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Sarmatian ostracods from Budapest (Hungary)

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(with 6 figures and 7 plates)

Abstract

This work is the first compilation of data on ostracods from a continuous Lower Sarmatian succession. The determination, detailed descriptions and illustrations of the following 17 species are provided: *Leptocythere tenuis* (REUSS) s. l., *Callistocythere maculata* PIETRZENIUK, *Callistocythere tokajensis* PIETRZENIUK, *Callistocythere egregia* (MÉHES), *Hemicyprideis dacica dacica* (HÉJJAS), *Cytheridea hungarica* ZALÁNYI, *Miocyprideis sarmatica* (ZALÁNYI), *Hemicytheria omphalodes* (REUSS), *Aurila méhesi* (ZALÁNYI), *Tenedocythere cruciata* BONADUCE, RUGGIERI et RUSSO, *Senesia vadászi* (ZALÁNYI), *Loxoconcha.*ex gr. *punctatella* (REUSS), *Loxocorniculum schmidi* (CERNAJSEK), *Loxocorniculum hastata* (REUSS), *Xestoleberis fuscata* SCHNEIDER, and *Argilloecia sarmatica* JIŘIČEK. Both forms of the Mediterranean relict fauna and of the endemic fauna evolved in the Parathetys are present. Generally Sarmatian ostracod fauna shows low diversity and high abundance. Some ostracod species reflect a significant reduction of ornamentation, which suggests a change in the environment and decrease in salinity.

Introduction

Due to the reconstruction in the courtyard of the former building of the Department of Palaentology, Eötvös University (2 Ludovika Square, Budapest) a more than 10 m deep working pit was dug out. This temporary outcrop exposed Sarmatian beds and gave an opportunity to study the microfauna. Previously we knew this layers from the boreholes of the Subway too but it hasn't been studied yet for microfauna.

The primary aim of this work is to provide taxonomy and illustrations of the Sarmatian ostracods. Detailed analysis of ostracods from Budapest hasn't been made yet. Moreover such detailed taxonomic work on the Hungarian Sarmatian ostracods has not been published since the first and the only detailed and illustrated descriptions by ZALÁNYI in 1913. J. BODA (1957) carried out a statistical evaluation on ZALÁNYI's work that included data from 571 different sites. He also published diagrams showing the evolution of ostracods. Further studies have been made by M. SZÉLES (1963) and A. KORECZ (1981).

Material and methods

Samples were taken from 3 boreholes around Ludovika square, a ventillaton tube of the Subway (line #3), a working pit at Ludovika square, and five boreholes between Nagyvárad square and Ludovika square (#615, #616, #617, #618, #619 boreholes). Localities are shown in Fig. 1.

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Fig. 1. Chart showing locations of the studied boreholes, the working pit and the ventillation tube in Budapest – **1.** the ventillation tube, the working pit and the boreholes Lud 1, Lud 2 and Lud 3; **2.** borehole #615; **3.** borehole #616; **4.** borehole #617; **5.** borehole #618; **6.** borehole #619. Scale 1 : 20,000.

Two of the boreholes at Ludovika Square were 30 m deep (Lud 1, Lud 3), while one was 25 m (Lud 2) deep. Borehole #618 was 18 m deep and borehole #617 was 16 m deep. Difficulty arose when describing petrology and local geology of the area, since no previous precise stratigraphic data were available. Therefore the stratigraphic descriptions from surrounding areas had to be applied. The section of Üllői Road between Könyves K. ring and Ludovika Square, and the open working pit of Ludovika square gave further information on the studied geological site.

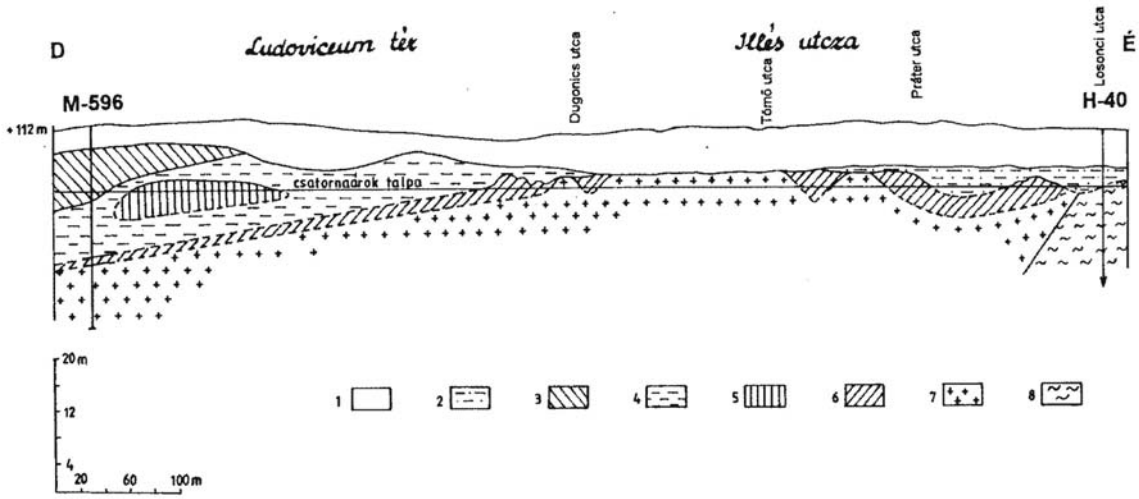


Fig. 2. An updated version of SCHAFARZIK's (1903) section along the Illés street trench, Budapest (KÓKAY 1996). Legend: Quaternary: 1. sand, gravel; 2. alluvial silt; Sarmatian: 3. Cerithium bearing limestone, 4. foraminifer bearing clay, 5. foraminifer bearing limestone; Upper Badenian: 6. Leithakalk, 7. fossil bearing sand and clay; Middle Badenian: 8. pelitic sequence. D = South; É = North

Sarmatian layers are situated along the Üllői Street between Nagyvárad Square and Ludovika Square. These layers are overlain by Pleistocene sandstone, sandy mud and antropogenic filling. The geological settings after BUBICS (1978) is the following: along this section the structure of the Sarmatian layers is the following: mollusc-bearing clay marls are dominant, and change in to calcareous marls, sandy limestone and limestone upwards. There are sand infiltrations between the layers. The Sarmatian layers show discordance to the Badenian base (angle of discordance 1-4°). Upper Sarmatian layers on the Lower Sarmatian show erosional discordance. The lower Sarmatian layers have the folowing lithological characters: clay marl is

dominant and contains calcareous marl and limestone beds. Clay marl contains bentonite; the main mineral components are montmorinollite and illite (24%). These layers are massive, rarely thick bedded, with the carbonate-content between 16 and 22%. Another section (perpendicular to Üllői Street) shows Quarternary sediment layers, however the outcrop at Ludovika Square did not open any of these layers (Figs. 2 and 3).

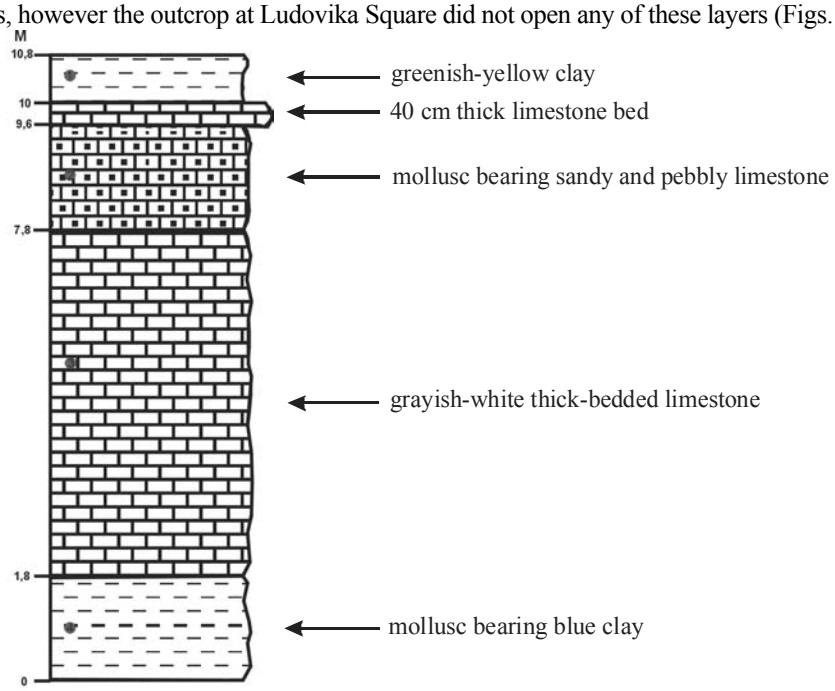


Fig. 3. The section of the open working pit is located at the Ludovika square.

The previous study was based on 152 samples of 5 boreholes, 2 samples from the ventilation shaft and 4 samples from the open working pit, which contained determinable ostracod fauna.

Ostracods were separated by the author using the usual method for fossiliferous ostracods. More than 16,000 ostracod specimens of 17 species and two bryozoan species were determined. Descriptions are following the terminology given by MORKHOVEN (1962) (Fig. 5).

