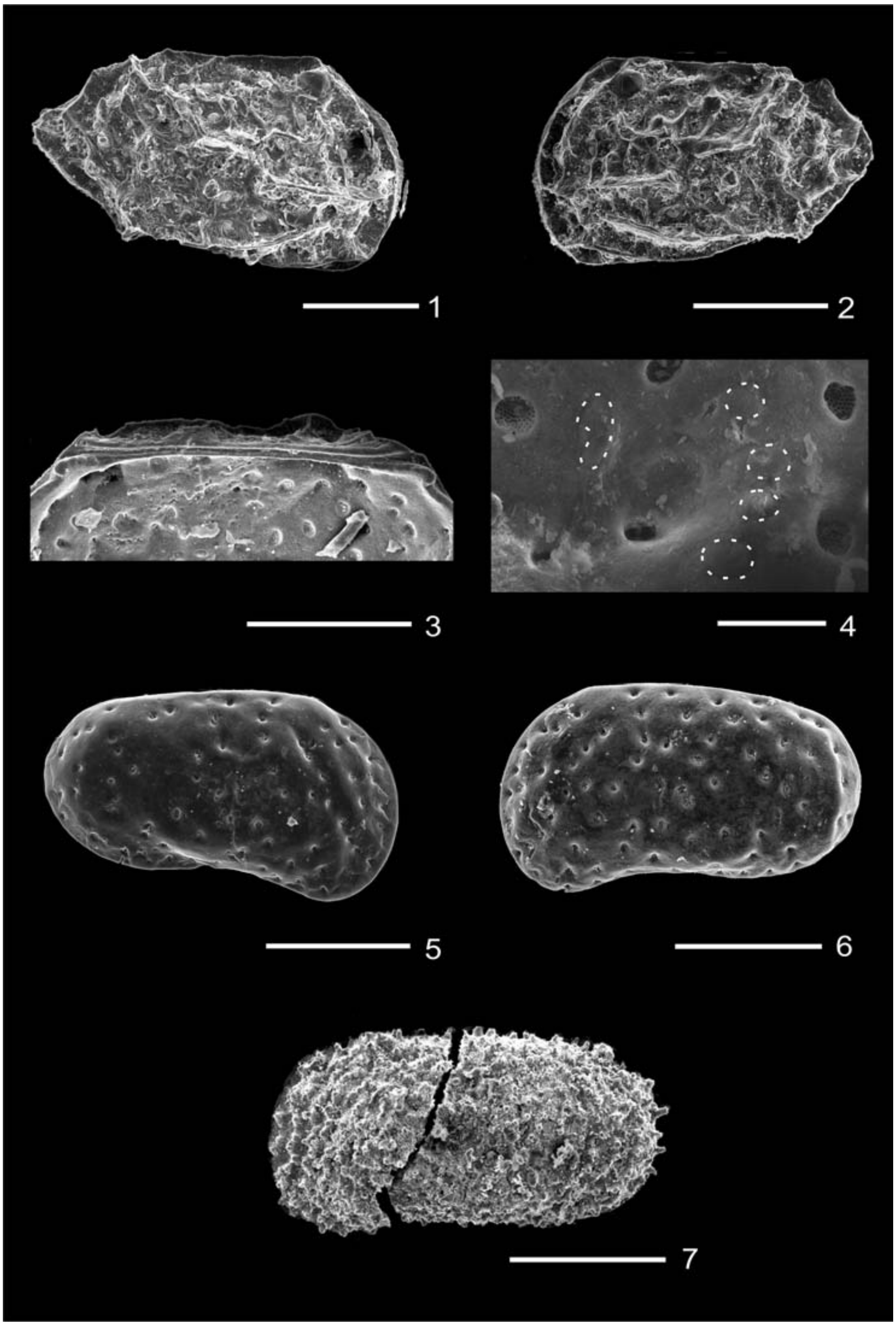

Plate 2

Figs 1–5 *Euxinocythere (Euxinocythere) praebosqueti* (SUZIN, 1956).

Fig. 1 RV. Mány–22 borehole, depth 74–80,2 m. Scale bar: 200 µm.
Fig. 2 LV. Mány–22 borehole, depth 74–80,2 m. Scale bar: 200 µm.
Fig. 3 RV. Mány–17 borehole, depth 81,5–85,3 m. Scale bar: 200 µm.
Fig. 4 LV from inside. Mány–17 borehole, depth 81,5–85,3 m.
Scale bar: 200 µm.
Fig. 5a Central muscle scars of LV. Mány–17 borehole, depth 81,5–85,3 m.
Scale bar: 50 µm.
Fig. 5b Hinge of LV. Mány–17 borehole, depth 81,5–85,3 m.
Scale bar: 200 µm.

Fig 6 *Amnicythere* sp.

