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THE DAVOEI ZONE IN THE BAKONY MOUNTAINS, HUNGARY

by

B. GÉCZY

Department of Paleontology, Eötvös University, Budapest

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Zusammenfassung

Im Laufe einer 15 Jahre hindurch geführten Sammeltätigkeit sind aus der Davoei – Zone (obere Zone der carixischen Unterstufe) des Bakonygebirges 11 616 Ammoniten – Exemplare gefunden worden, von denen 10 456 zu bestimmen waren.

Nach einer Analyse der verschiedenen Faunenelemente wird darauf hingewiesen, dass die Häufigkeit der Gattungen mit einem langsamen Evolutionstempo im Bakonygebirge, im Gegensatz zur NW-europäischen Faunaporvinz, wo im Seichtmeer viel abwechslungsreichere ökologische Verhältnisse herrschten, mit den ausgeglichenen ozeanischen Bedingungen erklärt werden kann.

Introduction

The "Ammonites Davöi" Zone has been designated within the Middle Lias by OPPEL (1856, p. 246). As most characteristic ammonite species, he recorded *Amm. capricornus* and *Amm. Davöi*, which are confined to this zone, and mentioned the common *Amm. fimbriatus* and *Amm. Henleyi*. According to the modern interpretation, the Davoei Zone is the upper zone of the Carixian Substage of Lower Jurassic Pliensbachian Stage.

In the NW European faunal province this zone is subdivided on the basis of the *Androgynoceras – Oistoceras* evolutionary lineage (DEAN et al. 1961, p. 466), recognizing the Androgynoceras maculatum, A. capricornus and Oistoceras figulinum Subzones, in ascending order. According to DEAN et al., the zonal index *Prodactylioceras davoei* occurs only in the upper two subzones, while MOUTERDE et al. (1971, p. 5) mention the index species as characteristic in the "Capricornu Horizon" in France.

In the Bakony Mountains the rarity of the NW European zonal and subzonal index species encumbers the delimitation and subdivisioning of this zone. The beds, which already lack the characteristic Ibex Zone *Tropidoceras* and *Acanthopleuroceras* species, and still lack the characteristic Stokesi Zone *Amaltheus* species, have been ranged into the Davoei Zone. On the basis of scattered occurrences of *Androgynoceras* and *Oistoceras*,

it is evident, that the beds delimited in this way, are geologically contemporaneous with the NW European Davoei Zone. The few specimens of the zonal index *Prodactylioceras davoei* collected so far, also support this parallelization.

ARKELL (1956, p. 190) was right when mentioned the Bakony Mountains as "one of the world's richest areas for Liassic ammonites". The Hungarian classic Jurassic students (VADÁSZ 1910, KOVÁCS 1931, 1942) described several ammonites from the Davoei Zone, however, they generally regarded these faunas as younger, and ranged them into the Amaltheus margaritatus Zone.

From 1960, during the geological reinvestigation of the Bakony Mountains, the directory of the Hungarian Geological Survey, namely J. FÜLÖP and J. KONDA made detailed studies on reference sections, and they charged the author to work out the ammonites yielded by the new excavations. The biostratigraphic evaluation of the Pliensbachian sections heve been published in a short communication (GÉCZY 1971), and the systematic description of the Carixian Ammonitina from the Bakony Mts. have been closed in 1972. In this latter monograph (GÉCZY 1976), because of extent-limitations, the descriptions of Phylloceratidae, Juraphyllitidae, and Lytoceratidae, families so common in the Bakony Mts., could not come. Since 1972 some new sections have been collected. Among these, especially important is the Hamuháza section, excavated in 1974, which resulted ammonites in such a great number (5679 specimens), that is nearly equal to that from the previous sections altogether (5936 specimens). The collection in the new sections have been carried out from surface of 2 to 32 m^2, layer by layer, with great accuracy. Thus, as a result of collections of 15 years, 11 615 ammonite specimens are known from the Davoei Zone, and this material enables the biostratigraphic evaluation of 8 Lower Jurassic profiles.

For the conveyance of the material, I am deeply indebted to J. KONDA, former director of the Hungarian Geological Survey.

Localities

All of the Davoei Zone localities are situated in the Northern Bakony, near to the villages Zirc and Bakonycsernye.

Among the profiles in the vicinity of Zirc, the relatively most complete Lower Jurassic sequence is of the Lókút-hill. Village Lókút is situated southerly 6 km from Zirc. In the reference section of 2 km from the village, in ESE direction, the thickness of the Davoei Zone is 87 cm. Easterly 1 km from this section, in the Kávás-hill profiles, the thickness of this zone is 174 cm. 3 km from the village Lókút, in SE direction, in the Középhát section, near to the Mohoskő-hill and Kávás-hill, the Davoei Zone is 206 cm in thickness. 500 m in SE direction from this excavation is situated the Büdöskút section, where the total thickness of this zone is merely 46 cm. 2 km from village Lókút, in SSE direction, on the northern side of the Papod-hill, within the Kericser profile, the thickness of the Davoei Zone is

259 cm. The Bocskor-hill locality is situated 2,5 km Zirc, in NW direction, where the thickness of the Davoei Zone is the greatest, i. e. 319 cm.

In his monograph KONDA (1970) gave a detailed geological evaluation of the profiles in the vicinity of Zirc, and supplemented a geological map about the sections around Lókút.

In the Tűzköves-ravine of Bakonycsernye, northeasterly 16 km from Zirc, the thickness of the Davoei Zone is 123 cm. 3 km from the Tűzköves-ravine, in SW direction, in the Hamuháza profile, the thickness is similar (111 cm). The relatively complete Jurassic section of Bakonycsernye have been introduced by the classical mongraph of PRINZ (1904), while the geology of Hamuháza have been studied by KOVÁCS (1931) in detail.

The general dynamism of the Jurassic sedimentation of the Bakony Mountains is given in the summarizing paper of GALÁCZ and VÖRÖS (1972).

Fauna

The Davoei Zone yielded the following ammonites:

Phylloceras hantkeni (SCHLOENBACH in PRINZ, 1904)
Phylloceras meneghinii GEMMELLARO, 1884
Phylloceras hebertinum (REYNÈS, 1868)
Phylloceras frondosum (REYNÈS, 1868)
Phylloceras zetes (D'ORBIGNY, 1850)
Phylloceras bonarellii BETTONI, 1900
Phylloceras lavizzarii (HAUER, 1854)
Phylloceras disciforme (REYNÈS, 1868)
Phylloceras sp.
Partschiceras anonymum (HAAS, 1913)
Partschiceras sp.
Calliphylloceras emeryi (BETTONI, 1900)
Calliphylloceras calais (MENEGHINI, 1881)
Calliphylloceras seroplicatum (HAUER, 1854)
Calliphylloceras geyeri (BONARELLI, 1900)
Calliphylloceras cf. capitanei (CATULLO, 1855)
Calliphylloceras sp.
Juraphyllites libertus (GEMMELLARO, 1884)
Juraphyllites diopsis (GEMMELLARO, 1884)
Juraphyllites quadrii (MENEGHINI in FUCINI, 1901)
Juraphyllites limatus (ROSEMBERG, 1909)
Juraphyllites nardii (MENEGHINI, 1853)
Juraphyllites planispira (REYNÈS, 1868)
Juraphyllites telegdirothi (KOVÁCS, 1934)
Juraphyllites n. sp.
Juraphyllites sp.
Harpophylloceras eximium (HAUER, 1854)
Meneghiniceras bicicolae (BONARELLI, 1895)
Meneghiniceras lariense costicillatum (FUCINI, 1900)
Lytoceras humile VADÁSZ, 1910
Lytoceras postfimbriatum PRINZ, 1904
Lytoceras altum VADÁSZ, 1910
Lytoceras cf. fimbriatum (SOWERBY, 1817)
Lytoceras cf. victoriae BETTONI, 1900
Lytoceras cf. tuba DE STEFANI, 1887
Lytoceras cf. baconicum VADÁSZ, 1910

Lytoceras cf. fimbriatoides GEMMELLARO, 1884
Lytoceras cf. paulostomaticum ROSENBERG, 1909
Lytoceras cf. secernendum DE STEFANI, 1886
Lytoceras cf. celticum GEYER, 1886
Lytoceras cf. ovimontanum depressum GÉCZY, 1967
Lytoceras cf. haasi GÉCZY, 1967
Lytoceras cf. mompianense BETTONI, 1900
Lytoceras sp.
Aegolytoceras fuggeri (GEYER, 1893)
Aegolytoceras cf. czjzekii (HAUER, 1856)
Audaxlytoceras cf. grandonense (MENEGHINI, 1881)
Audaxlytoceras sp.
Holcolytoceras quadrijugum (ROSENBERG, 1909)
Holcolytoceras ? sp.
Radstockiceras wiltshirei (WRIGHT, 1882)?
Radstockiceras cf. oppeli (SCHLOENBACH, 1863)
Radstockiceras sp.
Metaderoceras evolutum (FUCINI, 1921)
Peripleuroceras? sp.
Phicodoceras bettonii GÉCZY, 1976
Phricodoceras urcuticum (GÉCZY, 1959)
Phricodoceras cf. urcuticum (GÉCZY, 1959)
Phricodoceras urcuticum praeparonai GÉCZY, 1976
Phricodoceras oistoides GÉCZY, 1976
Coeloceras (Coeloceras) n. sp.
Coeloceras (Coeloceras) cf. grenouillouxi (D'ORBIGNY, 1844)
Coeloceras (Reynesocoeloceras) asperum FUCINI, 1905
Coeloceras (Reynesocoeloceras) cf. obesum FUCINI, 1905
Coeloceras (Reynesocoeloceras) cf. subcrassum FUCINI, 1905
Coeloceras (Reynesocoeloceras) intermedium FUCINI, 1905
Coeloceras (Reynesocoeloceras) incertum FUCINI, 1905
Coeloceras (Reynesocoeloceras) cf. levicosta FUCINI, 1905
Coeloceras (Reynesocoeloceras) indunense (MENEGHINI, 1881)
Coeloceras (Reynesocoeloceras) indunense monscetonae FISCHER, 1971
Coeloceras (Reynesocoeloceras) simulans FUCINI, 1905
Coeloceras (Reynesocoeloceras) simulans cf. subplanatum FUCINI, 1905
Coeloceras (Reynesocoeloceras) fallax FUCINI, 1905
Coeloceras (Reynesocoeloceras) psiloceroides FUCINI, 1905
Coeloceras (Reynesocoeloceras) psiloceroides raricosta FUCINI, 1905
Coeloceras (Reynesocoeloceras) longispira FUCINI, 1905
Prodactylioceras (Prodactylioceras) davoei (SOWERBY, 1822)
Prodactylioceras (Prodactylioceras) cf, enode (QUENSTEDT, 1884)
Prodactylioceras (Aveyroniceras) cf, acanthoides (REYNÈS, 1868)
Prodactylioceras (Aveyroniceras) acanthoides pinnai GÉCZY, 1976
Prodactylioceras (Aveyroniceras) italicum (MENEGHINI in FUCINI, 1900)
Prodactylioceras (Aveyroniceras) italicum fucinii FISCHER, 1971
Prodactylioceras (Aveyroniceras) n. sp.
Reynesoceras medolense (HAUER, 1861)
Liparoceras (Becheiceras) bechei (SOWERBY, 1821)
Liparoceras (Becheiceras) gallicum SPATH, 1936
Liparoceras (Parinodiceras) cf. parinodus (QUENSTEDT, 1884)
Androgynoceras cf. lataecosta (SOWERBY, 1827)
Androgynoceras lataecosta subcapricornu SPATH, 1938
Androgynoceras capricornus (SCHLOTHEIM, 1820)
Androgynoceras maculatum spathi GÉCZY, 1976
Androgynoceras n. sp. aff. maculatum (YOUNG et BIRD, 1822)?
Androgynoceras cf. sparsicosta (TRUEMAN, 1919)
Androgynoceras sp.

Oistoceras ? sp.
Oistoceras cf. sinuosiforme SPATH, 1938
Oistoceras cf. curvicorne (SCHLOENBACH, 1863)
Protogrammoceras praecurionii dubari GÉCZY, 1976
Protogrammoceras isseli (FUCINI, 1900)
Protogrammoceras isseli cantaluppii GÉCZY, 1976
Protogrammoceras pectinatum (MENEGHINI, 1881) n. subsp.
Protogrammoceras exiguum angulosum GÉCZY, 1976
Protogrammoceras sp.
Protogrammoceras ? dilectum (FUCINI, 1900)
Fuciniceras ? sp.
Fuciniceras dubari CANTALUPPI et MONTANARI, 1968
Fuciniceras n. sp. aff. falciplicatum (FUCINI, 1904)
Fuciniceras kericserense GÉCZY, 1976
Fuciniceras costicillatum (FUCINI, 1900)
Fuciniceras detractum (FUCINI, 1900)
Fuciniceras detractum portisiforme GÉCZY, 1976
Fuciniceras pantanellii serratum (FUCINI, 1905)
Fuciniceras boscense pannonicum GÉCZY, 1976
Fuciniceras boscense evolutum (FUCINI, 1905)
Fuciniceras cf. inclytum (FUCINI, 1900)
Fuciniceras n. sp. aff. ruthense in FUCINI (non: REYNÈS, 1968)
Fuciniceras cf. lavinianum (MENEGHINI in FUCINI, 1900)

The Davoei Zone yielded 118 species (and subspecies) of 22 genera. The generic distribution of the species, leaving aside the frequency, seems to be as equal. There are only 4 genera *(Harpophylloceras, Metaderoceras, Peripleuroceras?, Reynesoceras)*, with single species representation, and only 3 *(Partschiceras, Meneghiniceras, Holcolytoceras)*, with two species. On the other hand, the situation is remarkably different, if the study is made on the basis of specimen-number.

On the basis of the frequency, the order of the genera is as follows:

Genus	Specimen-number
Calliphylloceras	2126
Fuciniceras	1968
Phylloceras	1956
Juraphyllites	1732
Partschiceras	856
Protogrammoceras	634
Lytoceras	521
Coeloceras	181
Prodactylioceras	167
Harpophylloceras	133
Aegolytoceras	39
Androgynoceras	27
Radstockiceras	25
Meneghiniceras	25
Phricodoceras	18
Liparoceras	17
Audaxlytoceras	12

Genus	Specimen-number
Reynesoceras	11
Holcolytoceras	3
Oistoceras	3
Peripleuroceras?	1
Metaderoceras	1
	Total: 10 456

Because of imperfect preservation or small size, 1159 specimens, i.e. 9.9% of the fauna is generically undeterminable.