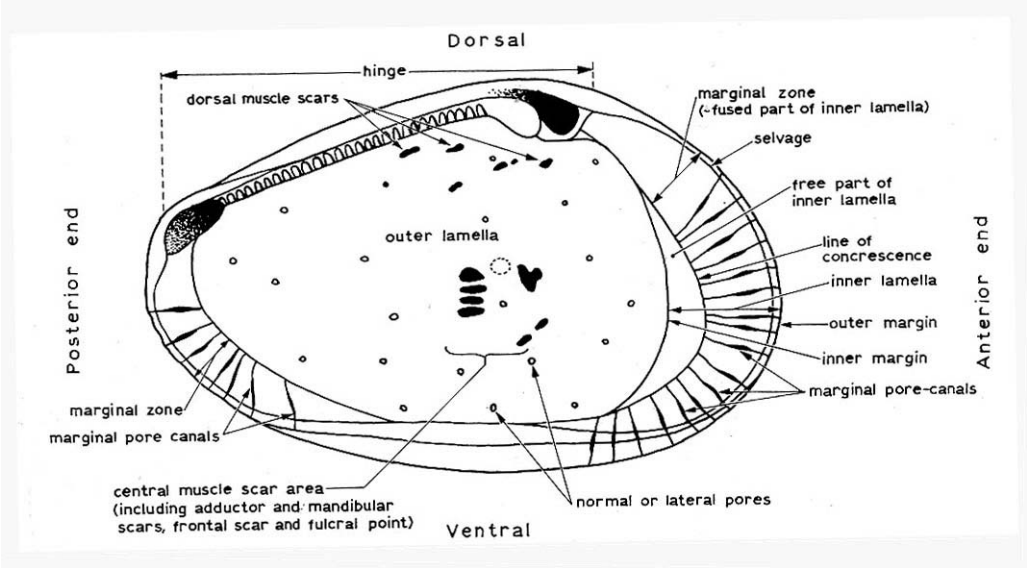
The studied strata belong to the s. str. (SUESS, 1866) Sarmatian stage, Kozárdian, as it was proven by the high abundance of *Aurila méhesi* (ZALÁNYI, 1913) index forms.

It has to be mentioned that the Central and Eastern Parathetys were probably disconnected at 10-11 Ma and therefore the Sarmatian stage is defined differently in the two regions. See correlation in Fig 4.

Central Paratethys		**Eastern Paratethys**	
Stage	Substage	Stage	Substage
Lower Pannonian		Meotian	
		Sarmatian s. l.	Chersonian
			Bessarabian
Sarmatian s. str.	Tinnyeian		
	Kozárdian		Volhynian

Fig. 4. Correlation of stages beetwen the Central Paratethys and the Eastern Paratethys (KÓKAY, 1985)

A more sophisticated zonation of the Lower Sarmatian substage was achieved by using the distribution data of the different species in each strata. The distribution of the species is shown by Fig. 6.



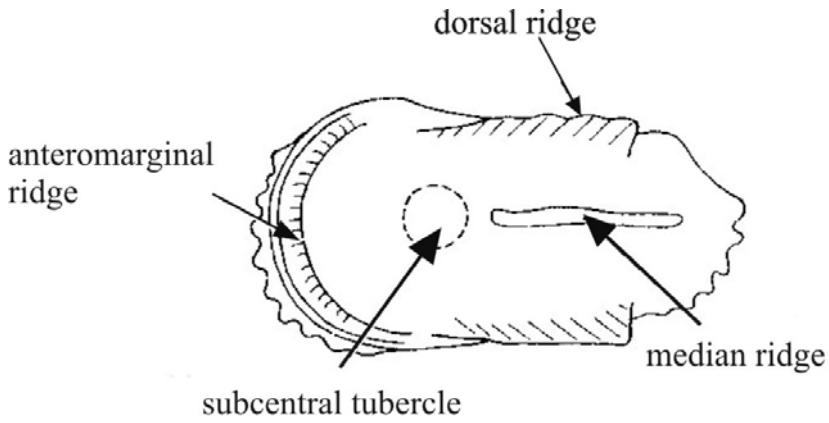


Fig. 5. Left valve of an ostracod showing main inside structural elements and main ornamental elements (MORKHOVEN 1962).

SPECIES	LOWER SARMATIAN		
	1.	2.	3.
Leptocythere tenuis (REUSS)			
Callistocythere maculata PIETRZENIUK			
Callistocythere tokajensis PIETRZENIUK			
Callistocythere egregia (MÉHES)			
Hemicyprideis dacica dacica (HÉJJAS)			
Cytheridea hungarica ZALÁNYI			
Miocyprideis sarmatica (ZALÁNYI)			
Hemicytheria omphalodes (REUSS)			
Aurila méhesi (ZALÁNYI)			
Tenedocythere cruciata BONADUCE, RUGGIERI ET RUSSO			
Senesia vadászi (ZALÁNYI)			
Loxoconcha ex gr. punctatella (ZALÁNYI)			
Loxocorniculum schmidi (CERNAJSEK)			
Loxocorniculum hastata (REUSS)			
Xestoleberis fuscata SCHNEIDER			
Cytherois sarmatica (JIŘIČEK)			

Fig 6. Stratigraphic distribution of species.

Systematical part

Systematic subdivision 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 Leptocytheridae HANAI, 1957
Subfamily Cytherinae DANA, 1853
Genus *Leptocythere* SARS, 1928

Leptocythere tenuis (REUSS, 1850) s. l.
Pl. 2, Figs 1-3.

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,1908) - HANGANU, pl. III, figs. 25-26.
1974. *Leptocythere tenuis* (REUSS, 1850) - CERNAJSEK, p. 475- 476, pl. II, fig. 6.

Material. 213 carapaces.
Dimensions (in mm): L = 0,54-0,65 mm; H = 0,24-0,31 mm; L/H = 2,07-2,25.
Description. In the outer lateral view, the anterior outline of the left valve is widely and almost symmetrically rounded. It turns gradually into the nearly straight dorsal outline, which breaks with a c. 140° angle into the posterior outline at 0,9 lenght of the valve. The posterior outline is symmetrical with a slightly concave upper part. The lower part of the posterior outline is convex and turns into the ventral outline at 0,8-0,9 length of the valve. The ventral outline shows a distinct incision at 0,3 and 0,5 length of the valve and turns gradually into the anterior outline. The height is nearly identical everywhere in the valve except the distal parts. The dorsal outline of the right valve is a little convex.
Ornamentation: The surface of valves is smooth. Along to the anterior margin there is a narrow depression. The lower part of the posterior margin on the left valve shows a slight depression starting from 0,8 of its height. There also is a posterior depression on the right valve, that begin at c. 0,5 height of the valve.
Inner lamella is wide anteriorly and posteroventrally. Anterior vestibulum is well-developed, posteroventral vestibulum is narrow.
Marginal pore canals: Few, branching to the ventral end (bi-, trifurcate).
Normal pores: Moderate in number.
Hinge:In the left valve the terminal elements are faintly crenulate sockets. The median element is a crenulate bar.
Muscle scars: There is a vertical row of four adductor muscle scars with a V-shaped frontal scar. Fulcral point is crescent-shaped.
Eye-tubercle: Absent.
Remarks: On the valvesurface of the *Leptocythere tenuis* (Reuss, 1850), the ostracod that is most common in the Pannonian, fine reticulation is characteristic. However, the studied Sarmatian strata show low abundance of ornamented forms, while smooth forms are dominant. The smooth forms are most probably of the same species, therefore I suggest to revise the definition of *Leptocythere tenuis* (Reuss, 1850) species.
Stratigraphical and geographical distribution: Austria, Azerbaijan: Miocene, Hungary: Miocene and Pliocene.

Genus *Callistocythere* RUGGIERI, 1953
Callistocythere maculata PIETRZENIUK, 1973
Pl. 1, Fig. 5-6.

1973. *Callistocythere maculata* n. sp.- PIETRZENIUK, p. 718-719, pl. I, fig. 4, pl. II, fig. 11-12, pl. V, fig. 5-7, fig. 13-14.

Material: 6 carapaces.

Dimensions (in mm): L=0,4 mm, H=0,8 mm, L/H=2.

Description: In the outer lateral view the anterior outline of the right valve is nearly symmetrically rounded. It turns gradually into the slightly convex dorsal outline. The dorsal outline shows a distinct posterior cardinal angle. The posterior outline is nearly symmetrically. It turns gradually into the ventral outline. The posterior part of the ventral outline is convex and changes to concave at 0,7 length of the valve. It bends gradually into the anterior outline. The maximum height is at 0,3 length of the valve.

Ornamentation: Primary reticulation can be observed on the surface of the carapace. A depression appears along the anterior margin. A rib can be observed at half height of the valve, between 0.3 and 0.8 length of the valve. The rib gradually join attaches with a node at the posterior end. Another rib can be observed extending from the eye tubercle towards the anterior margin. There is a sharp third rib near and almost parallel to the posterior margin.

Inner lamella: Wide in the anterior and posteroventral parts. Selvage is near and parallel to the outer margin.

Marginal pore canals: Moderately numerous, wide at their base and branching to the anterior end (polyfurcate).

Hinge: Similar to *Leptocythere*, except for the anterior part of the median element, which consists of two toothlets in the left valve.

Normal pores: Moderate in number.

Muscle scars: There is a vertical row of four adductor muscle scars with a V-shaped frontal scar. Fulcral point is crescent-shaped.

Eye-tubercle: Very weak.

Remarks: This species seems similar to that described from the Sarmatian of the Polish part of the Carpathian Foredeep, described by SCZECHURA (2000) as *Leptocythere* sp.

Stratigraphical and geographical distribution: Hungary: Upper Miocene.

Callistocythere tokajensis PIETRZENIUK, 1973
Pl.1, Figs. 7-8.

1973. *Callistocythere tokajensis* n. sp. - PIETRZENIUK, p. 705-706, pl. I, fig. 3, pl. II, fig. 1-2, pl. III, fig. 5-8, fig. 2-3.
1973. *Callistocythere scabra* n. sp. - PIETRZENIUK, p. 705-706, pl. I, fig. 3, pl. I, fig. 5., pl. IV, fig. 3-5, fig. 2-3.

Material: 23 carapaces.

Dimensions (in mm): L = 0,49-0,5 mm, H = 0,25-0,26 mm, L/H = 1,92-1,96.