LV. Mány–22 borehole, depth 74–80,2 m. Scale bar: 200 µm.

Plate 2

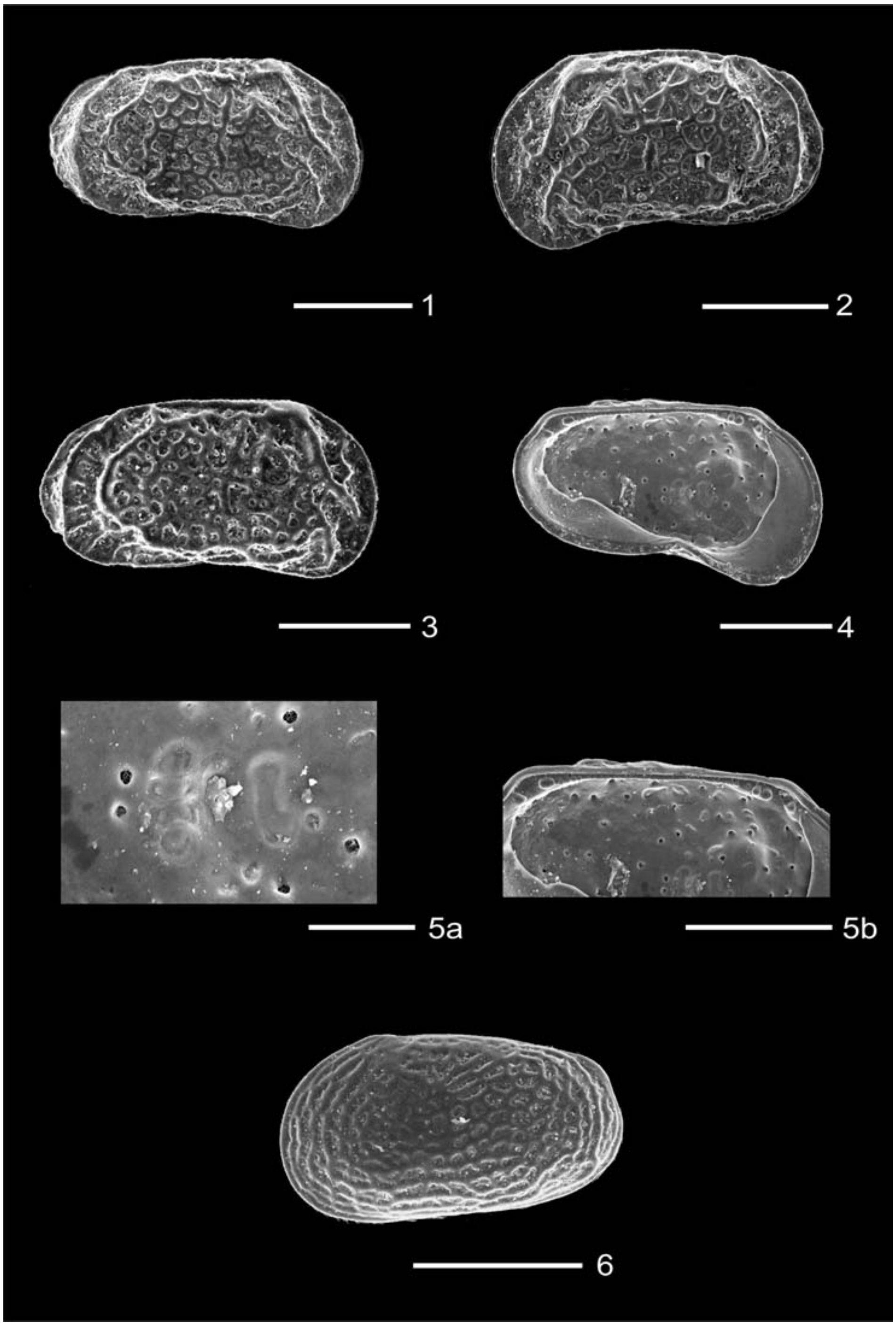

Plate 3

Figs 1–4 *Amnicythere tenuis* (REUSS, 1850).

Fig. 1 RV. Mány–22 borehole, depth 134,6–139,2 m. Scale bar: 200 µm.

Fig. 2 LV. Perbál–5 borehole, depth 104,8–105,8 m. Scale bar: 200 µm.

Fig. 3 RV from inside. Mány–17 borehole, depth 136,7–140,5 m. Scale bar: 200 µm.

Fig. 4 RV. Mány–17 borehole, depth 81,5–85,3 m. Scale bar: 200 µm.

Fig. 5 *Callistocythere egregia* (MÉHES, 1908).

RV. Mány–22 borehole, depth 151,5–153,3 m. Scale bar: 200 µm.

Fig. 6 *Callistocythere postvallata* PIETRZENIUK, 1973.

RV. Mány–22 borehole, depth 139,2–141,4 m. Scale bar: 200 µm.

Figs 7–8 *Callistocythere incostata* PIETRZENIUK, 1973.

Fig. 7 RV. Mány–22 borehole, depth 170,6–173 m. Scale bar: 200 µm.

Fig. 8 LV. Mány–22 borehole, depth 170,6–173 m. Scale bar: 200 µm.