74.4% of the generically determined specimens are ranged into 4 genera *(Calliphylloceras, Fuciniceras, Phylloceras, Juraphyllites)*. On the other hand, 12 genera comprises such few specimens, that these constitute 1.7% of the whole fauna, altogether. Consequently, it is justified to examine the fauna broken down according to families:

Families	specimen-number	%
Phylloceratidae	4938	47.23
Hildoceratidae	2602	24.89
Juraphyllitidae	1890	18.07
Lytoceratidae	575	5.50
Dactylioceratidae	360	3.44
Liparoceratidae	47	0.45
Oxynoticeratidae	25	0.24
Polymorphitidae	19	0.18

In the Bakony Mountains the Davoei Zone is unequivocally characterized by the Phylloceratidae, Juraphyllitidae and Lytoceratidae:

Phylloceratidae	47.23%
Juraphyllitidae	18.07%
Lytoceratidae	5.50%
Ammonitina	29.20%

However, the proportion of the Ammonitina differs by profiles, and depends considerably on the biofacies-types, and the corresponding former paleoceanographic conditions.

In the Kericser profile the Davoei Zone is represented by crinoidal, brachiopodal, "Hierlatz-type" limestone, with small ammonites, in which the percentage-proportion of the Ammonitina is strikingly high:

Phylloceratidae	9%
Juraphyllitidae	13%
Lytoceratidae	1%
Ammonitina	77%

The Ammonitina are represented with much smaller proportion in faunas from different types of the ammonitico rosso facies.

Relatively quite, shallower-water environment is suggested by ammonitico rosso sequences with intercalations of cherty beds, of which siliceous material is originated from silicospongian skeletal elements.

Rhythmical alterations of thicker cherty and thinner marly beds is characteristic within the Bocskor-hill section, where the Ammonitina are relatively still abundant:

Phylloceratidae	39%
Juraphyllitidae	21%
Lytoceratidae	6%
Ammonitina	34%

The Büdöskút and Középhát sections are characterized also by cherty intercalations. In Büdöskút the percentage-distribution is as follows:

Phylloceratidae	44%
Juraphyllitidae	23%
Lytoceratidae	7%
Ammonitina	26%

In the Középhát section:

Phylloceratidae	42%
Juraphyllitidae	24%
Lytoceratidae	9%
Ammonitina	25%

The proportion of the Ammonitina in the highly condensed Lókút fauna is similar:

Phylloceratidae	37%
Juraphyllitidae	29%
Lytoceratidae	7%
Ammonitina	27%

The Kávás-hill section, in the vicinity of Lókút, shows a slightly larger Ammonitina-proportion:

Phylloceratidae	34%
Juraphyllitidae	7%
Lytoceratidae	28%
Ammonitina	31%

The percentage-proportion of the Ammonitina in the Hamuháza section is somewhat smaller:

Phylloceratidae	58%
Juraphyllitidae	15%
Lytoceratidae	5%
Ammonitina	22%

Fewest Ammonitina were yielded by the typical, coarsely stylolitic ammonitico rosso limestone of Bakonycsernye:

Phylloceratidae	59%
Juraphyllitidae	13%
Lytoceratidae	10%
Ammonitina	18%

The percentage distribution of the Ammonitina decreases from the "Hierlatz" limestone to the typical ammonitico rosso limestone. In the alteration of the Juraphyllitidae and Lytoceratidae, one must take into account, that in chronostratigraphic point of view the certain sections are more or less inequivalent, representing only a portion of the Davoei Zone, or shorter intervals within this zone.

Considering the frequency of the species, the most abundant phylloceratid is *P. hantkeni*. From the calliphylloceratids, especially important is the *C. emeryi*. *Juraphyllites libertus* from the Juraphyllitidae is very abundant throughout, *J. limatus* and *lunensis* are characteristic rather in the lower part of the zone. The two *J. quadrii* specimens came also from this lower part. On the other hand, *J. planispira* and *J. telegdirothi* characterizes rather the upper part of the zone. Specifically undeterminable specimens are markedly frequent within the Lytoceratidae, and this fact can be due mainly to unfavourable preservation. The ammonites of the ammonitico rosso limestone are generally internal casts, which naturally lack the ornament of the shell.

The most abundant Ammonitina family is the Hildoceratidae. From this family the species *Fuciniceras costicillatum* is so abundant in the Davoei Zone, that it is useful as biozonal index in the Bakony Mts. From Dactylioceratidae, common form is the *Prodactylioceras italicum*, but the zonal index *P. davoei* is represented by 5 specimens altogether. Liparoceratidae, comparizing the NW European subzonal indices, are similary subordinate in appearance. The large-scale quantitative collections made in extended areas, unequivocally show, that Liparoceratidae are scattered in the faunas of the Bakony Mts. The smaller specimen number of the epipelagic Ammonitina and the abundance of the bathypelagic Phylloceratidae and Lytoceratidae can be explained by bathymetric conditions. On the other hand, the rareness of the Liparoceratidae is attributable rather to paleogeographic separation, namely to the independence of the Mediterranean faunal province on the southern margin of the Tethys (GÉCZY 1973). The qualitative regularities of the fauna – i. e. scattered occurrence of Mediterranean elements in the Middle European and scattered occurrence of Middle European elements in the Mediterranean province – do not support that supposition reckoning in ammonites with a lengthy postmortal transport, similar to that of modern *Nautilus*.

The scattered distribution of the Oxynoticeratidae and Polymorphitidae has an evolutionary explanation. Oxynoticeratidae and Polymorphitidae flourished in the Sinemurian and at the Sinemurian/Pliensbachian boundary, respectively. The occurrence of these relicts in the Davoei Zone

suggests, that the extinction is a relatively slow process, even in the case of ammonites.

In the point of view of evolution, the most common elements of the Bakony Mts. faunas are long-living forms. From the 4 most common genera, *Phylloceras*, and *Calliphylloceras* survive into the Cretaceous. The juraphyllitids appear in the Sinemurian, and endure throughout the Pliensbachian. Within the Hildoceratidae family, the *Fuciniceras* and *Protogrammoceras* are of strikingly long-living genera. The earliest representatives of the *Protogrammoceras* are known from the upper part of the Jamesoni Zone, but the genus survives into the Lower Toarcian in Madagascar. Finally, regarding the Coeloceratidae, the range of the *Coeloceras* is much longer (i. e. from Upper Sinemurian to Carixian) than these of the Toarcian genera *(Dactylioceras, Peronoceras,* etc.*)*, which are restricted to one or two zones.

The frequent occurrence of the genera with slow evolution in the faunas of the Bakony Mountains can be explained by the equable oceanic conditions, under which the role of the struggle for life was more subordinate than in the shallow-water NW European faunal province characterized by changing environmental influences.

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MEDITERRANEAN CHARACTER OF THE LOWER JURASSIC BRACHIOPOD FAUNA OF THE BAKONY MTS. (HUNGARY) AND ITS PALAEOGEOGRAPHIC IMPORTANCE

by

A. VÖRÖS

Palaeontological Department, Hungarian Natural History Museum, Budapest, Hungary

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Zusammenfassung

Der Verfasser durchführte einen Vergleich zwischen den Arten der 23 NW-europäischen, bezw. mediterranen Brachiopoden – Faunen des Unterjuras (Mittellias). Das geschah durch quantitative Methoden. Aufgrund dieser Methoden differenzieren sich die zwei Faunenprovinzen ungleich ausgeprägter, als laut früheren qualitativen Untersuchungen. Nach der Meinung des Verfassers ist die höchstwahrscheinlichste Erklärung der Provinzialität, dass ein beträchtlicher Teil des europäischen Shelfs sich im Mitteltrias abgelöst hatte und derselbe ist ins innere des Tethys – Ozeans geraten. So, könnten nach im Kreise der im inneren des Ozeans lebenden Brachiopoden von den europäischen Formen abweichende Evolutionslinien entwickeln. Das Bakonygebirge gehörte (aufgrund der Jura-Brachiopoden Fauna) zu diesem isolierten Mikrokontinent an, doch später ist das im Laufe des Schliessen der Tethys durch komplizierte Kollisionsbewegungen an seine heutige Stelle gekommen.

Introduction

The Mediterranean character of the Jurassic faunas in the Bakony Mountains has been well-known since the earliest investigations. The theory of plate-tectonics furnished a new basis for the palaeogeographic syntheses and this makes reasonable the reexamination or reevaluation of the faunistic relationships. Géczy (1973) carried out this for the Lower Jurassic ammonoids of the Bakony Mts.; the result was a remarkable palaeogeographic conclusion: the Transdanubian Central Mountains belonged to the southern marginal complex of the Tethys (to the African lithospheric plate) in the course of the Jurassic.

One can expect the benthonic assemblages to reflect the palaeogeographic differences much better than the free-swimming ammonoids. The results shown in the present paper (on the basis of Lower Jurassic bra-

* An improved and enlarged version of this paper was published in Palaeogeogr., Palaeoclimatol., Palaeoecol., 21., 1. (1977)

chiopods) lead to a partly different conclusion regarding the palaeogeographic position of the Bakony Mts. (together with other Mediterranean areas).

In the following I shall discuss the unity and homogeneity of the "Mediterranean province" with the Bakony Mts. belonging to here, and then the factors causing this provinciality.

The Mediterranean province on the basis of Lower Jurassic brachiopods

This subject was excellently treated and summarized by Ager (1967) with studies on 46 European Pliensbachian brachiopod faunas and mainly with map-drawings (fig. 7 in Ager loc. cit.) based on the distribution of the characteristic genera. He distinquished four assemblages, which appear as concentric belts on the map. The innermost (peri – Adriatic) belt contains the "most Mediterranean" elements, while the character of the subsequent belts tend to be more and more of NW European. Thus a gradual transition appears to occur between the two "provinces", excepting areas where this transition has been subsequently suppressed by the shortening effect of the Alpine orogeny.

In this paper I have tried to approach to the same problem for about the same span of time (Carixian and Domerian) by a somewhat different method.

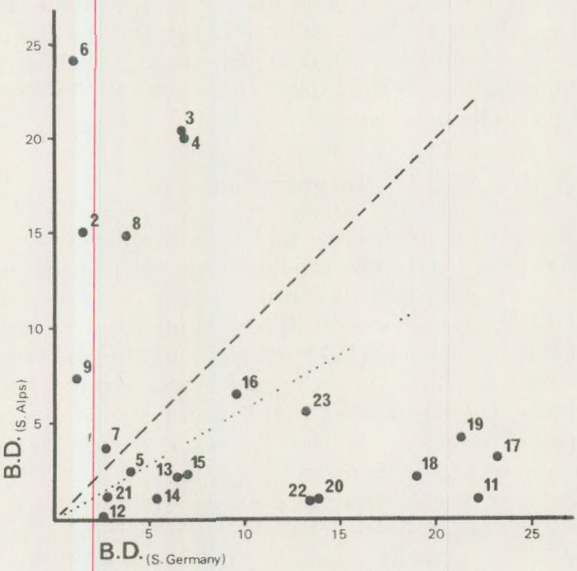

Fig. 1. Biotal dispersity indices of the studied Middle Liassic faunas compared with the South German (horizontal axis) and the Southern Alpine (vertical axis) faunas, respectively. (Numbers referred to Tables I and II)

Method

23 faunal units have been selected from the Mediterranean region and its surrounding areas (Fig. 2), which partly represent single localities or summarized data of several faunistically similar occurences. Well-illustrated monographs are available about the majority of these localities, while the material of some occurences has been examined personally by the author.

The 23 brachiopod faunas have been compared to one another by calculating the Koch index of biotal dispersity recommended by Reyment (1971, p. 165) as:

$$\text{B. D.} = \frac{-100(T-S)}{(n-1)S}.$$

Here n is the number of the faunas compared, T is the total number of species recorded in the faunas (or $N_1+N_2+N_3 \ldots$) and S is the total number of recorded different species. In the case of comparing merely two faunas, this is actually the Jaccard coefficient $\frac{C}{N_1+N_2-C}$ (recommended also by Géczy 1974), considering that C (total number of recorded common species) equals N_1+N_2-S. Thus, when comparing two fauna, the Koch formula can be simplified as $\text{B. D.} = \frac{100\ C}{S}$.

These numerical procedures have been applied here so that in the first step a type fauna has been selected within each of the Mediterranean and NW European regions, thought to be characteristic of the faunas of these

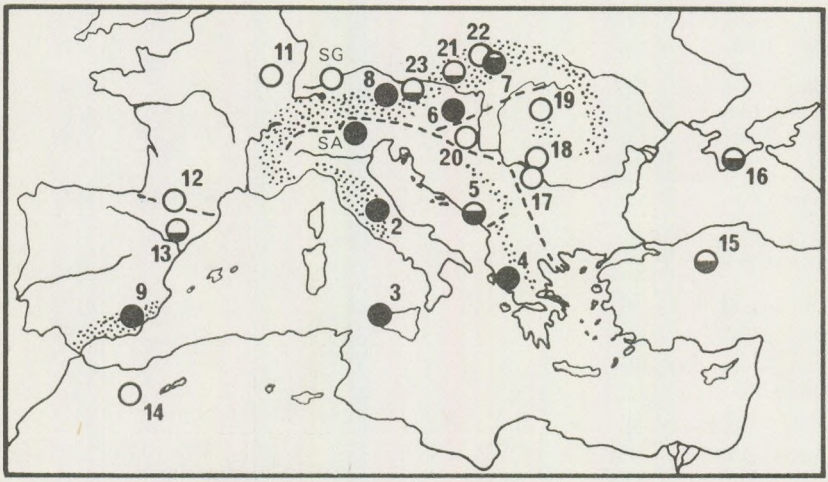

Fig. 2. Geographic distribution of the NW European (open circles) and Mediterranean (black dots) Middle Liassic faunas. The black filling-up of some circles is more or less proportional with their Mediterranean characters. Stippled: major nappe formation during the Alpine orogeny (in Europe); broken lines: known or supposed strike-slip (or transform) faults.

regions both in species number and composition. The type faunas under considerations are those occuring in the Southern Alps (on the basis of Uhlig 1879, Parona 1880, Böse et Schlosser 1900, Haas 1912 and Renz 1932; with 73 species), and South Germany (Swabia, on the basis of Quenstedt 1858, and Rau 1905; with 67 species), respectively. As a second step, the faunas of all the localities have been compared with the respective type faunas. (Such a comparison would have been well-established, if the original materials of all the faunas were revised by the same specialist. However, this is hampered by both objective and subjective difficulties, therefore cannot help relying upon the principle that the great number of data will reduce the amount of errors.)