Description: In the outer lateral view the anterior outline of the left valve is asimmetrically rounded with widely-arched upper while narrowly-arched lower parts. It turns gradually into the nearly straight dorsal outline. The posterior outline is nearly symmetrically rounded with its upper part slightly concave. The lower part of the posterior outline is more convex and turns gradually to the ventral outline. The posterior part of the ventral outline is convex and turns into concave at 0,5 length of the valve. It turns gradually into the anterior outline. The maximum height is at 0,2 length of the valve. The dorsal margin of the right valve is slightly convex.

Ornamentation: Primary reticulation can be observed on the surface. There is a narrow depression along the anterior margin. A rib appears at 0.5 height, between 0.35 and 0.8 length of the valve. The rib join with a node at the posterior end. At the posterior end turns back with 90º. The longitudinal rib branches into smaller transversal ribs. Another rib can be observed extending from the eye tubercle towards the anterior margin, with an angle of 140º. There is a sharp rib near and almost parallel to the posterior margin.

Inner lamella is wide in anterior and posteroventral parts. Selvage is near and parallel to the outer margin.

Marginal pore canals: Moderate by numerous, wide at their base, branching to the anterior end (polyfurcate).

Hinge: Typical of *Leptocythere*, except for the anterior part of the median element, which consists of two toothlets on the left valve.

Normal pores: Moderate in number.

Muscle scars: There is a vertical row of four adductor muscle scars with a V-shaped frontal scar. Fulcral point is crescent-shaped.

Eye tubercle: Very weak.

Remarks: The species *Callistocythere scabra* Pietrzeniuk,1973 seems to be an ecological variation of C*allistocythere tokajensis* Pietrzeniuk,1973 that shows a significant reduction of ornamentation, but retains most of the characteristics.

Stratigraphical and geographical distribution: Hungary: Upper Miocene.

Callistocythere egregia (MÉHES, 1908)

Pl.1 Figs 1-4.

1908. *Cythere egregia* n. sp. - MÉHES, p. 546-548, pl. 9, fig. 17-23.
1973. *Callistocythere pusztafaluensis* n. sp. - PIETRZENIUK, p. 716-718, pl. II, fig. 7-8, pl. VI, fig. 1-6, fig. 11-12.
1974. *Callistocythere egregia* (MÉHES,1908) - CERNAJSEK, p. 476- 477, pl. II, fig. 8.
1998. *Callistocythere* aff. *canaliculata* (REUSS,1850) - Zorn, p. 184-185.

Material: 769 carapaces.

Dimensions (in mm): L=0,48-0,51 mm, H=0,25-0,26.

Description: In outer lateral view, the anterior outline of the left valve is asymmetrically rounded, with widely-arched upper and narrowly-arched lower parts. It turns with 150º into the nearly straight dorsal outline. The dorsal outline shows a distinct posterior cardinal angle. The posterior outline is nearly symmetrical. It turns gradually to the ventral outline. The posterior part of the ventral outline is convex and turns to concave at 0,5 length of the valve. It bends gradually to the anterior outline. The maximum height is at 0,2 length of the valve. The dorsal margin of the right valve is slightly convex and turns gradually into the posterior margin.

Ornamentation: Irregular reticulation appears on the surface of the carapace. Along the anterior margin there is a wide depression. There is a sharp node at 0.3 length of the valve. A rib can be observed extending from the eye tubercle towards the anterior margin. There is a smaller rib in parallel position, close to the ventral margin. Near and almost parallel to the posterior margin the are two sharp ribs, join the posterior margin.

Inner lamella: Wide in anterior and posteroventral parts. Selvage is near and parallel to outer margin.

Marginal pore canals: Moderately numerous, wide at their base, branching to the anterior end (polyfurcate).

Hinge: Typical of to *Leptocythere*, except for the anterior part of the median element, which consists of two toothlets in the left valve.

Normal pores: Moderate in number.

Muscle scars: There is a vertical row of four adductor muscle scars with a V-shaped frontal scar. Fulcral point is crescent-shaped.

Eye-tubercle: Very weakly developed.

Variability: Most forms show a significant reduction of ornamentation, which can be explained by a change of the extant environment, especially a severe decrease in salinity. I could be found transitional forms too.

Stratigraphical and geographical distribution: Austria: Middle Miocene (Karpatian, Sarmatian), Hungary: Miocene (Sarmatian, Pannonian), Pliocene.

Family Cytherideidae SARS,1925
Subfamily Cytherideinae SARS,1925
Genus *Hemicyprideis* SARS,1925

Hemicyprideis dacica dacica (HÉJJAS, 1895)
Pl 2. Figs 4-8.

1895. *Cytheridea dacica* n. sp. - HÉJJAS, p. 59-60, 103, pl. IV, fig. 10a-c.
1913. *Cytheridea dacica* HÉJJAS, 1894 - ZALÁNYI, p. 97-99, textfig. 15.
1929. *Cytheridea dacica* HÉJJAS, 1894 - ZALÁNYI, p. 107-112, pl. I, fig. 1, textfig. 47-48.
1953. *Haplocytheridea dacica dacica* (HÉJJAS, 1894) - GOERLICH, p. 138-139, pl. 6, fig. 43-49.
1956. *Haplocytheridea dacica dacica* (HÉJJAS, 1894) - OERTLI, p. 45-46, pl. 4, fig. 94-103.
1958. *Haplocytheridea dacica dacica* (HÉJJAS) - KOLLMANN, p. 140, pl. 2, fig. 3, pl. 9, fig. 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, 1894) - 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, 1894 - CERNAJSEK, p. 472-473.
1975. *Haplocytheridea dacica dacica* (HEJJAS) - IONESI,CHINTĂUAN, pl. 1, fig. 6.
1975. *Hemicyprideis dacica dacica* (HÉJJAS, 1894) - BRESTENSKÁ, p. 397. pl. 2, fig. 15-16.

1976. *Haplocytheridea dacica dacica* (HÉJJAS) – CHINTĂUAN et NICORICI, p. 13, pl. II, fig. 7-9.
1979. *Hemicyprideis dacica dacica* (HÉJJAS, 1894) - BASSIOUNI, p. 58-59, pl. 13, fig. 11-12.
1985. *Hemicyprideis dacica dacica* (HÉJJAS, 1894) - MÜLLER, p. 22-24, pl. 3, fig. 15-17, pl. 4., fig. 1-4, non pl. 3, fig. 10-14.
non 1985. *Hemicyprideis dacica* (HÉJJAS, 1894) - CARBONNEL et al, p. 224, Pl. II, Fig. 10-12.
non 1992. *Hemicyprideis dacica dacica* (HÉJJAS, 1894) - APOSTOLESCU, GUERNET, p. 108-109, Pl. 2, Fig. 10.

Material: 42 carapaces.
Dimensions (in mm): L = 0,57-0,62 mm; H = 0,31-0,34 mm; L/H = 1,73-2,03.
Description: In the lateral view of the left valve the anterior outline is widely and nearly simmetrically rounded. It turns gradually into the widely arched dorsal outline. The dorsal outline turns into the posterior outline with a slightly break. The posterior outline is rather asymmetrically, the upper part is widely rounded and the lower part is narrowly rounded. The ventral outline is nearly straight. The anterior margin contains 20-30 small dents, while the lower part of the posterior margin bears 5-7 dents. The highest part is anteriorly. In the lateral view of the right valve, the posterior outline turns gradually into the dorsal outline. The highest part is at the half length of the valve.
Ornamentation: The surface of the carapace is finely pitted. There is a narrow depression along the lower part of the anterior margin on the valve. Along the posterior margin the depression is less expressed than the anterior margin.
Inner lamella: Wide in the anterior end, less wide on the posteroventral part. The selvage is close to the outer margin.
Marginal pore canals are rather densly distributed and straight.
Hinge: Long and crenulated anterior and posterior teeth and a crenulated bar in between appear on the right valve.
Normal pores: Scarsely distributed
Muscle scars: There is a V shaped frontal scar before the series of four adductor muscle scars on the right valve. Other scars are present below and above the adductor muscle scars.
Eye-tubercle: Absent.
Overlap: Rather distinct on the ventral, antero- and posterodorsal parts.
Variability: Sexual dimorphism: The male forms are more elongated than the females. The dorsal outline of the males is slightly rounded on the left valve opposite to the dorsal outline of the females.
Juveniles: The carapace of the larvae are smaller, more acute in the posterior part and more triangle shaped.
Remarks: Some forms that were previously determined as *Hemicyprideis dacica dacica* (HÉJJAS, 1895) are considered sensu lato named by the author. Figures by MÉHES (1941) do not show similarity to the cited illustrations and descriptions ZALÁNYI (1913). Figures by Oertli show forms significantly deviating from the s. str. definition of species and they should be considered as distorted forms. Forms presented by STANCHEVA (1963) are probably juveniles. MÜLLER (1985) described ostracods differ not only in shape but they are concentrically striated at both anterior and posterior end. Similar forms are mentioned from the Oligocene and Miocene of Turkey by BASSIOUNI (1979).
Stratigraphical and geographical distribution: Hungary, Switzerland, Germany, Austria, Czech Republic, Romania, Bulgaria, Turkey: Upper Oligocene – Upper Miocene.

Genus *Cytheridea* BOSQUET,1852
Cytheridea hungarica ZALÁNYI, 1913
Pl. 3, Figs 1-6.

1913. *Cytheridea hungarica* n. sp.- ZALÁNYI, p. 92-94, pl. V, fig. 11-14, textfig.3. et 11.
1941. *Cytheridea hungarica* ZALÁNYI - MÉHES, p. 74-75, pl. III, fig. 1-2, textfig. 99, 100, 141.
1958. *Cytheridea hungarica* ZALÁNYI - KOLLMANN, p. 150, pl. 1, fig. 1, pl. 6, fig. 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,1913 - 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.