Plate 3

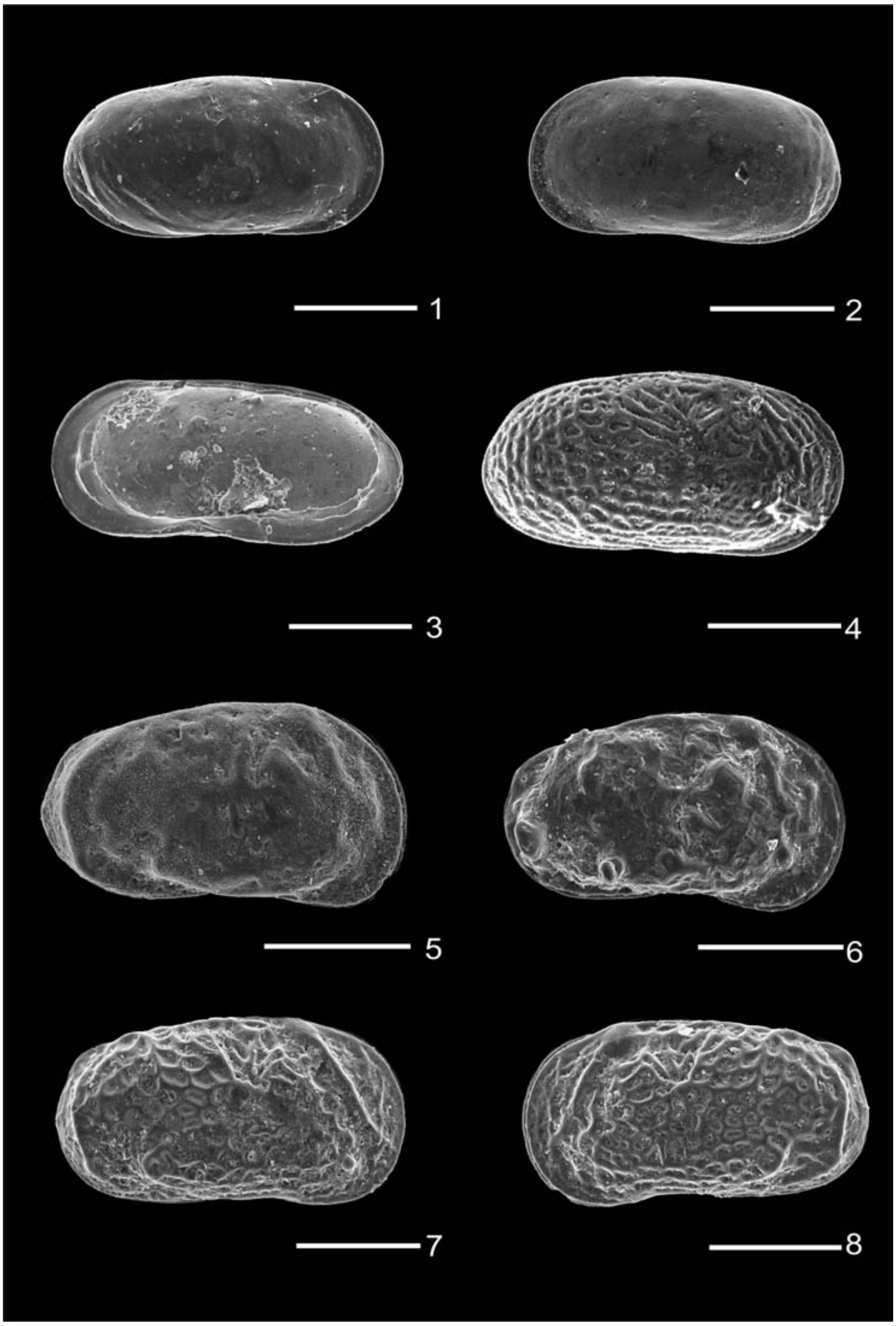

Plate 4

Figs 1–4,6 *Cyamocytheridea leptostigma leptostigma* (REUSS, 1850).
Fig. 1 RV. Mány–22 borehole, depth 62,5–66,5 m. Scale bar: 200 µm.
Fig. 2 LV. Mány–22 borehole, depth 45–52,5 m. Scale bar: 200 µm.
Fig. 3 LV from inside. Mány–22 borehole, depth 45–52,5 m.
Scale bar: 200 µm.
Fig. 4 LV. Juvenile. Mány–22 borehole, depth 45–52,5 m. Scale bar: 200 µm.
Fig. 6 LV from inside. Larval stage. Perbál–5 borehole, depth 73,5–74,4 m.
Scale bar: 200 µm.

Fig. 5 *Cyamocytheridea dérii* (ZALÁNYI, 1913).
RV. Mány–22 borehole, depth 67–70 m. Scale bar: 500 µm.

Figs 7–8 *Hemicyprideis dacica dacica* (HÉJJAS, 1895).
Fig. 7 RV. Mány–22 borehole, depth 162–163 m. Scale bar: 200 µm.
Fig. 8 LV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.