Results

The data and results obtained by the methods mentioned above are tabulated in Tables I and II. (The references in the tables are informative for specialists, i. e. it is unnecessary to enlarge the reference list with more precise items.)

Table I.

	N (number of species)	C_{SG} (common with South Germany)	B. D. index	C_{SA} (common with the Southern Alps)	B. D. index
2. Central Appennines Zittel 1869; Canavari 1880; 1881; 1883; Ramaccioni 1936	56	2	1.7	17	15.2
3. Sicily (Palermo, Trapani) Gemmellaro 1874; Di Stefano 1891	45	7	6.7	20	20.4
4. External Hellenids Renz 1932	28	6	6.7	17	20.2
5. External Dinarids (Lovćen) Ćirić 1949	9	3	4.1	2	2.5
6. Hungary (Bakony Mts.) Vörös unpubl.	40	1	0.9	22	24.2
7. Western Carpathians (Great Fatra) Siblík 1964	8	2	2.7	3	3.8
8. Northern Limestone Alps (Salzkammergut) Böse 1898	42	4	3.8	15	15.0
9. Betic Cordilleras Cisneros 1923	14	1	1.3	6	7.4

It is clear from Table I that the index of biotal dispersity of these localities is high when referred to the Southern Alps and low when referred to South Germany. This is an expression of their "Mediterranean" character. On the other hand, Table II shows an inverse situation, i. e. these are faunas of NW European character. However, certain faunas apparently do not fit in this simplified model. In order to obtain a clearer idea, we have plotted the faunal compositions against South German and Southern Alpine characteristics (Fig. 1).

Table II.

	N (number of species)	C_{SG} (commen with South Germany)	B. D. index	C_{SA} (commen with the S. Alps)	B. D. index
11. Elsass-Lotharingien Haas et Petri 1882	21	16	22.2	1	1.1
12. French Pyrenees Dubar 1925	8	2	2.7	—	—
13. NE Spain (Lérida) Delance 1969	15	5	6.5	2	2.3
14. NE Morocco (Taourirt) Dareste de la Chavanne 1930	10	4	5.5	1	1.2
15. Anatolia (Yakaçik) Ager 1959	10	5	6.9	2	2.5
16. Crimea Moisseev 1934	24	8	9.6	6	6.6
17. Yugoslavian Carpatho-Balkanids Radovanović 1889; Sučić – Protić 1969; 1971	50	22	23.2	4	3.4
18. Rumania (Svinica zone) Raileanu et Iordan 1964	21	14	18.9	2	2.2
19. Rumania (Padurea Craiului Mts.) Preda 1967	24	16	21.3	4	4.3
20. Hungary (Mecsek and Villány Mts) Vadász 1935 (collection) Ager et Callomon 1971	15	10	13.9	1	1.1
21. Križna nappe (Pristodolok) Pevny 1964; Siblík 1967; 1968	7	2	2.8	1	1.3
22. Manin unit (Kostelec Klippe) Siblík 1965; 1966; 1967; 1968	16	10	13.7	1	1,1
23. Gresten Trauth 1909	19	10	13.2	5	5.7

The majority of the points shows good differentiations, nevertheless there are points which seem to be transitional. A line of 45 degrees provides good theoretic separation, though in this case of tracing natural connections, the designation of a transitional interval seems to be more reasonable. According to these considerations, a second arbitrary line was drawn (dotted line). Points between these two lines are regarded as representing transitional faunas. It is important to take into account that those points assembled near the origin represent faunas with small (< 10) species number, and these can hardly lead to any convincing conclusion. Omitting these data, the South German and Southern Alpine faunas are rather markedly differentiated except that of No. 16 (Crimea), which remains transitional.

The characteristics which appear in the diagram are arranged in Fig. 2 by localities. The distribution agrees well with that obtained from earlier qualitative studies (Ager 1967, fig. 7), but the differentiation is apparently more conspicuous, with less transitional areas. It can also be seen that the point representing the Bakony Mts. (No. 6) is among the ones with the most strongly Southern Alpine character: its belonging to the Mediterranean province is obvious.

Regarding the faunas listed in Tables I and II as Mediterranean and NW European provinces respectively, the degree of provinciality can be calculated by the formula suggested by Johnson (1971) as

$$\text{P. I.} = \frac{C}{2\,E_1}.$$

Here C is the total number of taxa common in the two areas, and E_1 is the number of endemic taxa recorded in the smaller fauna. In this case the provinciality index P. I. equals 0.17, i. e. a very low value. On the basis of Johnson's data this means a marked provinciality. In his studies on North American Devonian brachiopods a low value like this was suggested to be indicative of a terrestrial barrier (N. B. His comparison was made on generic level!).

Summing up the above results, it can be proved that in a quantitative appraoch a considerable provinciality of the Mediterranean and NW European faunas occurs in the Middle Liassic, without true transitions between the two in European areas. This conclusion enables to draw another component, previously somewhat neglected, into the discussion on factors causing provinciality.

Factors causing Mediterranean provinciality

This discussion can be initiated from that recent, plate-tectonically reconstructed palaeogeographic situation, which outlines the Early Mesozoic Tethys as a true ocean of roughly V-shaped, easterly open and westerly closed. This ocean was bounded on both the Eurasian and African (Gondwana) continents by extended and essentially continuous shelves. Here, in the continent-ward zone of these shelves (now stable Europe and

North Africa) lived the NW European-type brachiopods. The Mediterranean-type brachiopds ought to be placed also somewhere in these shelf regions.

The Mediterranean province was regarded by Ager (1967) as a "bathyal" province. Thus this name would be applied to the deeply submerged parts of the shelf areas. In a recent work Ager (1971) stated, that as regards the "barriers", "bathymetry" and „bottom" schools existing in the literature on marine paleozoogeography, he is a "bottoms"-believer, and repeatedly emphasized that any brachiopod distribution is environmentally controlled.

Hallam (1971) in studies extended to other benthonic organisms came to a basically very similar conclusion underlining the reduced nutrient supply of the more open marine Tethyan areas. In a subsequent paper Hallam (1972) positively suggested that provinciality can arise on continuous shelf areas even without barriers, and in fact, the spatial changes in the Liassic faunas of stable Europe can be statisfactorily interpreted by the northward decrease of the environmental stability.

Géczy (1973) was first to convey the suggestion that the differentiation of the Jurassic ammonite faunal provinces can be due to the presence of intervening wide oceanic areas. This was based upon the understanding that the Mediterranean-type faunas lived on and above the huge carbonate platform-complex, which originally belonged to the southern shelf of the Tethys (Bernoulli and Renz 1970, Laubscher 1971, Bernoulli and Laubscher 1972). From the same considerations the Mediterranean-type brachiopods were ascribed the southern marginal complex of the Tethys (Vörös 1975).

On the other hand, such a sharp faunistic difference as that studied in this paper cannot entirely account for environmental factors continuously and gradually changing in space. Since the marginal shelf was undoubtedly continuous around the Tethys (at least up to the Toarcian), the Mediterranean brachiopod faunas (claimed to live on the southern shelf), because of the open shelf-communication, should display a more gradual transition and a smaller degree of provinciality as compared to those of the NW European province.

In addition, the differentiation can hardly be due to the bottom and/or depth control alone, because the bottom of the Early Jurassic Mediterranean sea was highly diversified (Jenkyns and Torrens 1971, Jenkyns 1971). Calcareous sands and coquinas (crinoidal limestones and Hierlatz limestones) originated from extremely shallow, current-swept rocky surfaces as well as relatively deep-water "mudstones" yield the same, Mediterranean-type, brachiopod faunas (Vörös 1975). Moreover, the Middle Liassic brachiopod fauna from the autochtonous sedimentary blanketing of the Great Fatras (locality No. 7 in Table I.) rich in coarse-detrital quartz (Mišik 1964, p. 47) shows similarly Mediterranean character as those from other areas of purely calcareous sedimentation.

Taking these facts into account, I must declare myself as a follower of the "barriers" school and try to find to the above mentioned problems a

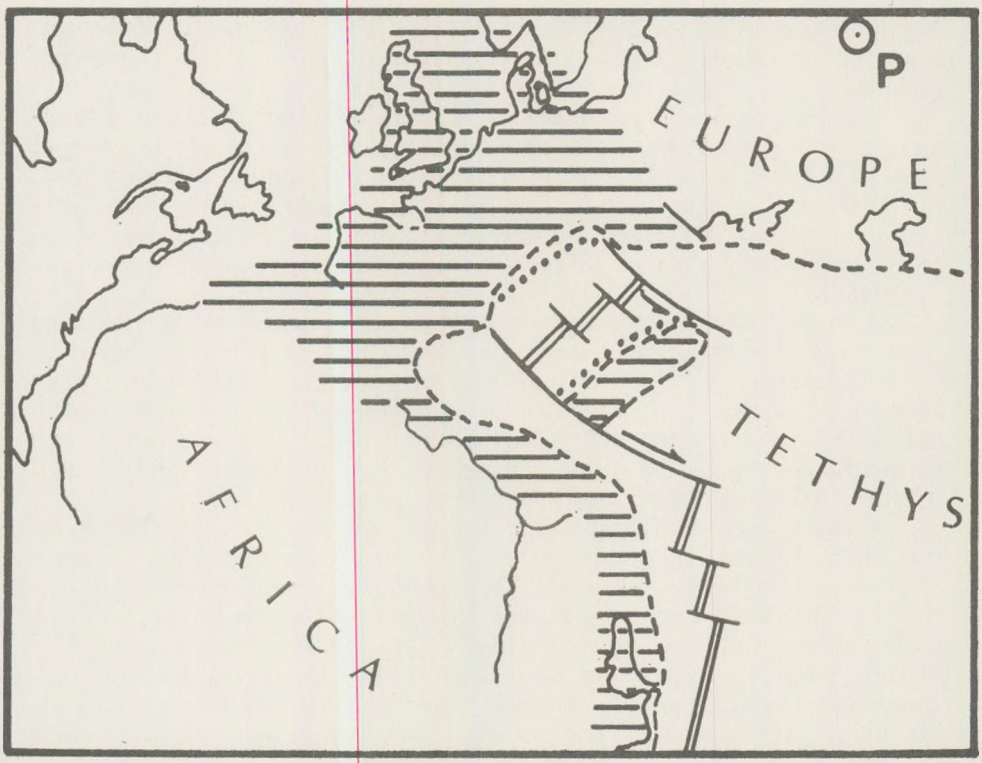

Fig. 3. A possible mechanism for the separation of the supposed microcontinent from Europe The rotation pole (P) is suggested by Dewey et al. (1973) for the Tethys plate. Dissected double lines: accreting plate margins with transform faults; Hachured area: shelf areas; Dotted lines: newly formed rifted margins with local and temporary uplift and erosion (This picture is not at all proved in many details).

solution, which is hazardous in some extent, however, does not contradict the faunistic facts, nor the plate-tectonic conception concerning the Mesozoic Tethys.

According to this tentative hypothesis, a considerable belt of the European shelf once uniformly overflown by a shallow epicontinental sea in the early Middle Triassic, was, in later Middle Triassic times, rifted and subsequently drifted away from the European continent, towards the open Tethys (Fig. 3).

Faunistic considerations

The above-mentioned drifting microcontinent could have provided proper conditions for the development of a "brachiopod province" even in the sense of Ager (1971). These brachiopods living on a huge submarine swell or plateau, which was overflown, especially at the beginning, by

shallow waters, could not have invaded into the surrounding oceanic bottoms of some thousand metres depth, thus their distribution, in fact, was environmentally controlled. In addition, their faunistic connection with the stable European shelf seems to have been disrupted, because their free-swimming larvae could not reach those areas. The larvae of the articulate brachiopods have a very short planktonic period, notably a few hours or some days at the most (Rudwick 1970, p. 155). Within this short span of time even a travel of 100 to 200 km length would have been possible via currents of such a high velocity, which is impossible for this period of the Mesozoic. Thus only driftwood or floating algae can be considered as factors facilitating the dispersal, but the connection implied by this is negligible.

The reduced nutrient supply suggested by Hallam (1971) for Mediterranean areas, is recognizable in fact, and is in accordance with this hypothesis (i. e. moving away from continental sources).

Ager et al. (1972), in their excellent work on the evolution of Mesozoic rhynchonellids, pointed out that the genera of the Dimerellacea subfamily show several archaic internal features similar to those characteristic of Ordovician and Devonian forms. Dimerellacea is a "Mediterranean" subfamily, because, while playing a subordinate role in NW European faunas, it has a predominance over Rhynchonellacea in the Mediterranean region. Similar archaic features appear within the Mediterranean terebratulids. Namely, relying upon studies on materials from the Bakony Mts. (Hungary), paired brachidium-supporting plates appear in the brachial valve of some sulcate species. These, as far as the author's knowledge goes, are unknown in forms familiar in NW European areas, but occur at other Mediterranean localities (Northern Limestone Alps, W Carpathians) and reminiscent of the septal (or crural) plates described in Devonian centronellids and Carboniferous-Mesozoic dielasmatids.

These characteristics reflecting a phylogenetic antiquity, can be presumably interpreted by the assumption that the articulates, which had just survived the Late Permian crisis and started to colonize the European shelf of the Early Triassic Tethys, were dissociated by that plate-tectonic event mentioned earlier. The environment on the microcontinent that was drifting ocean-ward (i. e. on the submarine plateau) was presumably more constant and this facilitated the maintenance or reappearance of archaic characters (a direct phylogenetic connection with the Ordovician and Devonian taxa mentioned being improbable). Originally homogenous and compatriotic, the faunas later would evolve independently on the two separated areas, and this would result in parallel evolutionary lineages. Additionally, the genetic variability and the adaptive responses to the different environments could give rise to markedly different lineages as well.