Material: 2051 carapaces.
Dimensions (in mm): H= 0,46-0,50 mm, L=0,82-0,9 mm, L/H= 1,78-1,8.
Description: In the lateral view of the left valve, the anterior outline is widely and almost simmetrically

rounded. It extends into the nearly straight dorsal outline with an angle of c. 160º at 0,4 length of the valve. The dorsal outline turns into the posterior outline with an angle of 140º at 0,9 length of the valve. The posterior outline is rather asymmetrical, the upper part is broadly rounded and the lower part is narrowly rounded. The posterior part of the ventral outline is concave but turns convex at 0,6 length of the valve and gradually joins with the anterior margin. The lower part of the anterior margin bears 6-7 larger dents. The maximum height is near the anterior margin. In the lateral view of the right valve, the posterior end of the carapace is more acute than in the left valve.

Ornamentation: The carapace is strongly and concentrically pitted. There is a narrow depression along the anteroventral margin.

Inner lamella: Widest at the anterior part. Selvage is ventral, situated subperipherially.

Marginal pore canals: Numerous, narrow, branching to the anterior end.

Hinge: Terminal elements are coarsely crenulate. Median hinge element consists of two alternating parts: a finely crenulate anteromedian bar and a crenulate posteromedian groove. The teeth are wedge-shaped.

Normal pores: Sieve-type, moderate in number.

Muscle scars: There is a V shaped frontal scar before the series of four adductor muscle scars on the right valve. Fulcral point is crescent-shaped.

Eye tubercle: Absent.

Variability: The shape of some forms are acute on the posterior end. These valves are more triangular than another (sexual dimorphism?). The degree of ornamentation also varies; in some forms it is highly reduced. This might result of the decrease in the salinity of seawater. These forms and the transitional forms are considered ecological variations.

Remarks: Some forms previously described as *Cytheridea hungarica* ZALÁNYI, 1913 are considered now sensu lato named. Figures published by MÉHES (1941) do not show similarity to the cited illustration and description of ZALÁNYI (1913).

Stratigraphical and geographical distribution: Hungary: Upper Oligocene - Miocene, Austria: Miocene (Sarmatian, Pannonian), Serbia: Miocene (Lower Sarmatian).

Genus *Miocyprideis* KOLLMANN,1960

Miocyprideis sarmatica (ZALÁNYI, 1913)

Pl. 3, Figs 7-8.

1913. *Cytheridea punctillata* G. S. BRADY var. *sarmatica* n. var. - ZALÁNYI, p. 101-102, pl. VI, fig. 9-11, textfig.16.
1974. *Miocyprideis sarmatica* (ZALÁNYI) - JIŘIČEK, p. 436-137, pl. 4, fig. 3-4.
1980. *Miocyprideis sarmatica* (ZALÁNYI) - KRSTIĆ, pl. III, fig. 1-4, 14, 16, pl. V, fig. 6-8.
1985. *Miocyprideis sarmatica* (ZALÁNYI) - IONESI, CHINTĂUAN, pl. I, fig. 1.

Material: 12 carapaces.

Dimensions (in mm): L=0,76-0,8 mm, H=0,4-0,46 mm, L/H= 1,74-1,9.

Description: In the outer lateral view of the left valve the anterior outline is almost symmetrically rounded and bends to the slightly convex dorsal outline at 0,5-0,6 length of the valve. The dorsal outline turns gradually into posterior outline at 0,9 length of the valve that bends to the straight ventral outline. The ventral outline gradually turns into the anterior outline. The anterior margin bears numerous small dents. The right valve is more rectangular and more elongated than the left valve.

Ornamentation: The carapace is finely pitted. Pits along the margin are arranged concentrically. There is a slight depression along the anterior margin.

Internal features could not be studied.

Eye tubercle: Absent.

S*ratigraphical and geographical distribution:* Austria, Hungary, Romania, Serbia, Slovakia: Miocene.

Family Hemicytheridae PURI, 1953

Subfamily Hemicytherinae PURI, 1953

Genus Hemicytheria POKORNÝ, 1952

Hemicytheria omphalodes (REUSS, 1850)

Pl. 4, Figs. 1-3.

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,1850) - CERNAJSEK, p. 468- 470, pl. I, fig. 7-8.
1985. *Hemicytheria omphalodes* (REUSS) - JIŘIČEK, pl. 56, fig. 7-9.

Material: 3 carapaces.

Dimensions (in mm): L= 0,44-0,45 mm, H= 0,21-0,26 mm, L/H= 2,1-1,73.

Description: In the lateral view of the left valve the anterior margin is widely and asymmetrically rounded, with widely-arched upper and narrowly-arched lower parts. It bends to the nearly straight dorsal outline with an angle of 140° at 0,4 length of the left valve. The dorsal outline declines with an angle of 20º towards the posterior end. It turns into the posterior outline at 0,9 length of the valve. The posterior outline is incised between 0,6 and 0,7 length of the valve. The upper part of the posterior outline is slightly concave and bends with an angle of 170° to the nearly straight lower part. The posterior margin extends into the ventral outline with an angle of 140° that is incised between 0,3 and 0,4 length of the valve. The maximum height is at 0,3 length of the valve. The dorsal outline of the right valve is less convex than in the left valve.

Ornamentation: The surface of the valve is reticulated. Two ribs appear along both anterior and ventral margins. The middle rib in the anterior part originates from the eye tubercle. The ornamentation of the anterior and posterior margins is reduced. The muscle scar area is also reduced.

Eye tubercle: Distinct.

Internal features unknown.

Variability: Forms with highly reduced ornamentation appear, which may be ecological variations due to a decrease in water salinity.

Remarks: The outline of the studied forms are only similar to the forms described by SOKAČ (1972) and REUSS (1850). Also it might be possible that these are juvenile forms contrast with the adult forms illustrated and described by JIŘIČEK (1974) and CERNAJSEK (1974).

Stratigraphical and geographical distribution: Austria, Slovakia: Miocene (Sarmatian, Pannonian), Croatia: Miocene (Pannonian), Hungary: Miocene (Sarmatian).

Genus *Aurila* POKORNÝ, 1955
Aurila méhesi (ZALÁNYI,1913)
Pl. 4, Figs. 4-7.

1913. *Cythereis méhesi* n. sp. - ZALÁNYI, p. 109-111, pl. VII, fig. 4-10, textfig. 2., 22.
1913. *Cythereis sarmatica* n. sp. - ZALÁNYI, p. 112-113, pl. IX, fig. 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,1913 - 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, fig. 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,1913*)* - 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.
2000. *Aurila mehesi* (ZALÁNYI) - SZCZECHURA, pl. VIII, fig. 13.

Material: 9656 carapaces.

Dimensions (in mm): L= 1,21-1,23 mm, H= 0,53-0,71 mm, L/H=2,28-1,73.

Description: In the outer later view of the left valve, the anterior outline is almost asimmetrically rounded and its upper part is more widely rounded than the lower part. The anterior outline turns gradually into the finely convex dorsal outline. The dorsal outline bends to the upper part of the concave posterior outline with an angle of 130-140° at 0,9 length of the valve. The lower part of the posterior outline is convex and turns into the ventral outline at 0,9 length of the valve. The posterior part of the ventral outline is nearly straight. The ventral outline become concave at 0,5 length of the valve and turns gradually into the anterior margin. The lower part of the posterior outline bears 4 to 6 small dents. Dents are bigger and less abundant on the right valve (3 dents on average) than the dents of the left valve. In the lateral view of the right valve, the ventral outline is concave and joins gradually to the anterior outline. The maximum height is shifted to the posterior

end.

Ornamentation: The surface of the valve is finely pitted. There is a narrow depression along the anteroventral and posteroventral margins.

The inner lamella: Widest at the anterior end. Selvage is indistinct, situated about halfway between the inner and outer margin.

The marginal pore canals: Numerous, mostly straight, bifurcate.

Hinge: In the right valve there is an anterior tooth and a finely crenulated median bar. The posterior tooth is incised to receive a small toothlet.

The normal pore: Scarsely distributed, small.

The muscle scars: There are five adductor scars and three frontal scars.

Eye-tubercle: distinct.

Variability: Adult forms show great variation of size. Juveniles are abundant and have a more triangular shape.

Remarks: Cythereis sarmatica ZALANYI (1913) species illustrated by SUZIN (1956) are acute at the posterior end and are triangular in lateral outline hence show similarity to my juveniles. Forms published by STANCHEVA (1962) are more bent at 0,9 length on the dorsal margin than the forms studied by the author. In my opinion this is same taxa as the forms by Stancheva (1962) and my forms alltogether on the based of the differences it could be distiungished as a new subspecies.

Stratigraphical and geographical distribution: Romania, Serbia, Russia, Ukraine, Austria, Poland, Bulgaria, Hungary: Miocene (Lower Sarmatian).

Genus *Tenedocythere* SISSINGH, 1972

Tenedocythere cruciata Bonaduce, RUGGIERI et RUSSO, 1986

Pl. 5, Figs 1-2.

1972. *Quadracythere (Tenedocythere) mediterranea* RUGGIERI, 1962 - SISSINGH, p. 126, pl. 10, fig. 3.
1986. *Tenedocythere cruciata* n. sp. - BONADUCE, RUGGIERI et RUSSO, p. 532, pl. 6, fig. 1-4, pl. 9, fig. 7.

Material: 3 carapaces.

Dimensions (in mm): L=0,86-0,9 mm, H=0,52-0,58 mm, L/H=1,65-1,55.

Description: In the outer lateral view of the left valve, the anterior outline is asymmetrically rounded and its upper part is more widely rounded than the lower parpl. The nearly straight dorsal outline shows at c. 0,4 length of the valve a distinct cardinal angle. It declines with 45º towards the posterior end of the valve. The posterior outline is incised and bears some relicts of large dents. The ventral outline is almost straight between 0,2 and 0,8 length of the valve. Between 0,7 and 0,8 length of the valve, the anteroventral ridge reaches out from the ventral outline. The maximum height is around 0,4 length of the valve.