Plate 4

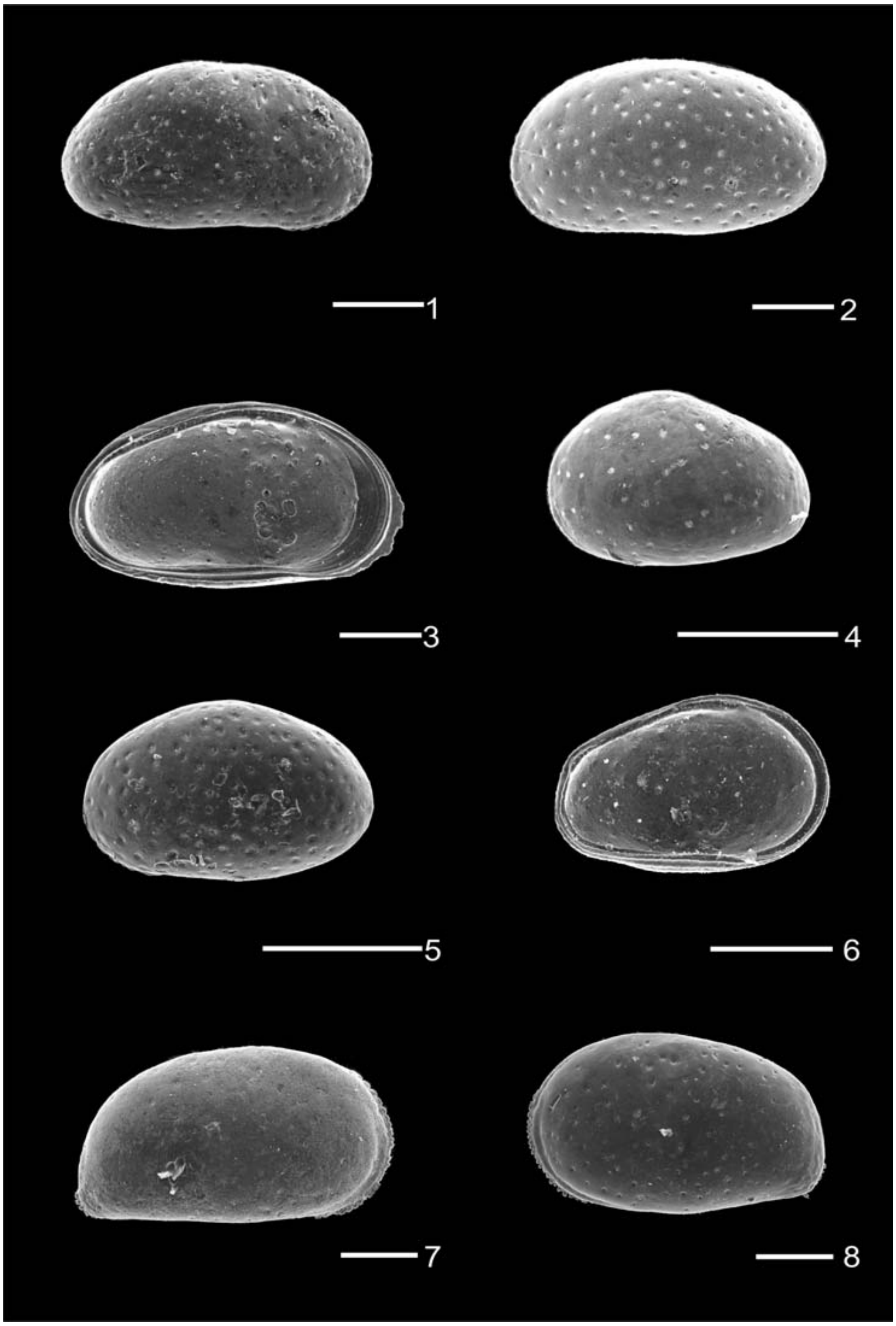

Plate 5

Figs 1–4 *Cytheridea hungarica* ZALÁNYI, 1913.

Fig. 1 RV. Mány–22 borehole, depth 145,2–145,4 m. Scale bar: 500 µm.
Fig. 2 LV. Perbál–5 borehole, depth 147–149,7 m. Scale bar: 500 µm.
Fig. 3 LV from inside. Perbál–5 borehole, depth 149,9–150,3 m. Scale bar: 500 µm.
Fig. 3a Hinge of LV. Perbál–5 borehole, depth 149,9–150,3 m. Scale bar: 200 µm.
Fig. 4 Central muscle scars of LV. Perbál–5 borehole, depth 149,9–150,3 m. Scale bar: 100 µm.

Figs 5–6 *Miocyprideis janoscheki* KOLLMANN, 1958.

Fig. 5 RV. Mány–22 borehole, depth 45–52,5 m. Scale bar: 200 µm.
Fig. 6 LV from inside. Mány–22 borehole, depth 39,8–41,1 m. Scale bar: 500 µm.
Fig. 6a Hinge of LV. Mány–22 borehole, depth 39,8–41,1 m. Scale bar: 200 µm.
Fig. 6b Central muscle scars of LV. Mány–22 borehole, depth 39,8–41,1 m. Scale bar: 50 µm.