Plate-tectonic considerations

The picture outlined on Fig. 3. is far from being proved in detail. The Late Triassic eastward motion (anticlockwise rotation) of the Tethyan plate around a given pole as well as the placing of the accretion margin into the western corner of the Tethys is based on the work of Dewey et al. (1973) while the attaching of the microcontinent to the posterior margin of the moving plate is arbitrary. Similarly arbitrary (but inconclusive under the present considerations) is the shape of this microcontinent. The site must have been so large to embrace its recently known fragments at least, i. e. the outer Hellenides, the Dinarides, some nappes of the Eastern Alps and Carpathians, the northern part of the Pannonian basin, the Southern Alps, Italy, the Betic-Balearic belt, the Rif and some other masses of the Atlas range.

It would be a meaningless effort to insist on the movement-mechanism outlined in Fig. 3. As another, alternative solution, some southward rotation of the African plate in relation to Europe is conceivable (with a probable large intracontinental transform fault in the place of the subsequently opened Atlantic). Such a movement would have similarly resulted in an off-European motion of the microcontinent under consideration. The author adheres only to the pre-Jurassic drifting of this microcontinent, which can be supported by some geological facts listed below.

Besides the brachiopodal provinciality asserted in the present paper, the Mediterranean Upper Triassic–Lower Jurassic lithofacies types also display a kind of "provinciality". Sediments most diversed both spatially and temporally do certainly occur, and yet a common feature is the predominance of carbonate rocks and the local nature of the detrital, terrigenous material. On this very basis Laubscher (1971) and Bernoulli and Renz (1970) separate the Mediterranean area from Europe and connect it with the southern margin of the Tethys. In this case the almost total absence of terrigenous material may be due to an extremely reduced continental influence, for which the arid climate of the southern continent was responsible. This climatic difference was done away by a new oceanic circulatory pattern, which developed in the Tethys at the beginning of the Middle Jurassic (Goldberg and Friedman 1974), and which can be reasonably connected with the Toarcian opening of the Central Atlantic. The reduced continental influence is suggested also by the high illite/caolinite ratio in the Alpine sediments (Hallam 1967). These facts can be plausibly interpreted by drifting too.

Palaeogeographic position of the Bakony Mts. in the Jurassic

The comparative study of the faunistic compositions of Lower Jurassic brachiopod faunas supports the opinion that the area of the Bakony Mts. belonged to the Mediterranean province. Drifting of a segment of the European shelf toward the open Tethyan ocean arouse as a decisive factor cau-

sing the Mediterranean provinciality. This means that in the Jurassic the Bakony Mts. belonged neither to the European nor to the African shelves but to an isolated, oceanic "Mediterranean microcontinent". This picture would serve a different starting-point for the reconstruction of the Alpine orogeny connected with the closure of the Tethys – but it will have to bear the control of the more and more extensive palaeomagnetic measurements.

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FROGDENITES (AMMONITINA, OTOITIDAE) FROM THE BAJOCIAN OF LÓKÚT, BAKONY MTS., HUNGARY

by

A. GALÁCZ

Department of Paleontology, Eötvös University Budapest

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Zusammenfassung

In der Nähe eines fossilreichen Profils des Bajociums aus dem Bakonygebirge (Transdanubisches Mittelgebirge, Ungarn) ist ein Exemplar der seltenen Ammoniten-Gattung *Frogdenites* zum Vorschein gekommen. Die Form wurde, da sie so selten und eigenartig ist, morphologisch ausführlich beschrieben. Die Beschreibung wird durch einige Bemerkungen über die stratigraphische und geographische Verbreitung der Gattung, ferner über ihren Dimorphismus ergänzt.

Introduction

In 1976 a student geologist (A. Hidvéghy) collected a small ammonite near the Middle Jurassic reference section of the Lókút Hill (Bakony, Transdanubian Mid-Mountains, Hungary). She found the specimen in the loose debris, therefore the exact horizon remained unknown. After detailed determination this ammonite specimen proved to belong into the peculiar Bajocian *Frogdenites* genus. In the extremely rich material of the Lókút Hill Bajocian, this genus is represented with several, stratigraphically controlled specimens. However, this single finding is worth to described separately, being a record of a genus of rare occurrence.

Description

Suborder Ammonitina Hyatt, 1889

Superfamily Stephanocerataceae Neumayr, 1875

Family Otoitidae Mascke, 1907

Subfamily Otoitinae Mascke, 1907

Genus *Frogdenites* Buckman, 1921

Frogdenites spiniger Buckman, 1921

Figs. 1—2.

1921. *Frogdenites spiniger* nov. – Buckman, S. S. (1909–30), T. A. III, pl. CCXV, figs. 1–4.

Material: A single internal mould of good preservation. A part of the body chamber is crushed and worn (soluted?).

Dimensions:

Diameter	Whorl breath (Wb)		Whorl height (Wh)		Wb/Wh	Umbilical diameter	
37 mm (at the aperture)	22.5	(61%)	17	(41)	1.31	12	(28)
31 mm (on the body chamber)	22.5	(72.5)	15.5	(50)	1.45	9	(29)
26 mm (at the end of phragmocone)	20.5	(79)	13	(50)	1.54	6.3	(24)

length of the body chamber: 330°

Description: A small microconchiate ammonite with depressed, barrel-shape inner and middle whorls and contracted body chamber. With the body chamber contraction the umbilicus becomes wider, and the slightly rounded umbilical slope tends to become flattened on the last half whorl. The closely-spaced inner ribs arise at the umbilical seam, prorsiradiate on the inner whorls, gradually become rursiradiate on the body chamber

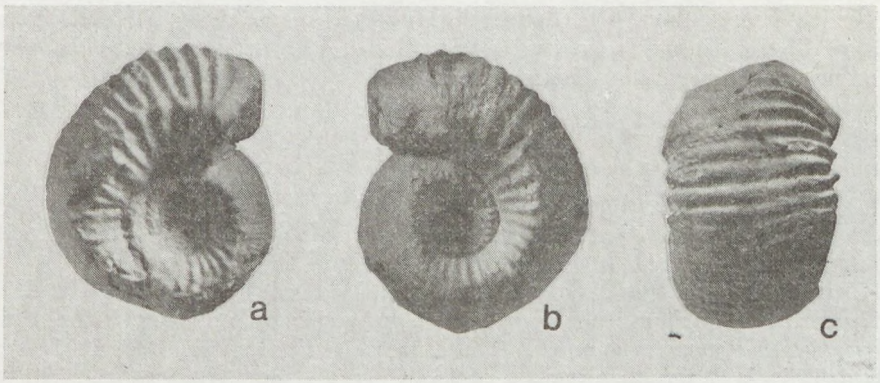

Fig. 1. Frogdenites spiniger BUCKMAN. a – b: lateral views; c: ventral view. Natural size.

and slightly rectiradiate near the aperture. The primary ribs of the phragmocone extend up to about 1/3 of the whorl-sides, while on the body chamber they are longer, reaching the half height of the flanks. The inner ribs end in small, sharp tubercules. The number of the primary ribs is constant on the outer whorls, i. e. 31 on the phragmocone and 31 on the last whorl, too (see Text-fig. 2b). The fine secondary ribs are rursiradiate on the phragmocone and on the body chamber, but their density varies, i. e. 3 per primary on the septate whorls and 2 per primary on the body chamber, respectively. On the last quarter of the body chamber the secondaries are extremely strong and sharp, and pass the highly-arched venter with a slight backward curve. The body chamber is strongly contracted, with a smaller decrease of height and stronger decrease of breath. The peristome

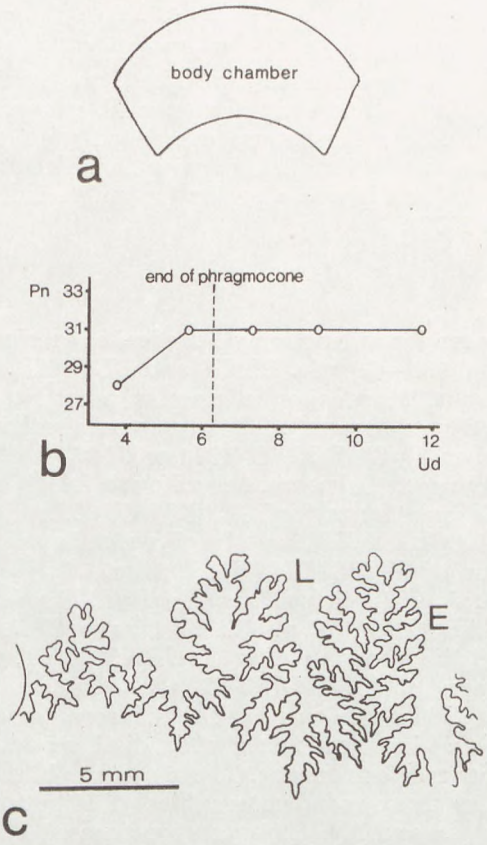

Fig. 2. Frogdenites spiniger BUCKMAN. a: whorl-section at 32.5 mm diameter; b: number of primary ribs (Pn) against umbilical diameter (Ud); c: suture-line.

cannot be seen accurately in this internal cast, but a flared lateral border is visible, which corresponds perhaps to the base of lateral lappet.

The suture-line (Text-fig. 2c) is characteristic, with high and slender saddles, deep, three-pronged first lateral lobe and a wide, somewhat irregular second lateral lobe at the row of the tubercles.

Comparison: This Lókút specimen shows a very close agreement with the holotype, except that being somewhat smaller. The type specimen of *F. spiniger* appears to be worn and fragmentary on the last part of the body chamber with 45 mm diameter, while the specimen described here shows the aperture at 37 mm. Other slight difference is shown in the number of primary ribs, which is c. 24 in the holotype and 31 in the Lókút form. *Frogdenites profectus* BUCKMAN (1923, pl. CDXXX, figs. 1–3) is different, being more depressed on its body chamber and showing rounded ribs and tubercles on its last whorl.

Stratigraphy: The exact stratigraphic position of the specimen is unknown, because of the nature of the finding. In the Bajocian fauna of the Lókút Hill, which were collected bed-to-bed, the genus *Frogdenites* is represented, but only with other species (e. g. *F. extensum*, *F. gibbelurum*, *F.* aff. *profectus*). These species are associated with a rich ammonite fauna, which is now under detailed examination. The studies suggest the need to correct the stratigraphic evaluation published in a preliminary report (GALÁCZ 1976).

Discussion

The only source for indentifying *Frogdenites* species is BUCKMAN's Type Ammonites (1909—30, pls. CCXV and CDXXX). He assigned two forms into this genus, *Frogdenites spiniger* as genotype and *F. profectus*, both from his „Sauzei hemera". The corrected stratigraphic position of these species is given by PARSONS (1974, pp. 167—168) as upper Laeviuscula Zone (Laeviuscula Subzone). According to PARSONS (1977, p. 112), the two small "*Labyrinthoceras*" of BUCKMAN (*L. extensum*, pl. CCXIV, *L. gibbelurum*, pl. CCLXXVII) are also *Frogdenites* species of similar age (see the suggestion of WESTERMANN 1964, p. 54).

Outside of the localities in southern England, *Frogdenites* was recorded from Portugal (PARSONS 1977, p. 112), SE France (PAVIA and STURANI 1968, p. 311) and the Venetian Alps (STURANI 1971, p. 63). The exotic records of the genus (see ARKELL 1953, p. 335) are doubtful. On the basis of the hitherto published data on *Frogdenites*, it seems reasonable to suppose that this genus is an important element in distinguishing upper Laeviuscula and lower Sauzei Zone faunas. The reports published so far suggest, that this genus has an extended geographical distribution in Europe, both in the Mediterranean and NW European provinces.

An interesting point in the taxonomy of *Frogdenites* species is that suggested by PARSONS (1977). He demonstrated, that *Frogdenites* is an independent genus in its stratigraphical range and dimorphism as well. In contradiction to the earlier practice (WESTERMANN 1964, p. 54) linking the microconchiate *Frogdenites* to the macroconchiate *Labyrinthoceras*, PARSONS suggested infraspecific dimorphism in that former genus. In this case, *Frogdenites* is transitional, also with its style of dimorphism, to the Sphaeroceratinae, where this character was documented recently by STURANI (1971).

In fact, PARSONS (1974, p. 167) indicated unnamed *Frogdenites* microconchs from the type locality of the genus. He recorded both microconch and macroconch *F. spiniger*, and in his 1977 paper (p. 114) he mentioned, that a low size ratio appears between the dimorphs. In the light of these considerations, the possibility arises that the here described *F. spiniger* is the microconch pair for the form represented by the type specimen. The maximal size of this latter was suggested by BUCKMAN as of 55 mm, and in this case the size ratio of a supposed microconch and macroconch *F. spiniger* pair gives a 0.67 (too low!) value. On the other

hand, *Trilobiticeras cricki*, a closely related, similar microconchiate form, with a 2.85 cm holotype and a 2.14 cm second paratype (PARSONS 1977, p. 108) shows at least 0.74 deviation in the adult diameter values. This suggests remarkable variability in adult size of these relate forms. These considerations show, that in the limited *Frogdenites* material, with two (or four) published, incomplete specimens and a single new finding, the problem of specific taxonomy and dimorphism cannot be solved for the present.

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OLIGOCENE OSTRACODS FROM THE SURROUNDINGS OF BUDAPEST

by

M. MONOSTORI

Department of Paleontology, Eötvös University, Budapest

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Zusammenfassung

Es werden die Ostracoden des unteren Teiles des Oligozäns (Kiscellien) der Umgebung von Budapest aus drei Bildungen, die unter abweichenden ökologischen Verhältnissen entstanden sind, beschrieben. Die Zahl der als neu beschriebenen Formen (Arten und Unterarten) beträgt 10: Hemicyprideis? anterocostata n. sp., Miocyprideis? rara derupta n. ssp., Cardobairdia hungarica n. sp., Bairdia rupelica n. sp., Parakrithe costatomarginata n. sp., Agrenocythere aculeataformis n. sp., Occultocythereis rupelica n. sp., Paracypris? rupelica n. sp., Cuneocythere marginata anterodepressa n. ssp., Loxoconcha delemontensis hungarica n. ssp., die der bestimmten und bereits bekannten Arten und Unterarten 19: Hemicyprideis helvetica (Lienenklaus), Schuleridea rauracica Oertli, Krithe papillosa (Bosquet), Echinocythereis cf. ligula (Lienenklaus), Leguminocythereis sorneana Oertli, Cytheretta variabilis Oertli, Loxoconcha cf. favata Kuiper, Cytherella compressa (von Münster), Cytherella dentifera Méhes, Cytherella pestinensis Méhes, Cytherella draco Pietrzeniuk, Kirthe pernoides (Bornemann), Costa hermi Witt, Henryhowella asperrima (Reuss), Buntonia sublatissima arcuatocosta Brestenská, Eucytheridea reticulata Goerlich, Cytheropteron emmeneggeri Scherer, Candona fertilis Triebel, Moenocypris cf. bockenheimensis Triebel.