Ornamentation: The longitudinal costae are more characteristic than the transversal costae. In the valve appear a dorsal, a ventral and an anteromarginal ridge. There is a cross shaped subcentral node on the muscle scar area.

The internal characters cannot be examined.

Eye tubercle is well developed under the cardinal angle.

Remarks: In comparison with the holotype, the studied samples are more elongated, the angle between the anterior and dorsal outlines is bigger, and the maximum height is more distally. My opinion the deviation of the outlines indicate sexual dimorphism. The curve of the dorsal outline makes the forms distinct from the similarly ornamented *Tenedocythere perplexa* BONADUCE, RUGGIERI et RUSSO, 1986 species. The relation to the species *Quadracythere svagrovsky* JIŘIČEK,1974 described from Slovakia is not clarified.

Stratigraphical and geographical distribution: Italy, Greece and Malta: Miocene, Hungary (Sarmatian).

Genus *Senesia* Jiřiček,1974

Senesia vadászi (ZALÁNYI, 1913)

Pl. 5, Figs 3-6.

1913. *Cythereis vadászi* n. sp. - ZALÁNYI, p. 123-124, pl. VIII, fig. 16-18, textfig. 4.e, 30.
1956. *Cythereis vadászi* ZALÁNYI, 1913 - CHOCZEWSKI, p. 72, pl. III, fig. 3.
1963. *Mutilus (Aurila) vadaszi*(ZALÁNYI, 1913) - STANCHEVA, p. 29, pl. IV, fig. 8.
1974. *Senesia vadászi* (ZALÁNYI, 1913) - JIŘIČEK, p. 446, pl 1, fig. 7-8.
1976. *Aurila vadaszi*(ZALÁNYI, 1913) - CHINTĂUAN, NICORICI, p. 17, pl. V, fig. 6.
1978. *Senesia vadászi* (ZALÁNYI, 1913) - BRESTENSKÁ et JIŘIČEK, pl 8, fig. 12.

1983. *Senesia vadaszi* (ZALÁNYI, 1913) - JIŘIČEK, pl. II, fig. 7.
1984. *Senesia limpida* n. sp. - STANCHEVA, p. 38-40, pl. 2, fig. 5-6.

Material: 1317 carapaces.

Dimensions (in mm): L=0,76-0,84 mm, H= 0,46-0,48 mm, H/L= 0,57-0,6.

Description: In the lateral view of the left valve, the anterior outline is asymmetrically rounded and its upper part is more widely rounded than the lower part. The anterior outline gradually joins with the nearly straight dorsal outline. The dorsal outline declines with 15-20° towards the posterior end. The dorsal outline bends at 0,9 length of the valve to the nearly straight posterior outline with an angle of 130-140°. The posterior outline is convex and turns gradually into the ventral outline at length 0,9 of the valve. The anterior part of the ventral outline is incised between 0,2 and 0,4 length of the valve. The lower parts of the anterior and posterior margins have dents, the dents on the posterior side are less pronounced than the anterior margin. In the lateral view of the right valve, there is an incision at the end of the anterior outline, before the anterior hinge element. The dorsal outline is widely rounded. The right valve is more acute than the left valve.

Ornamentation: The surface of the carapace is highly reticulated. There is a narrow marginal depression on the anteroventral and posteroventral side. The reticulation on the surface of the valve arranges concentrically.

Inner lamella: Moderately wide along the anterior and posteroventral margin. Selvage indistinct, situated about halfway between inner and outer margin.

Marginal pore canals: Very numerous, mostly straight, some bifurcating.

Hinge: In the right valve there is an anterior tooth and a finely crenulated median bar. The posterior tooth is incised to receive a small toothlet.

Normal pores: Moderate in number.

Muscle scars: There are five adductor scars and three frontal scars.

Eye-tubercle: Distinct.

Variability: The degree of ornamentation varies strongly. Many specimens show significant lower strong reduction of ornamentation, the number of pits decreases in the surface of the valve. This phenomenon is probably result of the stress of the environment, a potential decrease of salinity.

Remarks: In my opinion *Senesia limpida* STANCHEVA, 1984 is identical with *Cythereis vadászi* ZALÁNYI, 1913 and forms by the author.

Stratigraphical and geographical distribution: Poland: Miocene (Lower Sarmatian), Bulgaria : Middle Miocene (Sarmatian), Slovakia, Austria, Hungary: Miocene (Sarmatian, Badenian).

Family Loxoconchidae SARS, 1925
Genus *Loxoconcha* SARS, 1866
Loxoconcha ex gr. *punctatella* (REUSS, 1850)
Pl. 6, figs 1-2.

Material: 4 carapaces.

Dimensions (in mm): L= 0,75 mm, H=0,35 mm, L/H=2,14.

Description: In the lateral view of the left valve, the anterior outline is almost asymmetrically rounded with widely-arched upper while narrowly-arched lower part. The anterior outline gradually joins with the slightly convex dorsal outline. The dorsal outline bends at a distinct cardinal angle to the slightly convex posterior outline. The posterior outline turns gradually into the ventral outline. The ventral outline is convex except an incision between 0,2 and 0,4 length of the valve at the anterior part.

Ornamentation: Reticulation is arranged in concentric rows on the lateral valve surface and is less distinct at the muscle scar area.

Inner lamella: Widest along the anterior end, less wide in ventral and posterior parts. There is wide anterior and narrow posteroventral vestibulum. The selvage is distinct and quite far removed from the outer margin.

Marginal pore canals: Few, simple, straight.

Hinge: There is an anterior socket surrounded by a crescent-shaped anteromedian tooth and a more elongated posterior one in the left valve. The median hinge element is a crenulate bar.

Normal pores: Sieve-type, moderate in number.

Muscle scars: There are a V shaped frontal scar and a fulcral point in front of the row of four adductor muscle scars on the right valve.

Remarks: Ornamentation is only similar in the forms described by DUCASSE et CHAUZAC (1996). The major differences are that the dorsal and ventral outlines of the studied forms are less parallel and the carapace

is slightly more elongated than at the forms by the author.

Genus *Loxocorniculum* BENSON et COLEMAN, 1963
Loxocorniculum schmidi (CERNAJSEK,1974)
Pl. 7, Figs 1-2.

1972. *Loxoconcha (Loxocorniculina)* sp. - KRSTIĆ , pl. 6, fig. 7-8.
1974. *Loxoconcha schmidi* n. sp. - CERNAJSEK, p. 479, pl. 3., fig. 3-4.

Material: 21 carapaces.
Dimensions (in mm): L= 0,59-0,7 mm, H=0,32-0,37 mm, L/H=1,84-1,89.
Description: In the lateral view of the right valve, the anterior outline is almost asymmetrically rounded with widely-arched upper while narrowly-arched lower part. The anterior outline gradually joins with the almost straight dorsal outline. The dorsal outline bends at a distinct cardinal angle to the highly asymmetrical posterior outline. The posterior outline turns gradually into the ventral outline. The left valve is identical.
Ornamentation: Reticulation appears on the surface of the carapace. There are wide depressions along the posterior and anterior margins. A double margin is observable on the posterior end. Two large posterior spines appear. The upper spine are pointed towards the dorsal margin. The lower spine is perpendicular to the valve.
Iinner lamella: Widest at the anterior end, less wide in ventral and posterior parts. There is a wide anterior and narrow posteroventral vestibulum. The selvage is strong and quite far removed from the outer margin.
Marginal pore canals: Few, simple, straight.
Hinge: There is an anterior socket surrounded by a crescent-shaped anteromedian tooth and a more elongated posterior one in the left valve. The median hinge element is a crenulate bar.
Normal pores: Sieve-type, moderate in number.
Muscle scars: There is a V shaped frontal scar in front of the row of four adductor muscle scars on the right valve. Between the latter and the top scar of the row there is a clear fulcral point.
Stratigraphical and geographical distribution: Austria, Serbia, Hungary: Middle Miocene (Sarmatian).

Loxocorniculum hastata (Reuss, 1850)
Pl. 6, Figs 3-7.

1850. *Cytherina hastata* REUSS sensu CERNAJSEK,1974 - REUSS, pl. IX, fig. 26.
1941. *Loxoconcha hastata* (REUSS) - TRIEBEL, pl. VIII, fig. 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, fig. 14-15.
1971. *Loxoconcha* aff. *hastata* (REUSS) - KOLLMANN, p. 653-654, pl. XV, fig. 1-7.
1974. *Loxoconcha hastata* (REUSS) - CERNAJSEK, p. 463- 465, pl. III, fig. 1-2.
1978. *Loxoconcha hastata* (REUSS) - BRESTENSKÁ et 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. al., 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, fig. 9-11.
2004. *Loxocorniculum hastatum* (REUSS) - ZORN, p. 187, pl. V, fig. 4.

Material: 501 carapaces.
Dimensions carapace: L= 0,6-0,61 mm, H=0,36-0,38 mm, L/H=1,67-1,6.
Description: In the lateral view of the right valve, the anterior outline is almost asymmetrically rounded with widely-arched upper while narrowly-arched lower part. The anterior outline gradually joins with the almost straight dorsal outline. The dorsal outline bends at a distinct cardinal angle to the highly asymmetrical posterior outline. The posterior outline extends gradually into the nearly straight ventral outline.
Ornamentation: The ornamentation is similar to that of the *Loxocorniculum schmidi* (CERNAJSEK, 1974) species, although the posterior spines are less developed and are pointed towards the posterior margin.
Inner lamella: Widest at the anterior end, less wide in ventral and posterior parts. There is a wide anterior and narrow posteroventral vestibulum. The selvage is strong and quite far removed from the outer margin.
Marginal pore canals: Few, simple, straight.
Hinge: There is an anterior socket surrounded by a crescent-shaped anteromedian tooth and a more

elongated posterior one in the left valve. The median hinge element is a crenulate bar.