Plate 5

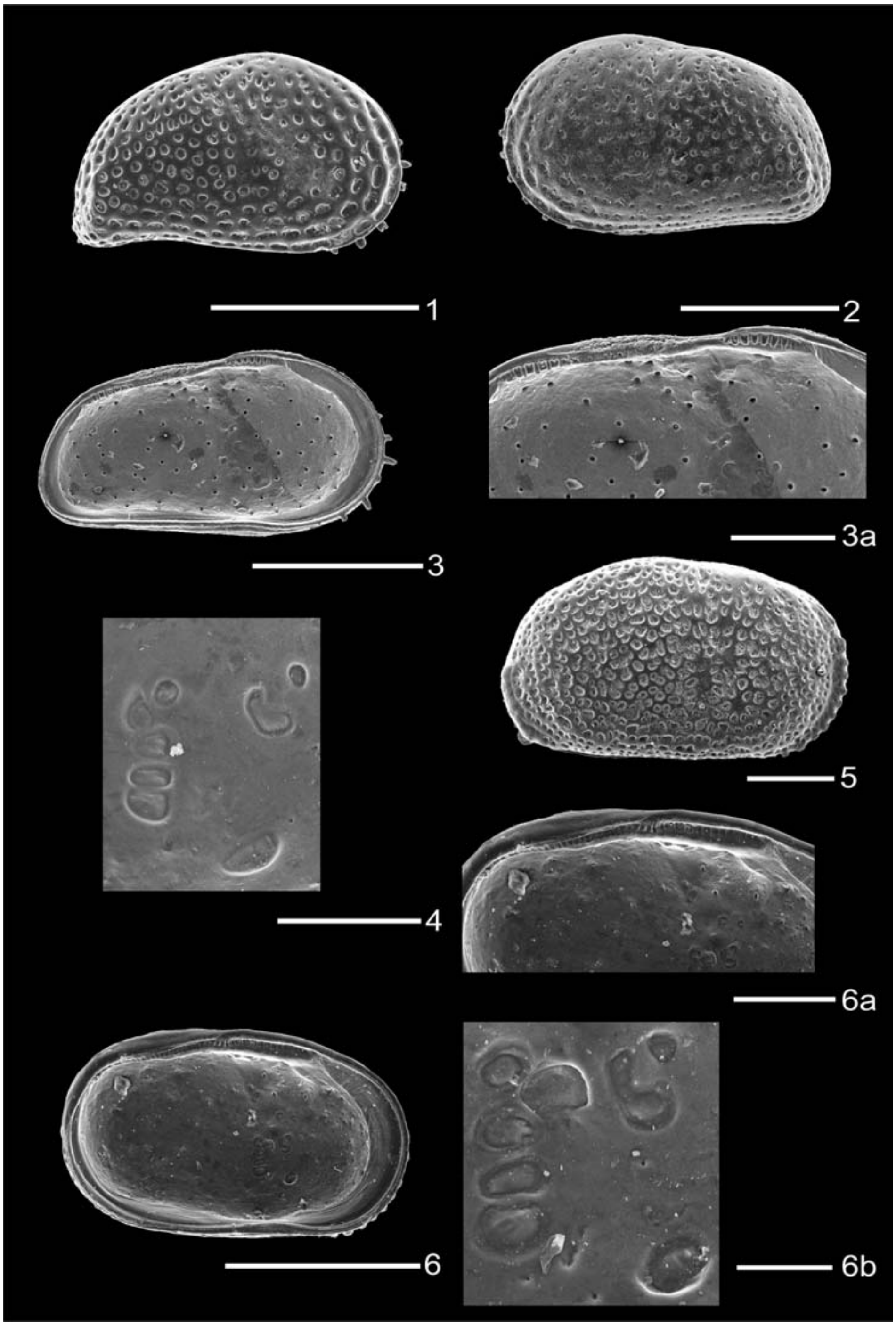

Plate 6

Fig. 1 *Miocyprideis sarmatica* (ZALÁNYI, 1913).
RV. Mány–22 borehole, depth 149,9–150,3 m. Scale bar: 500 µm.

Figs 2–6 *Hemicytheria omphalodes* (REUSS, 1850).
Fig. 2 LV♂. Perbál–5 borehole, depth 118,3–119,1 m. Scale bar: 200 µm.
Fig. 3 RV♀. Perbál–5 borehole, depth 118,3–119,1 m. Scale bar: 200 µm.
Fig. 4 LV♀. Perbál–5 borehole, depth 118,3–119,1 m. Scale bar: 500 µm.
Fig. 5 LV. Juvenile. Perbál–5 borehole, depth 118,3–119,1 m. Scale bar: 200 µm.
Fig. 6 LV♂ from inside. Perbál–5 borehole, depth 118,3–119,1 m.
Scale bar: 500 µm.
Fig. 6a Hinge of LV♂. Perbál–5 borehole, depth 118,3–119,1 m. Scale bar: 200 µm.
Fig. 6b Central muscle scars of LV♂. Perbál–5 borehole, depth 118,3–119,1 m
Scale bar: 100 µm.