Im Falle des Hárshegyer Sandsteines weist die paläoökologische Auswertung auf einen mehr oder minden abgeschlossenen, ufernahen Meeresteil mit seichtem Wasser von vermindertem Salzgehalt hin. Die Fauna des Kisceller Tones zeigt eine tief sublitorale-bathyale Ausbildung des offenen Meeres an. Die Fauna der Tarder Schichten lebte in einem Meeresteil von verhältnismässig tiefem Wasser, der jedoch durch vom normalen stark abweichende hydrochemische Verhältnisse charakterisiert werden kann.

Introduction

The descriptive work of the Hungarian Oligocene ostracods has been initiated by the studies of B. Zalányi in 1929, with descriptions of species from the Bükk Mountains. The next to publish on the rich Oligocene

ostracod material from NE Hungary and from the surroundings of Budapest was Gy. Méhes in 1941. Newer data on Hungarian Oligocene ostracods are those published by Brestenská in her 1975 work. This latter concerned the profile of the Wind brick-yard of Eger, and referred to Egerian (Oligo-Miocene) and Rupelian (Middle Oligocene) forms. The present writer published the preliminary report on the ostracods of the Tard Beds (Monostori, 1975). According to the usual interpretation, the age of these beds is of Lower Oligocene, Lattorfian.

In the recent years a project of detailed studies on samples from several boreholes made possible to work out the ostracod fauna of the Lower Oligocene. These studies concerned the Hárshegy Sandstone and the Tard Beds, which were previously regarded as of Lower Oligocene (Lattorfian), and the Kiscell Clay, which was hitherto known as of Middle Oligocene (Rupelian).

The material of the Hárshegy Sandstone came from Pilisszentkereszt, north to Budapest (see in Báldi et al., 1976), while the localities of the Tard Beds and Kiscell Clay faunas are in the northern part of the Danube-bank of Budapest.

Taxonomic descriptions

1. Ostracods from the Hárshegy Sandstone of Pilisszentkereszt

Subclass Ostracoda Latreille, 1806

Order Podocopida G. W. Müller, 1894

Suborder Podocopa Sars, 1866

Superfamily Cytheracea Baird, 1850

Family Cytherideidee Sars, 1925

Subfamily Cytherideinae Sars, 1925

Genus Hemicyprideis Malz et Triebel, 1970

Hemicyprideis? anterocostata n. sp.

Plate I, figures 1 – 2.

Derivatio nominis: Referring to the distinct marginal rib. Holotypus: A carapace.
Locus typicus: The Pilisszentkereszt gorge.
Stratum typicum: "i" bed.
Diagnosis: Both valve with a sharp marginal rib along the anterior outline and to the ventral swelling ventrally.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is rounded somewhat asymmetrically, with a widerly-arched upper part. The anterior outline breaks with a c. 140° angle into the nearly straight dorsal outline, which abruptly rounds into the posterior outline around 0,9 length. The posterior outline is hardly arched, and narrowly arches into the perpendicular ventral outline. The straight ventral outline shows a distinct sinus between 0,5 and 0,9 lengt.

The sinus is weaker in the outline of the left valve.

Dorsal view. The periphery slopes anteriorly and posteriorly with 70 to 90° angle, the intermediate portion is nearly parallel, but is markedly uneven by the swellings of the valves.

2. Ornametation. The surface of the valves is irregularly pitted, and distinct swellings appear additionally. The biggest swelling occurs around 0,4 length and at the half of the local height, the other two are situated around 0,6 length, along the ventral outline, and dorsally at the three-quarter of the local height, respectively. A slightly elongate swelling appears at the posteroventral angle, and an additional one at 0,9 length, around three-quarter of the local height. A sharp marginal rib runs all along the anterior outline, and ventrally to the ventral swelling. An other marginal rib connects the two posterior swellings. The surface is depressive between the swellings; a deeper depression is situated prependicularly to the dorsal outline, just behind the swelling at 0,4 length. This depression courses to the upper part of this latter swelling.

3. Dimensions (in millimetres): Length: 0,98 – 0,90
Height: 0,54 – 0,46
Length/Height ratio: 1,96 – 1,81

4 – 8. The inner characters (i. e. the inner lamella, the marginal pore-canals, the hinge, the normal pores and the muscle scars) are not discernable.

9. Eye-spot: absent.

10. Overlap: The left valve slightly overlaps the right one.

11. Sexual dimorphism: The more elongate, anteriorly lower forms are probably the males.

12. Variability: The swellings are indistinct in some specimens. Connection of variable grade may appear between the two dorsal swelling, and between the two ventral swellings, parallelly to the outline.

Comparison

H. helvetica (Linenklaus) is a closely similar form in shape and ornamentation, but the here described form differs in having the very distinct marginal rib and the position of the greatest width at the posteroventral tubercle. Additionally, the dimensions are far greater.

Material

11 carapaces.

Hemicyprideis helvetica (Lienenklaus, 1896)

Pl. I, figs. 3–5.

1896. Cytheridea mülleri var. helvetica Lienenklaus – Lienenklaus, p. 26, pl. II, fig. 6.

1953. Haplocytheridea helvetica (Lienenklaus, 1895) – Goerlich, pp. 140–141, pl. 7, figs. 52–55.

1956. Haplocytheridea helvetica (Lienenklaus, 1895) – Oertli, pp. 43–45, pl. 4, figs. 80–93.

1957. Haplocytheridea helvetica (Lienenklaus) – Keij, p. 62, pl. III, figs. 27–30.

1966. Haplocytheridea helvetica (Lienenklaus) – Moussou, p. 37, pl. 9,

1975. Hemicyprideis helvetica (Lienenklaus) – Brestenská, p. 398, pl. 6, figs. 1–6.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is rounded symmetrically, or somewhat asymmetrically, in the latter case the upper part is more broadely arched. The anterior outline shows at 0,4 length a more or less distinct break at the joint with the straight dorsal outline. This latter breaks with a c. 130° angle at 0,9 length into the nearly straight posterior outline. The posterior outline curves with a narrow arch into the nearly straight ventral outline, which is slightly sinuous between 0,7 and 0,9 length. Traces of anterior marginal denticulation appear occasionally.

The sinus is more indistinct in the right valve.

Dorsal view. The periphery of the carapace rises with a c. 40° angle to 0.2 length, then the periphery of the two valves is nearly parallel, while undulating by the swellings. The periphery slopes with 70 to 80° angle from 0.9 length.

2. Ornamentation. The surface of the valves is irregularly pitted. Near to the dorsal margin, between 0.1 and 0.4 length, a weak, between 0.2 and 0.5 length and at one-third of the local height an other, stronger, bipartite swelling appears. A strong swelling is situated at 0.6 length, along the ventral margin, and an other at the two-third of the local height. A conspicuous swelling occurs at the posteroventral angle, and an other, very weak, additional swelling appears just below the joint of the dorsal and posterior outlines. The surface shows keel-like sharpenings between the swellings in the anterior part of the ventral area, and weakly along the posterior outline.

3. Dimensions (in mm): L: 0.68 – 0.59
H: 0.35 – 0.32
L/H: 2.06 – 1.80

4 – 8. The inner features are not discernable.

9. Eye-tubercle is absent.

10. The left valve slightly overlaps the right one.

11. The males are more elongate and lower anteriorly.

12. The swellings are differently developed, and are indistinct occasionally in some specimens. In certain specimens concentric reticules appear anteriorly.

Remarks

The Pilisszentkereszt forms are well compared to the representatives of the species figured in the literature.

Geological and geographical distribution

GFR: Chattian; France: Oligocene; Belgium: Tongrian and Rupelian; Switzerland: Rupelian and Lower Chattian; USSR: Oligocene.

Material

366 carapaces.

Cytherideinae, cf. Hemicyprideis parvula Malz et Triebel, 1970
Pl. I, figs. 6 – 8.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is symmetrically rounded. It rounds gradually into the dorsal outline, of which two, nearly straight lines enclose a c. 150° angle at 0.4 length, then courses – from 0.8 length – into the rounded posterior outline. The posterior outline narrowly arches into the ventral outline, which is sinuous between 0.9 and 0.4 length. The ventral outline of the left valve is nearly straight.

Dorsal view. The periphery of the carapace is parallel between 0.2 and 0.8 length, with narrowly-arched anterior and posterior portions.

2. Ornamentation. The surface of the valves is nearly smooth and somewhat uneven.

3. Dimensions (in mm): L: 0.92 – 0.84
H: 0.47 – 0.40
L/H: 2.10 – 1.81

4 – 8. The inner characters are not visible.

9. Eye-tubercle is absent.

10. The left valve slightly overlaps the right valve.

11. The males are more elongate and lower anteriorly.

12. In some specimens the break of the dorsal outline is indistinct.

Remarks

The morphological characters and the ornamentation are identical to those in the species of Malz and Triebel. The hinge cannot be seen, a single specimen shows an extremely weak anteroventral vestibulum, thus it is possible, that the forms are in relation to the genus Cytheridea.

Geological and geographical distribution:

GFR: Sannoisian.

Material

75 carapaces and 5 right valves.

Genus Miocyprideis Kollmann, 1960

Miocyprideis? rara derupta n. ssp.

Pl. IX, figs. 8–9.

Derivatio nominis: Referring to the break of the valve-surface.
Holotypus: A carapace.
Locus typicus: The Pilisszentkereszt gorge.
Stratum typicum: "h" bed.
Diagnosis: Characterized by a strong break of the surface, parallelly to the outline, except in the anterodorsal area.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is symmetrically rounded, and gradually arches into the slightly curved (nearly straight) dorsal outline. The posterior outline is nearly symmetrically rounded, with widely-arched upper and narrowly-arched lower line. The ventral outline is nearly straight, and breaks into the anterior outline at 0.8 length.

Dorsal view. The periphery of the carapace rises with a c. 50° angle to 0.1 length, then, after a sharp break, rises with a c. 10° angle to just behind 0.9 length, and slopes abruptly, with 70° angle to the end of the valve.

2. Ornamentation. The surface of the valves is covered by coarse, irregularly-arranged pitting. The surface breaks close and nearly parallelly to the outline and slopes abruptly toward the plane of the valve-closure. This slope is most abrupt posteriorly and ventrally, is weaker anteriorly, and is absent between 0.2 and 0.5 length. The posterior break diverges from the outline, its course is straight and perpendicular to the ventral outline, and near to the dorsal outline, is abruptly curved and terminated in a short portion, which is parallel to the dorsal outline. The two corners of the posterior break are tubercle-like. The surface is protruded just below the half of the local height and around 0,4 length, and in the upper third of the local height and around 0,6 length, while the other parts of the surface within the break, are more or less depressive.

3. Dimensions (in mm): L: 0.65 – 0.59
H: 0.34 – 0.31
L/H. 1.97 – 1.74

4 – 8. The inner characters cannot be studied.

9. Eye-tubercle is absent.

10. The left valve slightly overlaps the right one.

11. Some specimens are more elongate and lower, these are probably the males.

12. The strength of the described ornamental elements is highly variable in some specimens.

Comparison

The here described form resembles the type subspecies M. rara rara (Goerlich, 1953), but differs in having the conspicuous break in the surface.

Material

295 carapaces.

Cytherideinae gen. et sp. indet.

Remarks

Forms which closely resemble Cytheridea (Cytheridea) mülleri truncata Goerlich, 1953 and Hemicyprideis elongata Keen, 1972 in shape and ornamentation. Characteristic is the concentrically arranged pitting and the occurrence of anteriorly and ventrally concentric (generally 3) ribs. Because of the invisible inner features, these poorly-preserved specimens cannot be determined more closely.

Subfamily Schulerideinae Mandelstam, 1959

Genus Schuleridea Swartz et Swain, 1946

Schuleridea rauracica Oertli, 1956

Pl. I, figs. 9 – 13.

1956. Schuleridea rauracica Oertli – Oertli, pp. 47 – 50, pl. 5, figs. 110 – 123.

1958. Schuleridea (Aequacytheridea) rauracica Oertli, 1956 – Kollmann, p. 186, pl. 4, .fig. 4, pl. 21, figs. 6 – 7.

1975. Schuleridea (Aequacytheridea) rauracica Oertli, 1956 – Doebl and Sonne, p. 143, pl. 2, fig. 10

Description.

1. Shape. Outer lateral view. The anterior outline of the left valve is nearly symmetrically rounded, and gradually curves into the widely-arched dorsal outline, which breaks around 0.4 – 0.5 length. The posterior line of the dorsal outline is nearly straight, and joints with a small break

to the posterior outline at 0.9 length. The rounded posterior outline shows a slight break at the third of the greatest height, and the lower portion of the arch curves gradually into the convex ventral outline.

The lines of the dorsal outline are nearly straight in the right valve, the break is situated at 0.4 length. The upper line of the posterior outline, as well as the ventral outline, is nearly straight.

Dorsal view. The periphery of the left valve rises with 45° angle to 0.1 length, then the rise decreases gradually to 0° to 0.6 length, then slopes from 0° to 30° to 0.9 length, and finally the angle attains 60° angle.

The right valve is somewhat flattened, with a slightly depressed periphery anteriorly.

2. Ornamentation. The surface of the valves is coarsely pitted, especially in the central areas.

3. Dimensions (in mm): L: 0.87 – 0.80
H: 0.54 – 0.51
L/H: 1.61 – 1.57

4 – 8. The inner features are not discernable.

9. Eye-tubercle is absent.

10. The left valve markedly overlaps the right one.

11. In a significant part of the specimens both valves are inflated posteriorly, and the posterior slope abruptly changes into perpendicular in dorsal view.

Remarks

Posteriorly inflated specimens are unknown from the type locality, and from the subsequent literature.