Normal pores: Sieve-type, moderate in number.

Muscle scars: There is a V shaped frontal scar in front of the row of four adductor muscle scars on the right valve. Between the latter and the top scar of the row there is a clear fulcral point.

Stratigraphical and geographical distribution: Hungary: Miocene (Sarmatian), Czech Republic, Slovakia, Germany, Austria: Miocene (Carpathian, Badenian), France: Oligocene - Miocene, Slovakia (Badenian), Austria: Miocene (Eggenburgian - Pannonian), Bulgaria: Upper Miocene, Poland: Miocene.

Family Xestoleberididae SARS, 1928
Genus *Xestoleberis* SARS, 1866
Xestoleberis fuscata SCHNEIDER, 1953
Pl. 7, 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, fig. 14-15.

Material: 1156 carapaces.

Dimensions (in mm): L= 0,86-0,88 mm, H=0,51-0,53 mm, L/H=1,66-1,68.

Description:: In the lateral view of the left valve, the anterior outline is widely rounded, wide-arched in the upper and narrow-arched in the lower parts. The anterior outline gradually extends to the convex dorsal margin, which declines with an angle of approximately 15º to the posterior direction. The posterior outline is narrow-arched and gradually turns into the ventral outline. The ventral outline shows an slight incision between 0,5 and 0,6 lenght of the valve. The dorsal outline gradually turns into the anterior margin. The maximum height is between the length 0,4 and 0,5 of the valve. The posterior outline of the right valve is more widely rounded than that of the left valve.

Ornamentation: The surface of the carapace is smooth.

Inner lamella: Widest on the anterior, less wide in ventral and posterior regions. The selvage is subperipherial.

Marginal pore canals: Simple, straight, short.

Hinge: Merodont. Terminal crenulate teeth occur on the right valve. The crenulation is continuous, short distance on both ends of the median element, which consists of a strongly curved ridge.

Normal pores: Moderate in number.

Muscle scars are not examined.

Eye tubercle: Absent.

Stratigraphical and geographical distribution: Hungary: Miocene (Sarmatian), Russia and Ukraine: Miocene, Austria: (Badenian) .

Family Paradoxostomatidae BRADY and NORMAN,1889
Genus *Cytherois* G. W. MÜLLER, 1884

Cytherois sarmatica (JIŘIČEK, 1974)
Pl. 7, figs 6-7.

1974. *Argilloecia sarmatica* n. sp. - JIŘIČEK, pp. 452-453,PL. II, Fig. 9-10.
2000. *Cytherois sarmatica* OLTEANU – SZCZECHURA, p. 99, Pl. 8, Fig. 1-3.

Material: 27 carapaces.

Dimensions (in mm): L= 0,34-0,41 mm, H=0,13-0,16 mm, L/H=2,61-2,56.

Description: In the outer lateral view the anterior outline of the right valve is narrowly, nearly symmetrically rounded. The anterior outline gradually extends into the convex dorsal outline. The dorsal outline bends to the simmetrically posterior outline at 0,3 length of the valve with an angle of 140º. The carapace ends in an acute angle in the posterior parpl. The posterior outline gradually extends to the ventral margin, which shows a slightly incision between 0,5 and 0,7 length of the valve. The ventral outline gradually turns into the anterior outline. The outline of the left valve is semi-identical.

Ornamentation: The surface of the carapace is smooth.

Internal features unknown.

Eye tubercle: Absent.
Stratigraphical and geographical distribution: Austria, Hungary, Slovakia: Miocene (Sarmatian).

Conclusions

The studied strata represent a continuous Sarmatian sedimentation. 17 ostracod species were determined. Both forms of the relict Mediterranean fauna and the endemic fauna evolved in the Parathetys are present. The most characteristic features of the Sarmatian fauna are low diversity and large abundance. Some ostracod species reflect a significant reduction of ornamentation, which suggests an change in the extant environment and a probable decrease in salinity.

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Plate 1

Figs 1-4. *Callistocythere egregia* (MÉHES, 1908).

Fig. 1. Right valve. 104x. Lud2 borehole depth 12,6-15,9 m.
Fig. 2. Left valve. 103x. Lud2 borehole depth 12,6-15,9 m.
Fig. 3. Right valve. 140x. Ecological variation. Lud 2 borehole depth 12,6-15,9 m.
Fig. 4. Left valve from the inner side. 110x. Lud 2 borehole 12,6-15,9 m.

Fig 5-6. *Callistocythere maculata* PIETRZENIUK, 1973.

Fig. 5. Right valve. 126x. 616 borehole depth 11 m.
Fig. 6. Left valve. 125x. 616 borehole depth 11 m.

Figs 7-8. *Callistocythere tokajensis* PIETRZENIUK, 1973.

Fig. 6. Right valve. 104x. Lud 2 borehole depth 12,6-15,9 m.
Fig. 7. Left valve. 104x. Lud 2 borehole depth 12,6-15,9 m.

Plate 1

Plate 2

Figs 1-3. *Leptocythere tenuis* (REUSS, 1850).

Fig 1. Right valve. 95x. Lud 3 borehole depth 14,5-17 m.
Fig 2. Left valve. 107x. Lud 3 borehole depth 14,5-17 m.
Fig 3. Right valve from the inner side. 76x. Lud 3 borehole depth 14,5-17 m.

Figs 4-8. *Hemicyprideis dacica dacica* (HÉJJAS, 1895).

Fig 4. Left valve from the inner side. 63x. 618 borehole depth 5,8 m.
Fig 5. Right valve. Female. 70x. 618 borehole depth 5,8 m.
Fig 6. Left valve. Female. 60x. 618 borehole depth 5,8 m.
Fig 7. Right valve. Male. 66x. 618 borehole depth 5,8 m.
Fig 8. Left valve. Male. 62x. 618 borehole depth 5,8 m.

Plate 2

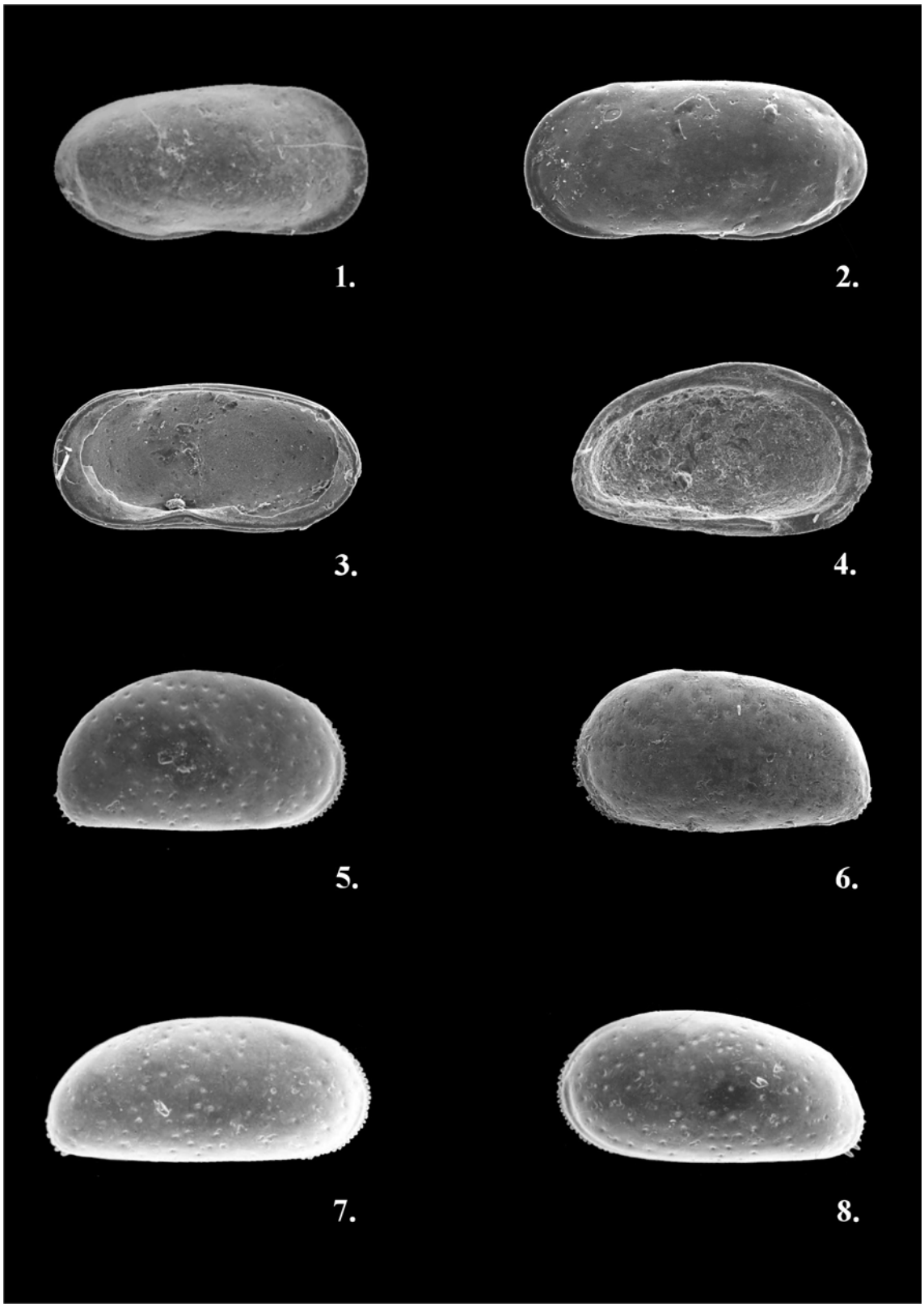

Plate 3

Figs 1-6. *Cytheridea hungarica* ZALÁNYI, 1913.