Plate 6

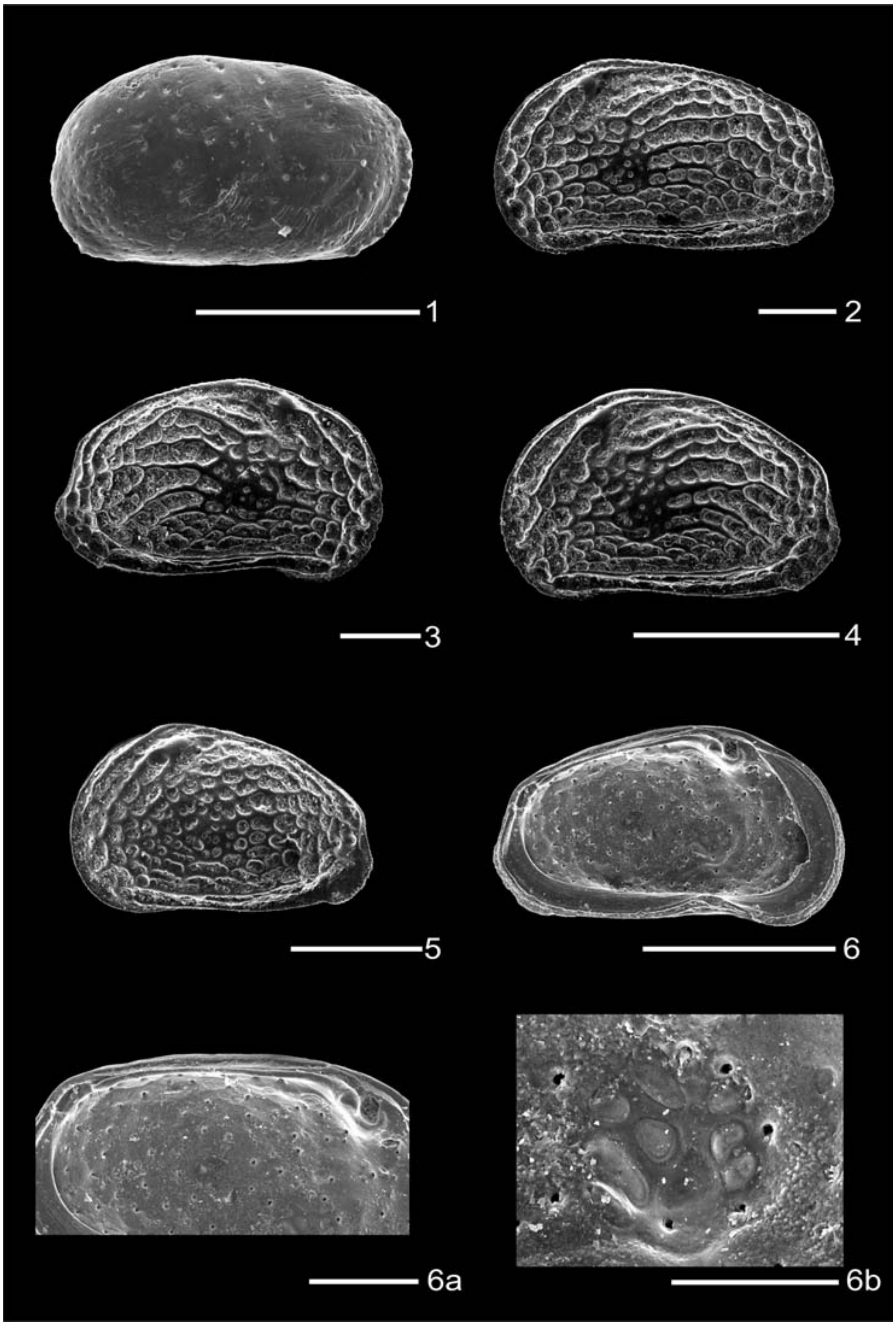

Plate 7

Figs 1–4 *Senesia vadaszi* (ZALÁNYI, 1913).

Fig. 1 RV. Mány–22 borehole, depth 162–163 m. Scale bar: 500 µm.

Fig. 2 LV. Perbál–5 borehole, depth 169,3–172,3 m. Scale bar: 500 µm.

Fig. 3 LV. Juvenile. Mány–22 borehole, depth 162–163 m. Scale bar: 200 µm.

Fig. 4 LV from inside. Mány–22 borehole, depth 155–157,9 m. Scale bar: 500 µm.

Figs 5–7 *Aurila mehesi* (ZALÁNYI, 1913).

Fig. 5 RV. Mány–17 borehole, depth 150,8–151,8 m. Scale bar: 500 µm.

Fig. 6 LV. Mány–22 borehole, depth 143,1–145,1 m. Scale bar: 500 µm.

Fig. 7 RV from Juvenile. Mány–17 borehole, depth 147,6–150,4 m. Scale bar: 500 µm.

Fig. 7a Hinge of RV. Mány–17 borehole, depth 147,6–150,4 m. Scale bar: 200 µm.

Plate 7

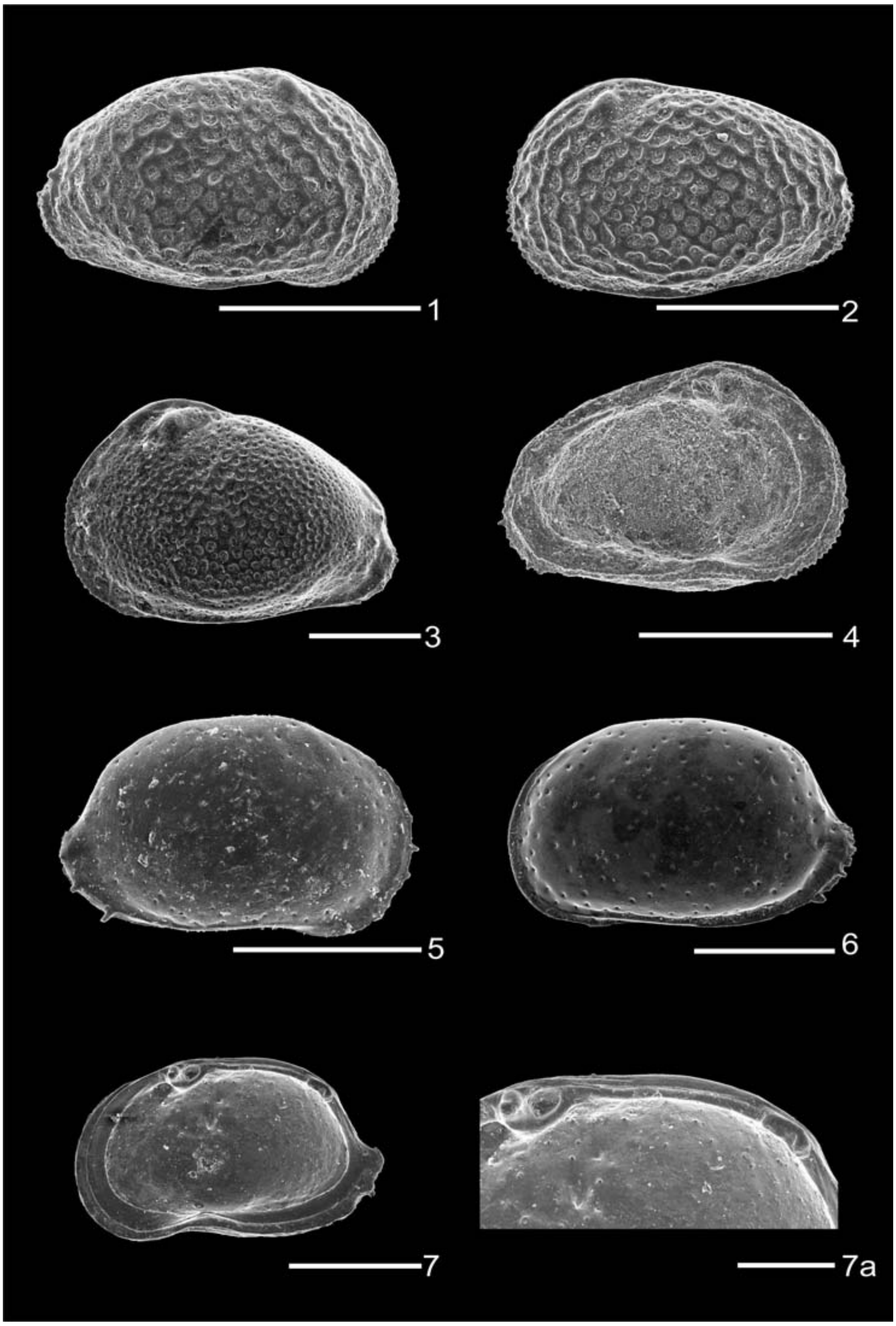

Plate 8

Figs 1–2 *Aurila merita* (ZALÁNYI, 1913).