Geological and geographical distribution

GFR: Lower Rupelian; France: Lower Stampian; Switzerland: Rupelian.

Material

7 carapaces.

Family Cushmanideidae Puri, 1973

Genus Pontocythere Dubowsky, 1939

Pontocythere? sp.

Poorly-preserved specimens, which can be ranged probably into this genus.

Family Krithidae Mandelstam, 1960

Genus Krithe Brady, Crosskey et Robertson, 1874

Krithe papillosa (Bosquet, 1852)
Pl. I, fig. 14.

1852. Cytheridea papillosa Bosquet – Bosquet, p. 42, pl. III, fig. 5.
1941. Cytheroma gigantea Méhes – Méhes, p. 27, test-fig. 1; pl. I, figs. 10–13.
1957. Krithe papillosa (Bosquet) – Keij, p. VIII, figs. 1–4.
1961. Krithe papillosa (Bosquet, 1852) – Deltel, p. 112, pl. 8, figs. 121–122.
1965. Krithe papillosa (Bosquet) – Moyes, p. 43, pl. V, fig. 7.
1966. Krithe papillosa (Bosquet) – Moussou, pp. 62–63, pl. 17, figs. 66a–c.
1969. Krithe papillosa (Bosquet, 1852) – Carbonnel, pp. 69–70, pl. 3, fig. 11.
1969. Krithe papillosa (Bosquet) – Scheremeta, pp. 89–90, pl. VII, figs. 5–7.
1970. Krithe papillosa (Bosquet, 1852) – Witt, pl. 8, figs. 5–6; pl. 9, fig. 1.
1971. Krithe papillosa (Bosquet, 1852) – Blondeau, p. 83, pl. IX, fig. 7.
1975. Krithe papillosa (Bosquet) – Brestenská, p. 400, pl. 12, figs. 7–10.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is nearly symmetrically rounded, and gradually rounds into the nearly straight dorsal outline. The posterior outline declines from 0.7 – 0.8 length, with a gradually narrowing arch, then rounds into the ventral outline at the level of this latter. The ventral outline is conspicuously sinuous between 0.3 and 0.7 length. The height is situated anteriorly.

The ventral sinus is weaker in the left valve.

Dorsal view. The rise of the periphery decreases from 60° to 30° to 0.2 length, and from 30° to 0°, to 0.6 length. From this latter point the periphery slopes gradually from 0° to 45° at 0.9 length, then between 0.9 length and the end of the valve a slope up to 90° angle appears.

2. Ornamentation. The surface of the valves is smooth, without ornamentation.

3. Dimensions (in mm): L: 0.74–0.71
H: 0.39–0.31
L/H: 2.24–1.95

4–8. The inner characters can be studied imperfectly.

9. Eye-spot is absent.

10. The left valve overlaps the right one.

11. The somewhat more elongate forms are probably the males.

12. The course of the dorsal and ventral outlines is slightly variable.

Remarks

The here described forms are good match to those described in the literature.

Geological and geographical distribution

GFR: Burdigalian; France: Lutetian?, Stampian to Burdigalian; USSR: Oligocene; Czechoslovakia: Egerian.

Material.

90 carapaces.

Family Trachyleberididae Sylvester–Bradley, 1948

Subfamily Trachyleberidinae Sylvester–Bradley, 1948

Genus Costa Neviani, 1948

Costa cf. hermi Witt, 1967

Pl. II, fig. 1.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is slightly asymmetrically rounded, with wider arch in its upper two-third. It rounds into the slightly sinuous dorsal outline with 140° angle at 0.2 length. The dorsal outline breaks at 0.9 length with a 140° angle, and joints to the posterior outline. The upper half of the posterior outline is markedly concave, its lower half is narrowly convex. Just behind 0.8 length the posterior outline rounds into the slightly asymmetrically concave ventral outline. The lower line of the posterior outline shows traces of 5 denticles, and in spite of the poor preservation, traces of denticulation are visible also along the anterior outline.

The ventral sinus is more distinct in the right valve.

Dorsal view. The periphery of the valves is parallel, in a distance corresponding to one-third of the greatest width, up to 0.1 length, then rises with c. 40° angle to 0.3 length. The next portion rises with c. 10° angle to 0.7 length (here it is formed by the ventral ridge), then slopes with 50° angle to 0.9 length. Finally a parallel portion courses, which is slightly narrower than that of the anterior part.

2. Ornamentation. The dorsal ridge of the generally characteristic 3 ridges starts from just before 0.4 length, slightly below the dorsal outline. Its course is slightly arched, forming the dorsal outline between 0.2 and 0.3 length. The stronger median ridge arises from tubercles situating between 0.2 and 0.3 length, runs toward the dorsal outline, and with a perpendicular break at 0.7 length, fades into the surface. The ventral ridge is distinct, starts from around 0.2 length, near the ventral outline, runs parallelly to the median ridge, and fades before that into the surface. The surface is conspicuously reticulated among the ridges, the interspaces are large along the ridges. These interspaces are formed by concentric and radial riblets anteriorly. Distinct anteromarginal ridge occurs, the cardinal angle is protruded.

3. Dimensions (in mm): L: 0,81
H: 0,38
L/H: 2,13

4 – 8. The inner characters are not discernable.

9. The eye-spot is conspicuous.

10. The left valve overlaps the right valve.

Remarks

The ornamentation of these badly-preserved specimens closely resembles that of C. hermi, but the shape is different, especially with the concave ventral outline.

Material

3 carapaces.

Genus Pterygocythereis Blake, 1933

Pterygocythereis sp.

Poorly-preserved, specifically indeterminable specimens.

Genus Echinocythereis Puri, 1954

Echinocythereis cf. ligula (Lienenklaus, 1896)

Pl. II, fig. 2.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is asymmetrically rounded, with wider arch in its upper two-third. The anterior outline breaks at 0.1 length, then joints, with an other break at 0.2 length, to the dorsal outline. The dorsal outline is concave to 0.5 length, then slightly convex to just behind 0.9 length where breaks with a 120° angle into the posterior outline. The upper line of the posterior outline is somewhat concave, the lower line is convex, widely-arched and gradually rounds into the ventral outline. The ventral outline is concave between 0.2 and 0.7 length.

Dorsal view. The periphery of the carapace, following an abrupt marginal part, rises with c. 30° angle to 0.4 length, then the surface is nearly parallel, with a small concavity on both sides. From 0.7 length the surface slopes increasingly from 30 to 45° angle, with a final, parallelly-sided portion, which corresponds to one-quarter of greatest width.

2. Ornamentation. The surface is covered with mainly irregular reticulation, with tiny tubercules in the joints of the reticules. The ornamentation is arranged into concentric ribbing in the anterior and ventral areas. Ventral ridge runs between 0.3 and 0.9 length in the ventral area, coursing near to the ventral outline, but a sharp deviation in its posterior end, and fading into the surface at one-third of local height. The ridge is

blunt, it is rather a strong break of the surface, which bears some parallel superposed ribs. Dorsal rib is not seen. A weak subcentral tubercle appears around 0.3 length.

3. Dimensions (in mm): L: 0.81
H: 0.41
L/H: 1.98

4–8. Inner characters cannot be studied.

9. A conspicuous eye-tubercle appears at the cardinal angle, with a distinct postjacent depression.

10. The left valve slightly overlaps the right one.

Remarks

The single, poorly-preserved carapace resembles most closely the specimens of this species described from the Rupelian of Switzerland.

Material

A single carapace.

Subfamily Campilocytherinae Puri, 1960

Genus Leguminocythereis Howe et Law, 1936

Leguminocythereis sorneana Oertli, 1956

Pl. II, fig. 3.

1956. Leguminocythereis sorneana Oertli – Oertli, pp. 91–93, pl. 12, figs. 320–337.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is asymmetrically rounded, its upper half is more widely arched. The anterior outline breaks into the dorsal outline with a 150° angle at 0.4 length. The dorsal outline is sinuous, and rounds into the posterior outline at 0.8 length. The upper two-thirds of the posterior outline is widely, its lower third is narrowly arched. The ventral outline is nearly straight. The lower line of the posterior outline is denticulated.

Dorsal view. The rise of the surface decreases from 90 to 20° to 0.2 length, then decreases to 0° to 0.6 length. In the posterior portion the slope is of 10° angle to 0.8, and 90° angle to the end of the valve.

2. Ornamentation. The surface is covered by coarse reticulation, which is conspicuously arranged concentrically near the outline. The reticulation is indistinct in the area corresponding to the muscle scars. The two ribs running nearly parallel to the outline (with somewhat straighter run in their middle part) are especially strong. The inner rib terminates in a a flattened, tubercle-like swelling near to the cardinal angle. The surface is somewhat depressed behind that swelling.

3. Dimensions (in mm): L: 1.12
H: 0.54
L/H: 2.07

4–8. No inner characters were discernable.
9. Eye-tubercle is absent.
10. The left valve is somewhat bigger than the right one.

Remarks

The ornamentation is characteristic to this species, but the outline, in dorsal view, shows transition to L. lienenklausi Oertli, 1956, a species known from the Chattian of Switzerland.

Geological and geographical distribution

Switzerland: Rupelian

Material

A single carapace.

Family Cytherettidae Triebel, 1972

Genus Cytheretta G. W. Müller, 1894

Cytheretta variabilis Oertli, 1956

Pl. II, figs. 4–5.

1956. Cytheretta variabilis Oertli – Oertli, pp. 62–63, pl. 7, figs. 172; 180–188.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is asymmetrically rounded, with a wider arch in the upper two-third and a narrower arch in the lower third. The anterior outline rounds with a 140° angle at 0.2 length into the slightly sinuous dorsal outline. This latter forms a protruded corner at 0.9 length, and breaks into the posterior outline. The upper third of the posterior outline is narrowly, the lower two-third is widely-arched, and evenly rounds into the nearly straight ventral outline, which is extremely concave near its mid-length.

The cardinal angle is less-protruded in the right valve. The postero-ventral angle is missing, thus the upper line of the posterior outline is concave. The ventral outline is more sinuous.

Dorsal view. The surface rises with 45° angle to 0,1 length, with 30° angle to 0.2 length, and with 10° angle to 0.8 length. Here a nearly perpendicular recession appears, then the surface terminates with a parallelly-sided portion, which corresponds to one-third of the greatest width.

2. Ornamentation. The most conspicuous ornamental element is the longitudinal swelling, which arises anteroventrally, near to the margin, and runs parallelly to the ventral outline, strengthens posteriorly, and

terminates in a tubercle-like ending at 0.8 length. Near to valve's mid-line an other swelling appears, which is tubercle-like between 0.3 and 0.4 length. The dorsal swelling is arched between 0.5 and 0.8 length, and forms here the greater part of the dorsal outline, except its anterior and posterior portions. Densely-spaced ribs occur conspicuously in the ventral area, running parallely to the outline. The traces of longitudinal ribbing are visible among the swellings in some places. The surface is covered by distinct pitting.

3. Dimensions (in mm): L: 0.89
H: 0.51 – 0.50
L/H: 1.78 – 1.75

4 – 8. The inner characters are not visible.

9. Eye-tubercle is absent.

10. The left valve conspicuously overlaps the right one.

11. The more elongate specimens are probably the males.

12. The ornamentation shows variability similar to that described in forms from the type locality.

Remarks

A slight difference from the type is the extreme development of the ventral swelling.

Geological and geographical distribution.

Switzerland: Rupelian.

Material

6 carapaces.

Family Loxoconchidae Sars, 1925

Genus Loxoconcha Sars, 1866

Loxoconcha cf. favata Kuiper, 1918

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is assymetrically rounded, with obliquely truncate upper half, arching into the straight dorsal outline at about 0.2 length, with 140° angle. The dorsal outline forms a c. 120 – 130° angle with the posterior outline at 0.9 length. The upper half of the posterior outline is concave, then a subjacent narrow arch appears, and the lower half forms a widely-arched convexity. These two lines meet at a right angle. The posterior outline rounds gradually into the nearly straight ventral outline, which curves with a narrow arch into the anterior outline. The height is situated anteriorly.

The outline of the right valve is similar.

Dorsal view. The surface starts with a very short, parallelly-sided portion, which corresponds to 0.1 maximal width, then its rise decreases

from 60° to 30° to 0.2 length, and from 30° to 0° to 0.3 length. Postjacently the surface courses parallelly to 0,7 length, then slopes increasingly from 0° to 90° to 0.9 length, and terminates with an ending similar to that in the anterior part.

2. Ornamentation. The surface is covered by coarse and irregular reticulation.

3. Dimensions (in mm): L: 0,57 – 0,54
H: 0,32 – 0,30
L/H: 1,69 – 1,80

4 – 8. The inner characters are not visible.

9. The eye-tubercle appears indistinctly.

10. The left valve slightly overlaps the right one.

Remarks

The dorsal view is identical with that in the descriptions and figures of this species, but in lateral view the nearly straight ventral outline is generally shorter than that in the type, thus the posterior narrowing of the shape appears more anteriorly.

Material

29 carapaces.

Family Cytheruridae G. W. Müller, 1894

Subfamily Cytheropterinae Hanai, 1957

Genus Eocytheropteron Alexander, 1933

Eocytheropteron? sp.

Poorly-preserved specimens, showing only the shapes. Their arrangements are most probable into this genus.

Superfamily Cypridaceae Baird, 1845

Ill-preserved specimens suggesting the representation of several families of this superfamily.

2. Ostracods from the Kiscell Clay of Buda

Subclass Ostracoda Latreille, 1806

Order Podocopida G. W. Müller, 1894

Suborder Platycopa Sars, 1866

Family Cytherellidae Sars, 1866

Genus Cytherella Jones, 1849

Cytherella compressa (von Münster, 1830)

Pl. II, figs. 6 – 9.