Fig. 1. Right valve. Female. 63x. 618 borehole depth 15,4 m.
Fig. 2. Left valve. Female. 57x. 618 borehole depth 15,4 m.
Fig. 3. Right valve. Male. 60x. 618 borehole depth 15,4 m.
Fig. 4. Left valve. Ecological variation. 68x. 618 borehole depth 15,4 m.
Fig. 5. Right valve. Ecological variation. 71x. 618 borehole depth 15,4 m.
Fig. 6. Right valve from inner side. 58x. 618 borehole depth 15,4 m.

Figs 7-8. *Miocyprideis sarmatica* (ZALÁNYI, 1913).

Fig. 7. Left valve. 58x. Lud 1 borehole depth 10,3-13,6 m.
Fig. 8. Left valve from inner side. 59x. Lud 1 borehole depth 10,3-13,6 m.

Plate 3

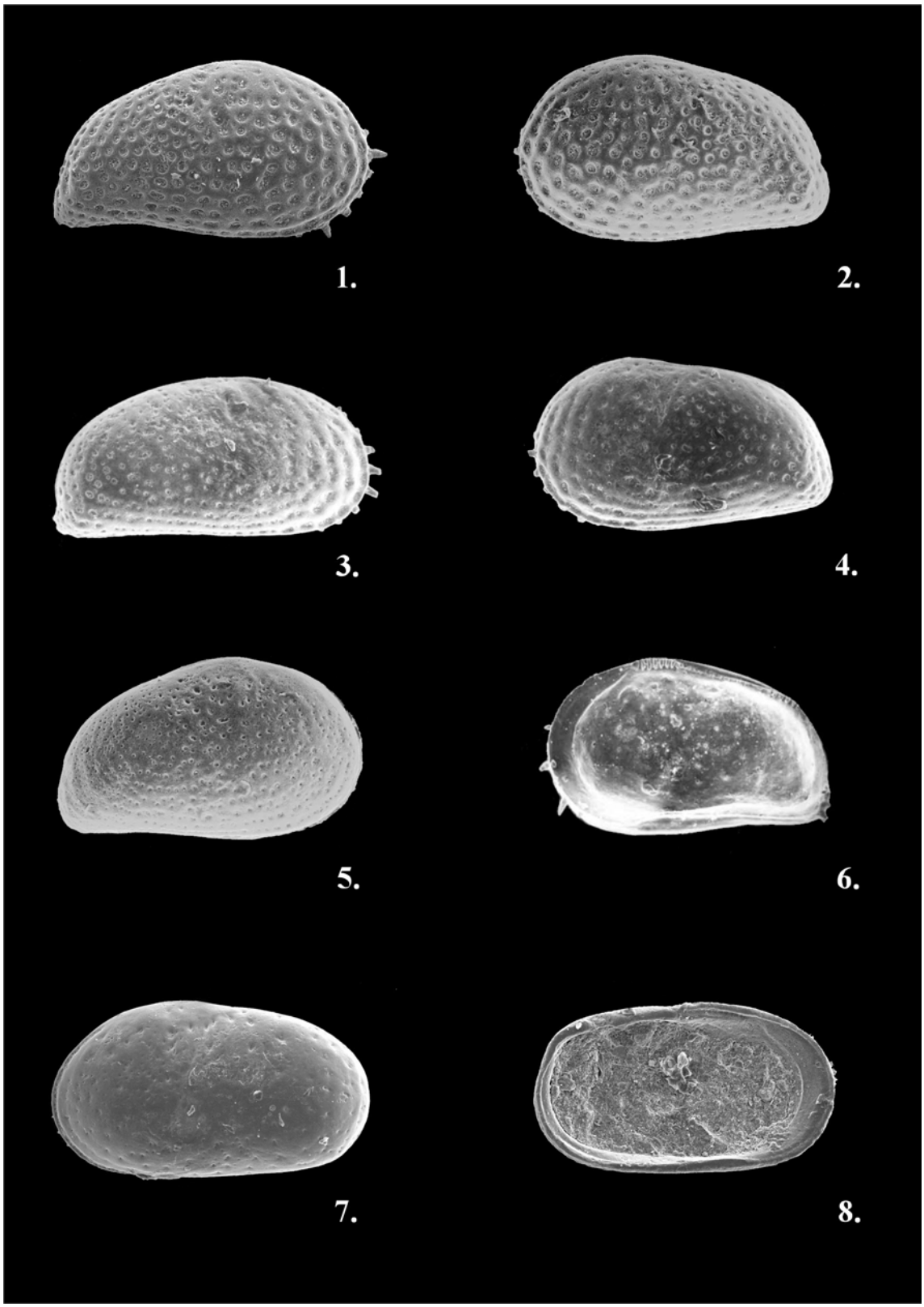

Plate 4

Figs 1-3. *Hemicytheria omphalodes* (REUSS, 1850).

Fig. 1. Right valve. 109x. Lud1 borehole 13,2-15,5 m.
Fig. 2. Left valve. 109x. Lud1 borehole 13,2-15,5 m.
Fig. 3. Left valve. Ecological variation. 60x. Lud1 borehole 13,2-15,5 m.

Figs 4-7. *Aurila méhesi* (ZALÁNYI, 1913).

Fig. 4. Left valve. 36x. 618 borehole 10,8 m.
Fig. 5. Right valve. 43x. 618 borehole 10,8 m.
Fig. 6. Right valve. Larval stage. 53x. 618 borehole 10,8 m.
Fig. 7. Right valve from inner side. 41x. 618 borehole 10,8 m.

Plate 4

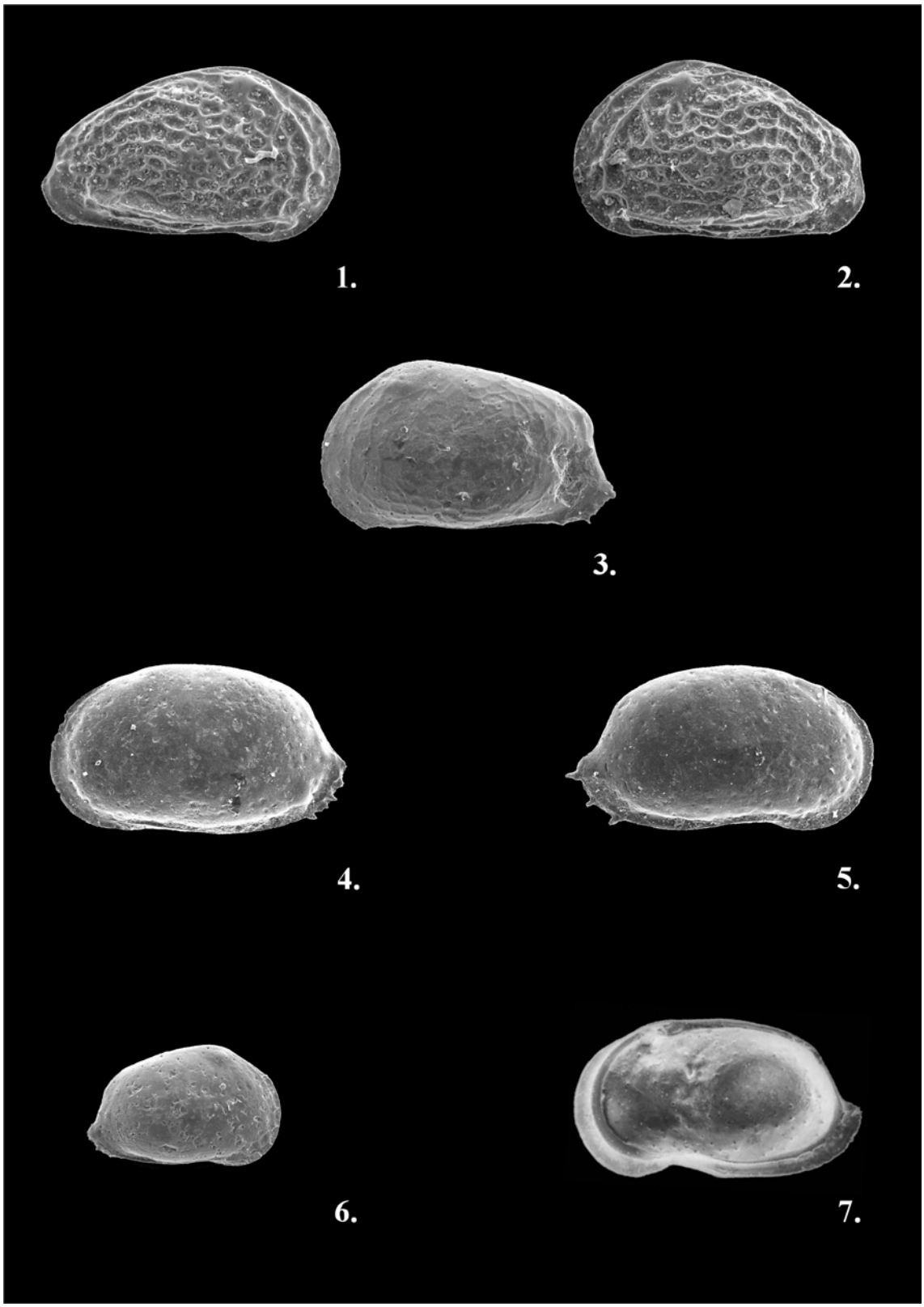

Plate 5

Figs 1-2. *Tenedocythere cruciata* Bonaduce, RUGGIERI et RUSSO, 1986.

Fig. 1. Left valve. 52x. 617 borehole depth 4,8 m.
Fig. 2. Left valve. Ecological variation. 75x. 617 borehole depth 4,8 m.

Figs 3-6. *Senesia vadászi* (ZALÁNYI, 1913).