Fig. 1 RV. Mány–17 borehole, depth 147,1–147,5 m. Scale bar: 200 µm.

Fig. 2 LV. Mány–22 borehole, depth 165,5–167,5 m. Scale bar: 500 µm.

Figs 3–7 *Aurila notata* (REUSS, 1850).

Fig. 3 RV♀. Mány–22 borehole, depth 45–52,5 m. Scale bar: 500 µm.

Fig. 4 LV♀. Mány–22 borehole, depth 70–72 m. Scale bar: 500 µm.

Fig. 5 RV♂. Mány–22 borehole, depth 45–52,5 m. Scale bar: 500 µm.

Fig. 6 LV♂ from inside. Mány–22 borehole, depth 66,5–67 m. Scale bar: 500 µm.

Fig. 6a Hinge of LV♂. Mány–22 borehole, depth 66,5–67 m. Scale bar: 200 µm.

Fig. 7 Central muscle scars of LV. Mány–17 borehole, depth 130–134,2 m. Scale bar: 100 µm.

Plate 8

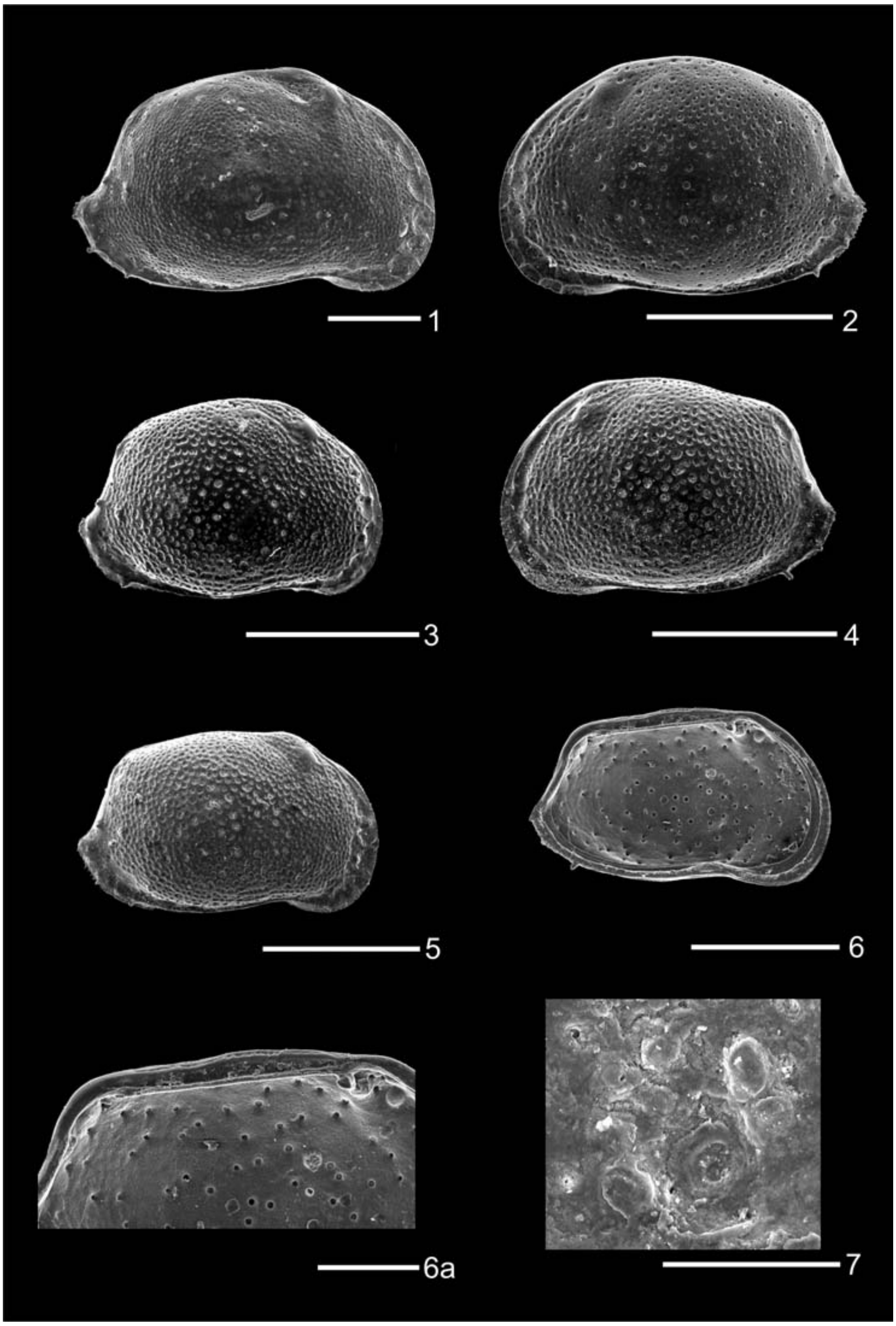

Plate 9

Figs 1–2 *Loxocorniculum hastatum* (REUSS, 1850).
Fig. 1 RV♀. Perbál–5 borehole, depth 177,2–178,2 m. Scale bar: 200 µm.
Fig. 2 LV♀. Perbál–5 borehole, depth 177,2–178,2 m. Scale bar: 200 µm.