1830. Cythere compressa Münster – Münster, p. 64.
1852. Cytherella compressa Münster – Bosquet, p. 11, pl. I, fig 1.
1956. Cytherella ex gr. compressa Münster – Suzin, pp. 159–160, pl. I, figs. 1–2.
1957. Cytherella compressa (von Münster) – Keij, p. 45, pl. I, fig. 10.
1962. Cytherella cf. compressa (von Münster) – Hinte, pp. 167–168. pl. I, fig. 3.
1968. Cytherella (Cytherella) compressa (von Münster, 1830) – Haskins, p. 252, pl. 1, figs. 1–8.
1969. Cytherella compressa (v. Münster, 1830) – Pietrzeniuk, p. 9, pl. I, figs. 1–2; pl. XXIII, figs. 1–2.
1975. Cytherella compressa (Münster) – Brestenská, pp. 380–381, pl. III, figs. 1–6.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, with wider arch in its lower half. The dorsal outline is nearly straigth or hardly concave from 0.2 to 0.6 length, then breaks with a c. 150° angle, and gradually rounds into the rather widely-arched posterior outline. This latter curves into the nearly straight ventral outline at 0,8 length. The height is situated somewhat posteriorly.

The anterior outline is nearly symmetrically rounded in the right valve. The dorsal outline is slightly convex, the posterior outline is nearly symmetrically rounded, the ventral outline is nearly straight, with gradual curves toward the anterior and the posterior outlines. The height is situated around mid-length.

Dorsal view. The rise of the surface gradually decreases from 45° to 0° angle to 0,6 length, then its slope increases from 0° to 90°, with narrower arch from 0,8 length.

2. Ornamentation. The surface of the valves shows visible reticulation only in its anterior and posterior areas. The reticulation is most conspicuous along the anterior margin of the left valve.

3. Dimensions (in mm): L: 0.89–0.79
H: 0.54–0.44
L/H: 1.62–1.82

4–8. Inner features are those characteristic to this genus.
9. Eye-tubercle is missing.
10. The right valve overlaps conspicuously the right one.
12. The arch of the dorsal outline is more distinct in some specimens.

Remarks

The conspicuous break in the dorsal outline of the left valve is a distinctive feature as compared to forms known from the literature. A possible subspecific designation needs more comparative studies.

Geological and geographical distribution

Holland: Bartonian to Rupelian; Belgium: Upper Ypresian to Rupelian; England: Bartonian; Austria: Middle Eocene; Czechoslovakia: Rupelian to Egerian; USSR: Eocene.

Material

6 left valves, 4 right valves, 5 carapaces.

Cytherella dentifera Méhes, 1941

Pl. III, figs. 1–4.

1941. Cytherella dentifera Méhes – Méhes, pp. 78–90, pl. VII, figs. 12–16; 20a, 94, 103.
1975. Cytherella dentifera Méhes – Brestenská, p. 381, pl. 3, figs. 10–14.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, with wider arch in its lower half. The dorsal outline is nearly straight, hardly concave between 0.2 and 0.6 length. Postjacently, with a c. 160° break, it rounds with gradually narrowing arch, into the posterior outline. This latter gradually rounds into the slightly sinuous ventral outline. The height is situated anteriorly.

The anterior symmetry of the right valve is rather indistinct, the dorsal outline is slightly convex, thus the narrowingly-arched roundness toward the posterior outline shows no break. The ventral outline is less concave. The height is situated anteriorly.

Dorsal view. The rise of the periphery decreases from 45° to 30° to 0.2 length, to 15° to 0.4 length, and 0° to 0.6 length. The postjacent portions slope increasingly, from 0° to 20° to 0.8 length, and to 90° to the termination of the valve.

2. Ornamentation. The posterior areas of both valves are finely spiniferous. Weak reticulation appears along the anterior and posterior outlines.

3. Dimensions (in mm) L: 0.84–0.78
H: 0.53–0.45
L/H: 1.73–1.58

4–8. The inner features correspond to those characteristic to this genus.

9. Eye-spot is absent.

10. The right valve conspicuously overlaps the right one.

11. The specimens described below are probably the males.

12. Some specimens appear in dorsal view as less-inflated in the posterior surface. This results in that the slope deviates from the abrupt, perpendicular arch, but runs nearly straightly, in 45° angle, and the abrupt termination appears only in the very end of the valve. The rise of the

anterior surface is similarly more regular. The shape of these specimens is more elongate in lateral view, because the outline of the right valve corresponds to that of the left valve, except the anterior extension and the described ventral sinus of the former. In some posteriorly inflated specimens may show in dorsal view a little more abrupt rise between 0.3 and 0.6 lenght in the outline.

Remarks

The Budapest specimens can be well indentified to the description and figures of Brestenská.

Geological and geographical distribution

Czechoslovakia: Rupelian to Egerian.

Material

5 left valves, 2 right valves, 12 carapaces.

Cytherella pestinensis Méhes, 1941

pl. III, figs. 5–8.

1941. Cytherelloidea pestinensis Méhes – Méhes, pp. 81–82, pl. VII, figs. 21–22; text-figs. 18, 95, 105.
1975. Cytherella pestinensis (Méhes) – Brestenská, pp. 382–383, pl. 1, figs. 1–9.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is nearly symmetrically rounded, with somewhat wider arch in its ventral half. The anterior outline gradually rounds into the dorsal outline, which is nearly straight between 0.3 and 0.7 length, then curves into the posterior outline. The arch of this latter is narrower than that of the anterior outline. The posterior outline breaks at the point which corresponds to the midline of the valve. The lower half of the posterior outline is hardly arched, and joints to the nearly straight ventral outline with a second break. The ventral outline rounds from 0.3 length gradually into the anterior outline. The height is situated anteriorly.

The anterior outline of the left valve is distinctly asymmetric, which is caused by the less-gradual anterior-dorsal outline transition. The dorsal outline is depressive between 0.3 and 0.5 length. The lower half of the posterior outline is formed by a convex process. The height is situated anteriorly.

Inner lateral view. The posterior process of the left valve is concave inward, and is separated from the valve-interior by the edge of the hinge.

Dorsal view. The rise of the periphery decreases from 40° to 0° to 0.7 length, then increases from 0° to 90° throughout.

2. Ornamentation. The surface is finely reticulated; concentrically arranged reticulation appears distinctly along the anterior margin. The central areas are usually smooth. The anterior area of the left valve is slightly depressed, the posterior area is finely spiniferous.

3. Dimensions (in mm): L: 0.83 – 0.76
H: 0.57 – 0.42
L/H: 1.88 – 1.45

4 – 8. The inner features are identical to those which characterize the genus.

9. Eye-spot is absent.

10. The right valve conspicuously overlaps the right one.

11. The more elongate specimens are probably the males.

12. The arch of the ventral line of the posterior outline may be variable in the right valve, but the break and the wider arch appears in all cases.

Remarks

The majority of the here described forms are thicker than the specimens figured by Brestenská.

Geological and geographical distribution

Czechoslovakia: Rupelian to Egerian.

Material

5 left valves, 11 right valves, 9 carapaces.

Cytherella draco Pietrzeniuk, 1969

Pl. IV, figs. 1 – 3.

1969. Cytherella draco Pietrzeniuk – Pietrzeniuk, p. 9, pl. I, figs. 3 – 5; pl. XXIII, figs. 3 – 4.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is broadely-rounded, with a somewhat wider arch in the ventral than in the dorsal half. The dorsal outline is nearly straight from 0.2 length, its anterior line rounds with a c. 145° angle just behind 0.5 length, into the similar, nearly straight posterior line. The dorsal outline, just behind 0.9 length, gradually curves into the posterior outline, of which arch is narrower than that of the anterior outline. The posterior outline gradually rounds into the very widely arched, convex ventral outline. The height is situated around the middle of the valve.

The outline of the right valve is similar.

Dorsal view. The rise of the periphery decreases from 30° to 0° to 0.6 length, then increasing from 0° to 20° to just behind 0.9 length, terminates in a 90° angle slope. The surface is slightly depressive in the anterior part of the valve.

2. Ornamentation. The surface of the valves is smooth.

3. Dimensions (in mm): L: 0.86 – 0.81
H: 0.58 – 0.55
L/H: 1.48 – 1.46

4 – 8. The inner characters are identical to those characteristic to this genus.

9. Eye-spot is absent.

10. The right valve overlaps the left valve throughout.

12. The course of the dorsal outline is less angular in the more elongate specimens. The ventral outline may be straight, especially in the left valve. The maximal width appears distinctly posteriorly in the dorsal view of some specimens.

Geological and geographical distribution

GDR: Eocene.

Material.

1 left valve, 1 right valve, 9 carapaces.

Cytherella aff. méhesi Brestenská, 1975

Pl. IV, figs. 4 – 7.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is symmetrically rounded. The dorsal outline is convex, with an extremely wide arch. The posterior outline is narrowly and symmetrically rounded. The ventral outline is nearly straight. The height is situated posteriorly.

The anterior and posterior outlines of the left valve are somewhat asymmetrical, and the anterior part of the dorsal outline is straight. The height is situated around the middle of the valve, or anteriorly.

Dorsal view. The periphery rises with c. 30° angle to just behind 0.4 length, then this rise decreases to 0° to the portion between 0,6 and 0.7 length. Postjacently the periphery slopes with 40° angle and terminates abruptly.

2. Ornamentation. Along the anterior outline of the left valve weak reticulation, along the posteroventral outline-portion indistinct reticulation and spinuousity appears, respectively. This latter area is somewhat protruded from its surrounding.

3. Dimensions (in mm): L: 0.78 – 0.71
H: 0.50 – 0.41
L/H: 1.78 – 1.54

4 – 8. The inner features correspond to those characteristic to the genus.

9. Eye-spot is absent.

10. The right valve overlaps the left one.

12. The anterior portion of the right valve's dorsal outline is also straight in some specimens. The posterior part of the ventral outline appears occasionally as slightly sinuous.

Remarks

In the Budapest material the width of the valves shows greater dimensions than those in the forms of Brestenská. The specimens are closely allied to species C. confusa Lienenklaus, 1900, of which detailed character. are unknown. However, because of the conspicuous morphological variability, the arrangement into the C. dentifera-group is also possible.

Material

2 left valves, 1 right valve, 15 carapaces.

Cytherella sp.

Several poorly-preserved specimens and juvenile valves, with uncertain specific affinity.

Material

3 left valves, 3 right valves, 21 carapaces, 63 fragments and 8 instarss

Suborder Metacopa Sylvester – Bradley, 1947

Superfamily Healidiacea Harlton, 1933

Family Saipanettidae McKenzie, 1968

Genus Cardobairdia van den Bold, 1960

Cardobairdia hungarica n. sp.

Pl. IV, figs. 8 – 9.

Derivatio nominis: Referring to the Hungarian occurrence of the type.
Holotypus: A carapce.
Locus typicus: Borehole Budapest H – 2.
Stratum typicum: Rupelian, between 18,9 and 19,3 m depth.
Diagnosis: Elongate form with more convex dorsal and less convex ventral outline, with asymmetrical, narrowly-arched anterior outline.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is asymmetrically rounded, with a rather narrow arch, and gradual roundness into the convexly-arched dorsal outline. This latter meets the posterior outline in a slight break just in front of 0.9 length. The upper line of the posterior outline is hardly concave, and rounds with a very narrow arch into the convexly-arched ventral outline at the half of the maximal height. The transition of the ventral and anterior outlines forms a narrowly-arched

curve, which results in the asymmetry of the outline. The arch of the ventral outline is more depressed than that of the dorsal outline. The height is situated around the middle of the valve.

The arch of the dorsal outline of the right valve is more depressed, and the ventral outline is straight or hardly concave.

Dorsal view. The greatest width is situated just behind 0.5 length. The anterior portion of the periphery rises with a c. 30° angle, except the nearly perpendicular start, and its posterior portion slopes with a similar (c. 30°) angle, and terminates perpendicularly. Thus the dorsal view is rather angular.

2. Ornamentation. The surface of the valves is smooth.

3. Dimensions (in mm): L: 0.48 – 0.46
H: 0.26 – 0.25
L/H: 1.92 – 1.81

4 – 8. The inner characters cannot be seen generally. A single carapace shows the central muscle-scar area, with the characteristically numerous scars. However, the details are not visible.

9. Eye-spot is absent.

10. The left valve overlaps the right valve in its all length, especially ventrally and dorsally.

Remarks

As compared to the very similar C. elliptica Pietrzeniuk, 1969, this form shows markedly different convexities in the dorsal and ventral outlines, which resulted in distinctly asymmetric anterior outline.

Material

6 carapaces.

Suborder Podocopa Sars, 1866

Superfamily Bairdiacea Sars, 1866

Family Bairdiidae Sars, 1888

Genus Bairdia McCoy, 1844

Bairdia rupelica n. sp.

Pl. V, figs. 1 – 2.

Derivatio nominis: Referring to the age of the type.

Holotypus: A carapace.

Locus typicus: Budapest, Borehole H – 3.

Stratum typicum: Rupelian, between 65.3 and 68.3 m depth.

Diagnosis: Thick form with straight ventral outline, with posterior outline which is acute at the quarter of the maximal height, and with valves which are compressed anteriorly and posteriorly in dorsal view.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is rounded with a relatively narrow arch, and joints to the dorsal outline with a slight break. The dorsal outline is straight or somewhat concave to 0.3 length. At 0.5 length the anterior line of the dorsal outline rounds with a moderate arch into the posterior line, which is slightly concave behind 0.6 length. The very narrowly arched posterior outline appears at about one-quarter of the maximal height, and gradually rounds into the straight ventral outline. This latter curves evenly into the ventral outline. This transition is distinctly differs from the abrupt joint of the anterior and dorsal outlines.

The outline of the right valve is conspicuously concave anterodorsally and posterodorsally, and its ventral outline shows a distinct, asymmetric sinus around the middle of the valve. The caudal end is acute. The anterior and posterior margin is fringed by fine spines. The distinct anterodorsal and ventral concavities result in a slightly angular anterior area. The height is situated around the middle of the valve.

Dorsal view. The periphery rises with a c. 30° angle to 0,1 length. This rise increases to 40° angle to 0,3 length, then decreases to 0° to 0.5 length. Postjacently the periphery slopes increasingly from 0° to 40° to just behind 0.8 length, then decreasingly to c. 10° to the end of the valve.

2. Ornamentation. The surface of the valves is covered by fine pitting, which is more distinct anteriorly.

3. Dimensions (in mm): L: 1.05
H: 0.66
L/H: 1.59

4 – 8. No inner characters are discernable.