Fig. 3. Left valve. 58x. Lud 3 borehole depth 10,6-11,6 m.
Fig. 4. Right valve. 57x. Lud 3 borehole depth 10,6-11,6 m.
Fig. 5. Left valve from inner side. 58x. Lud 3 borehole depth 10,6-11,6 m.
Fig. 6. Right valve. Ecological variation. 59x. Lud 3 borehole depth 10,6-11,6 m.

Plate 5

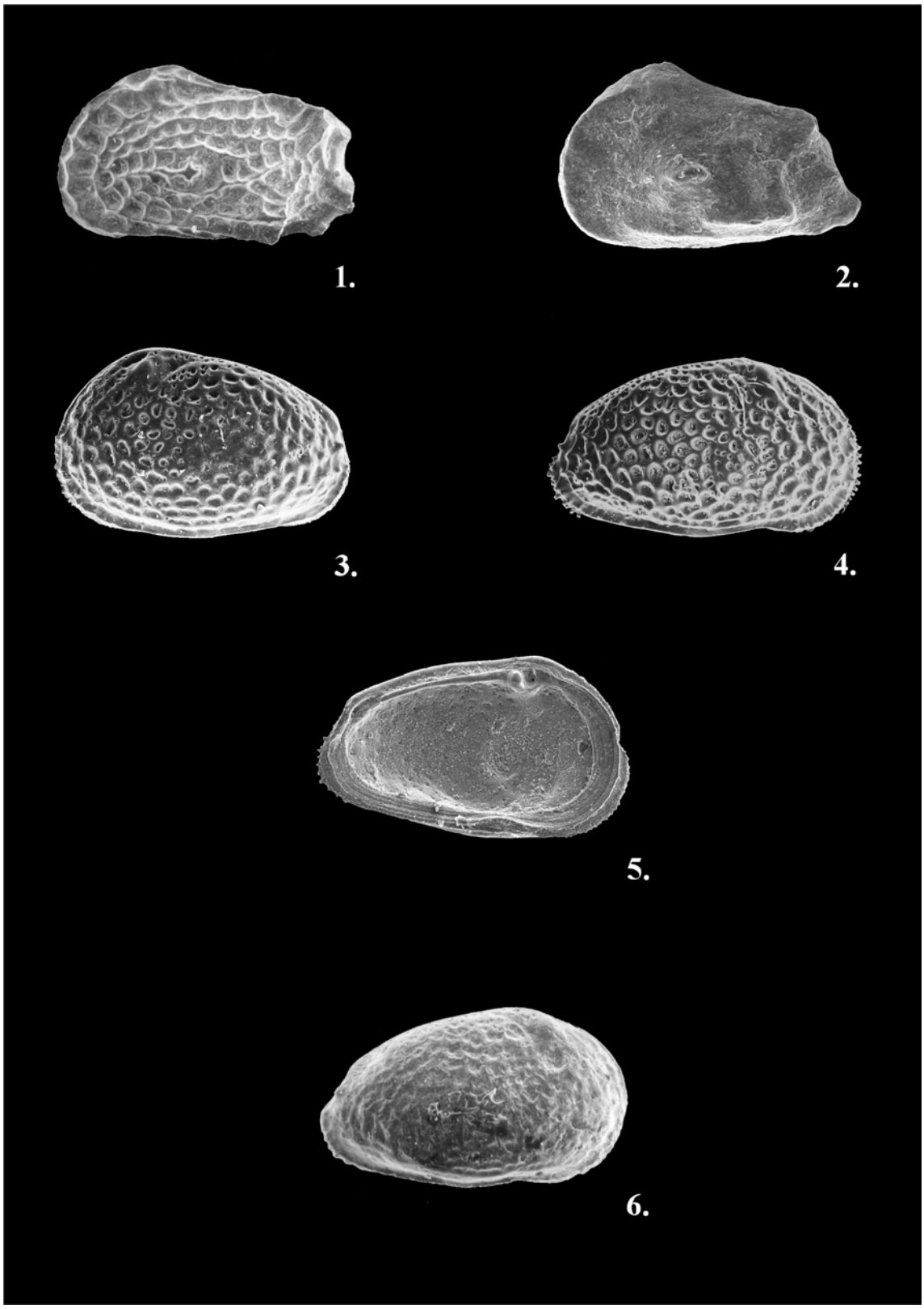

Plate 6

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

Fig. 1. Left valve. 89x. Lud 2 borehole 10-12,7 m.
Fig. 2. Left valve. Ecological variation. 90x. Lud 2 borehole 10-12,7 m.

Figs 3-7. *Loxocorniculum hastata* (REUSS, 1850).

Fig. 3. Right valve. Male. 86x. Lud 2 borehole 10-12,7 m.
Fig. 4. Left valve. Male. 85x. Lud 2 borehole 10-12,7 m.
Fig. 5. Right valve. Female. 87x. Lud 2 borehole 10-12,7 m.
Fig. 6. Left valve. Female. 86x. Lud 2 borehole 10-12,7 m.
Fig. 7. Right valve from inner side. 86x. Lud 2 borehole 10-12,7 m.

Plate 6

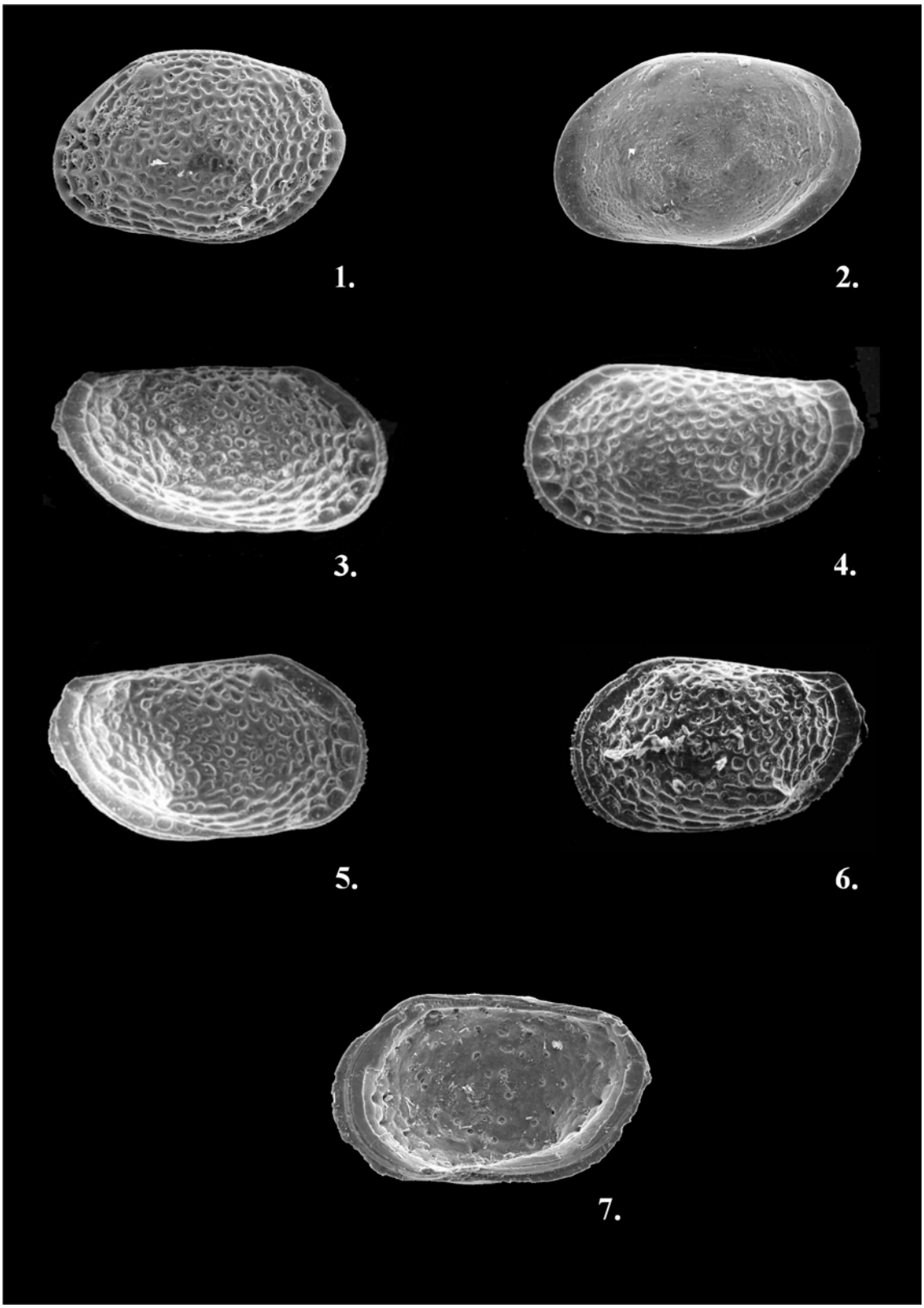

Plate 7

Figs 1-2. *Loxocorniculum schmidi* (CERNAJSEK, 1974).

Fig. 1. Right valve. 74x. Lud2 borehole 10-12,7 m.
Fig. 2. Left valve. 90x. Lud2 borehole 10-12,7 m.

Figs 3-5. *Xestoleberis fuscata* SCHNEIDER, 1953.

Fig. 3. Right valve. Male. 83x. Lud2 borehole 19,7-22,6 m.
Fig. 4. Left valve. Male. 89x. Lud2 borehole 19,7-22,6 m.
Fig. 5. Right valve from the inner side. 96x. Lud2 borehole 19,7-22,6 m.

Figs 6-7. *Cytherois sarmatica* (JIŘÍČEK, 1974)

Fig. 6. Right valve. 151x. 615 borehole 16,7 m.
Fig. 7. Left valve. 146x. 615 borehole 16,7 m.

Plate 7