Figs 3–5 *Loxoconcha porosa* MÉHES, 1908.
Fig. 3 LV. Mány–22 borehole, depth 45–52,5 m. Scale bar: 200 µm.
Fig. 4 LV. Ecological variation. Mány–22 borehole, depth 70–72 m. Scale bar: 500 µm.
Fig. 5 RV from inside. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.
Fig. 5a Hinge of RV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 200 µm.
Fig. 5b Central muscle scars of RV. Mány–17 borehole, depth 104,5–106 m. Scale bar: 100 µm.

Fig. 6 *Loxoconcha kochi* MÉHES, 1908.
RV. Mány–22 borehole, depth 45–52,5 m. Scale bar: 200 µm.

Plate 9

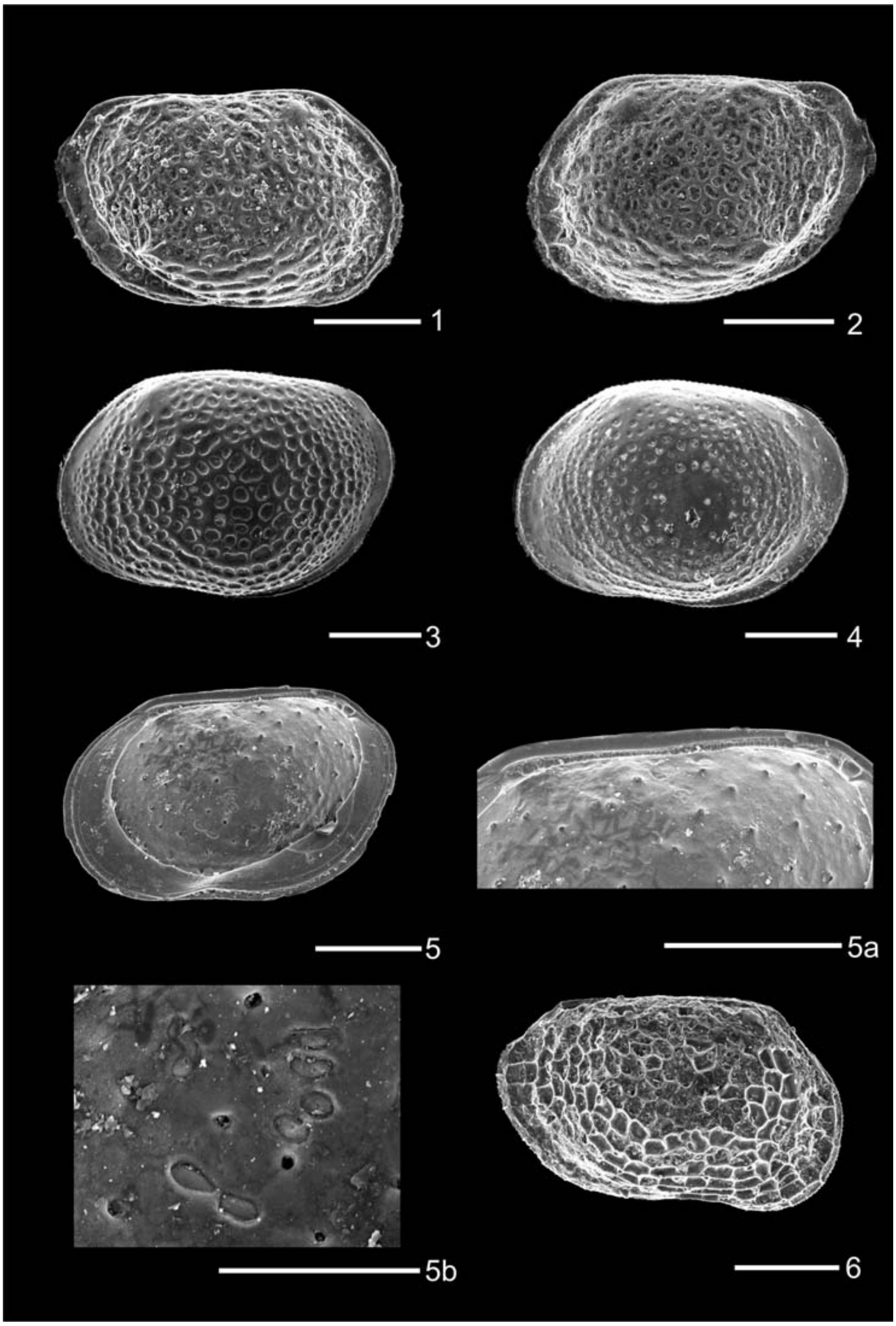

Plate 10

Figs 1–2 *Loxoconcha* ex gr. *punctatella* (Reuss, 1850).
Fig. 1 RV. Mány–22 borehole, depth 173–175,9 m. Scale bar: 200 µm.
Fig. 2 LV. Mány–17 borehole, depth 173,1–173,3 m. Scale bar: 200 µm.

Figs 3–5 *Xestoleberis fuscata* Schneider, 1953.
Fig. 3 LV. Mány–22 borehole, depth 134,6–139,1 m. Scale bar: 200 µm.
Fig. 4 RV. Mány–22 borehole, depth 170,6–173 m m. Scale bar: 200 µm.
Fig. 5 LV from inside. Mány–22 borehole, depth 170,6–173 m.
Scale bar: 200 µm.
Fig. 5a Central muscle scars of RV. Mány–22 borehole, depth 170,6–173 m.
Scale bar: 50 µm.

Plate 10