9. Eye-spot is absent.

10. The left valve overlaps the right conspicuously.

Comparison

Bairdia urvanovae n. sp. from the Middle Eocene of Dorog shows more acute and upwardly curved posterior end, and a more depressed arch in the dorsal outline. The somewhat similar B. succinata Deltel, 1961 has lower shell, with upwardly-curved and higher posterior termination. In. B. producta Ducasse, 1967 the height is situated anteriorly, because of the different curve of the dorsal outline, and has no compressed anterior and posterior outline-parts, which are characteristic in the Budapest form.

Material

2 carapaces.

Bairdia sp.

Markedly damaged, low specimens, with affinities of this genus, but with differences from the species described above.

Superfamily Cytheracea Baird, 1850

Family Krithidae Mandelstam, 1960

Genus Parakrithe van den Bold, 1958

Parakrithe costatomarginata n. sp.

Pl. V, fig. 3.

Derivatio nominis: Referring to the represented antero- and posterodorsal marginal ridges.

Holotypus: A carapace.

Locus typicus: Budapest, Borehole H – 3.

Stratum typicum: Rupelian, between 56.8 and 59.0 m depth.

Diagnosis: Conspicuously elongate form, with blunt antero- and posteromarginal ridges.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is symmetrically rounded, and gradually rounds into the nearly straight dorsal outline, which is slightly depressed between 0.3 and 0.5 length. The dorsal outline gradually curves into the distinctly asymmetric posterior outline just in front of 0.8 length. The upper two-third of the posterior outline is widely, the lower third is narrowly rounded. The ventral outline courses somewhat sinuously from 0.9 length anteriorly. The maximal height is situated just behind 0.2 length.

The outline of the right valve is similar.

Dorsal view. The periphery rises with a c. 30° angle to 0.2 length, then the angle of the rise decreases from 10° to 0° to 0.5 length. Postjacently the outlines of the valves are parallel to 0.7 length, then slope gradually to 30° angle. The carapace terminates posteriorly with a 90° angle, with width corresponding to the half of the maximal width.

2. Ornamentation. The surface of the valves is smooth, except the appearing blunt anteromarginal and posteromarginal ridges. The latter is conspicuous in the lower line of the posterior outline.

3. Dimensions (in mm): L: 0.54
H: 0.20
L/H: 2.70

4. The inner lamella is broad throughout, especially in the anterior area, where a conspicuous, anteriorly rather narrow vestibulum occurs.

5. The number of the partly bifurcating marginal pore-canals is about 15 anteriorly.

6 – 8. Other inner features are insufficiently seen.

9. Eye-spot is absent.

10. The left valve overlaps the right one.

Comparison

This form is distinguished from the known Parakrithe species, with the presence of the marginal ridges, as well as with the course of the outline.

Material

1 carapace.

Genus Krithe Brady, Crosskey et Robertson, 1874

Krithe pernoides (Bornemann, 1855)

Pl. V, figs. 4–10.

1855. Bairdia pernoides Bornemann – Bornemann, pl. XX, figs. 7–8,
1918. Krithe pernoides Bornemann – Kuiper, pp. 36–37, pl. I, figs. 2. a–c.
1957. Krithe pernoides (Bornemann) – Keij, p. 86, pl. VI, fig. 11.
1962. Krithe pernoides (Bornemann) – Ruggieri, p. 17, pl. I, figs. 12–13.
1969. Krithe pernoides (Bornemann, 1855) – Pietrzeniuk, p. 24, pl. V, fig. 11; pl. XV, figs. 13–14.
1969. Krithe pernoides (Bornemann) – Scheremeta, pp. 90–91, pl. VII, figs. 8–10.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is symmetrically rounded, and gradually merges into the nearly straight dorsal outline, which breaks at 0.8 length with a c. 135° angle, forming the very widely arched (nearly straight and oblique) posterior outline. This latter rounds into the ventral outline with an elevated break of 80° angle. The height is situated anteriorly.

The joint of the dorsal and posterior outlines is more gradual in the right valve.

Dorsal view. The rise of the periphery decreases from 45° to 0° angle to 0.6 length. The postjacent portion slopes increasingly from 0° to 40° angle, and shows the specifically characteristic truncation at the termination. The truncate posterior end is markedly depressed in both valves.

2. Ornamentation. The surface of the valves is smooth.

3. Dimensions (in mm): L: 0.84–0.55
H: 0.38–0.28
L/H: 2.39–1.71

4. The inner lamella is broad in the anterior part of the marginal zone. The selvage is markedly distinct, especially posteriorly, where it deviates from the course of the outer margin. A large, button-shaped vestibulum occurs anteriorly.

5. The simple, mainly straight marginal pore-canals occur in low number.

6. In the hinge of the left valve a conspicuous groove, with bordering bar, appears.

7. A few normal pores are visible.

8. The dorsal one of the four elongated adductor muscle scars is contracted and curved, with upwardly-oriented branches. The frontal scar is bifid.

9. Eye-spot is absent.

10. The left valve overlaps the right one.

11. The elongate forms may have been the males.

12. Some specimens are elongated, with more rounded joint of the dorsal and posterior outlines. The course of the ventral outline varies from slightly concave to slightly convex. The Height/Length ratio (i. e. the elongation) varies within wide extremities.

Remarks

The specimens from Budapest are well comparable to the figures and descriptions of the literature.

Geological and geographical distribution

GDR: Upper Eocene; Belgium and Holland: Rupelian; Italy: Miocene; USSR: Oligocene.

Material

24 left valves, 29 right valves, 37 carapaces, 23 fragments and 2 instars.

Krithidae gen. et sp. indet.

A form which resembles that described above, with somewhat asymmetrical anterior outline, dorsal outline without depression and less-asymmetric (i. e. less-acute) posterior outline. The termination of the periphery is of 45° angle posteriorly, in dorsal view. Marginal ridge is missing. The marginal zone is narrower. The state of preservation is too bad for any closer determination.

Family Trachyleberididae Sylvester–Bradley, 1948

Subfamily Trachyleberidinae Sylvester–Bradley, 1948

Genus Trachyleberis Brady, 1898

Trachyleberis cf. spinosa (Lienenklaus, 1900)

Two damaged specimens with affinity to this group.

Genus Costa Neviani, 1928

Costa hermi Witt, 1967

Pl. V, figs. 11–12; Pl. VI, fig. 1.

1967. Costa hermi Witt – Witt, p. 30, pl. 1, figs. 21 – 26.
1975. Costa hermi Witt – Brestenská, pp. 392 393, pl. 7, figs. 7 – 11.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, with a wider arch in its upper half. The anterior outline meets the uneven dorsal outline at 0.3 length. The course of the dorsal outline is disrupted by a depression, with strenghtened reticulation between the caudal angle and the arch of the dorsal ridge. The dorsal outline breaks into the posterior outline with a 130° angle at 0.9 length. The upper half of the posterior outline is concave, its lower half is convex. The posterior outline gradually rounds into the nearly straight ventral outline. The outlines are fringed with spines. There are two rows of densely-spaced spines anteriorly, 6 to 7 marked spines posteroventrally (closely accompanied with a second row of 6 to 7 smaller spines) and a single spine posterodorsally. The height is situated anteriorly.

The caudal angle is less-protruded in the right valve, and the angle of the posteroventral corner is blunter. The arch of the lower line in the posterior outline is wider, thus the posterior end is more acute.

Dorsal view. The periphery is parallel in the two valves with a width comparable to one-third of greatest width to 0.1 length, then rises with a c. 45° angle to just behind 0.2 length. The next portion is parallel again in the two valves, and postjacently there is a slope of 30° to c. 0.9 length. The termination is a parallel portion, with width similar to that in the anterior part.

2. Ornamentation. The main ornamentation elements are the ridges and the reticulation. A subcentral tubercle appears between 0.2 and 0.4 length. The upwardly-arched dorsal ridge runs from 0.4 to 0.8 length, forming the dorsal outline between 0.6 and 0.8 length. The dorsal ridge ends with a c. 130° upward curve, fading into the reticulation at the upper third of the local height. The slightly upwardly coursing median ridge starts above the longitudinal bisector of the valve, on the subcentral tubercle, and curves nearly perpendicularly at 0.8 length, then fades into the reticulation. The hardly upwardly running ventral ridge arises just behind 0.2 length, at one-fifth of the local height, and terminates perpendicularly to the surface at 0.8 length. The termination bears a spine occasionally. The anterior outline is bordered by a distinct anteromarginal ridge, which starts from the eye-tubercle. Along the ventral margin, there is an anteriorly two-branched, ridge-like, sharpened rib, of which length is similar to that of the ventral ridge. The reticulation is conspicuous in the whole valve surface. The 3, arranged interspaces of the anterior surface are formed by concentric and radial ribs. The surface is inflated between 0.6 and 0.9 length. The anterior end of the median ridge, the dorsal ridge and the eye-tubercle are connected by strengthened, anteriorly convex ribs.

3. Dimensions (in mm): L: 0.94–0.81
H: 0.51–0.42
L/H: 1.96–1.84

4. The inner lamella is broad anteriorly and posteroventrally, the inner margin and the line of concrescence are coincidental. The selvage runs close to the outer margin.

5. The marginal pore-canals are numerous anteriorly and fewer posteroventrally. These are simple, straight, with ampulla around their centre.

6. The hinge of the left valve consists conspicuous sockets anteriorly and posteriorly, button-shaped tooth as anteromedian element, and slightly crenulate bar as posteromedian element. The anterior hinge element of the right valve is a strong, two-stepped tooth, the posterior element is an arched, lamellar tooth, the anteromedian element is a socket, and the posteromedian element is a slightly crenulate groove.

7. The normal pores are rather few in number.

8. A ventral row of four elongated adductor muscle scars appear in the right valve, with a curved frontal scar showing anterodorsally-directed branches.

9. The conspicuous eye-tubercle is situated somewhat below the caudal angle.

10. The left valve overlaps the right one, especially at the caudal and posterodorsal angles.

11. The elongate specimens may have been the males.

12. Some specimens are elongated, with posteriorly shortened ridges. The strength of the ornamentation, as well as the distinctness of the reticulation or the ridges is variable in certain samples. In some samples the ridges are hardly distinguished from the reticulation. On the other hand, the radial rib may be strengthened in some specimens.

Remarks

As compared to the type, these specimens lack the anterior rib-strengthening between the second and third rows of the interspaces, while show a strong anteromarginal rib. These differences may suggest a new subspecies.

Geological and geographical distribution

GFR: Chattian to Aquitanian; Czechoslovakia: Rupelian and Egerian; Hungary: Rupelian and Egerian.

Material

9 left valves, 2 right valves, 25 carapaces, 10 fragments.

Genus Agrenocythere Benson, 1972

Agrenocythere aculeataformis n. sp.

Pl. VI, fig. 2.

Derivatio nominis: Referring to the similarity with Oertliella aculeata.

Holotypus: A carapace.

Locus typicus: Budapest, Borehole H – 7.

Stratum typicum: Rupelian, between 22 and 36 m depth.

Diagnosis: Elongate, posteriorly strongly lowered, ventrally concave form.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is slightly asymmetrically rounded, with a somewhat narrower arch in its upper half. The anterior outline rounds at 0.2 length, with 130° angle, into the straight dorsal outline, which disrupted by the protrusions of the dorsal ridge at 0.6 and 0.8 length. The dorsal outline breaks in a 120° angle just before 0.9 length, and meets the posterior outline. The upper two-third of the posterior outline is slightly concave, its lower third is slightly convex, and the two lines enclose 80 to 90° angle. The posterior outline rounds into the slightly and asymmetrically concave ventral outline. The anterior and posteroventral outlines are denticulated. The height is situated anteriorly.

The outline of the right valve is similar.

Dorsal view. The periphery is parallel in both valves with a width corresponding to a third of the maximal width to 0.1 length, then rises with a c. 30° angle to 0.4 length. The postjacent portions run parallelly to 0.7 length, then slope with c. 45° to 0.9 length. The posterior end is similar to the anterior, but the width is equal to one-quarter of the maximal width.

2. Ornamentation. The surface of the valves is conspicuously reticulated. The reticulation is regular in the anterior surface, with 7 larger interspaces, which are bordered by radial riblets. These larger interspaces are accompanied with two rows of more or less concentric interspaces. A distinct ventral ridge runs parallelly and above the ventral outline, from 0.2 to just behind 0.7 length. A dorsal ridge appears between 0.5 and 0.8 length. The dorsal ridge is formed by a row of lamellar and spinuous ornamental elements. The ventral ridge is an undivided lamella between 0.2 and 0.5 length. The ornamentation becomes sharper upon the subcentral tubercle, just as described by Benson (1972). Distinct marginal ridge appears anteriorly and posteriorly. The anterior termination of the ventral ridge is connected to the anteromarginal ridge by a riblet. A conspicuous, long riblet courses perpendicularly to the dorsal outline, into the cardinal angle, with a slight thickening at its termination.

3. Dimensions (in mm): L: 0.98
H: 0.53
L/H: 1.85

4 – 8. Inner features are not visible.

9. The place of the eye-tubercle is indicated by the thickening of the riblets, as described above in the ornamentation.

10. The left valve overlaps the right one.

Comparison

The shape of the here described from differs from that of the known species, and shows only slight similarity to that of Oertliella aculeata (Bosquet), the probable ancestor.

Material

A single carapace.

Genus Henryhowella Puri, 1957

Henryhowella asperrima (Reuss, 1850)

Pl. VI, figs. 3–5.

1850. Cypridina asperrima Reuss–Reuss, p. 74, pl. X, fig. 5.
1851. Cypridina echinata Reuss–Reuss, pp. 90–91, pl. VII, fig. 66.
1918. Cythereis asperrima Reuss–Kuiper, pp. 43–44, pl. II, figs. 15a–c.
1941. Cythereis asperrima (Reuss, 1850)–Méhes, pp. 46–47, pl. V, figs. 15–16; text-figs. 36, 76, 124–125.
1957. Trachyleberis (Trachyleberis) asperrima echinata (Reuss)–Keij, p. 91, pl. XII, figs. 1–2; pl. XIII, fig. 15.
1962. Henryhowella asperrima (Reuss)–Ruggieri, pp. 18–20, pl. I, figs. 16–19.
1963. Henryhowella echinata (Reuss)–Triebel, text-fig. 30.
1965. Henryhowella asperrima (Reuss)–Moyes, pp. 83–84, pl. IX, figs. 11–12.
1967. Henryhowella asperrima (Reuss)–Witt, p. 33, pl. 2, fig. 3.
1967. Henryhowella asperrima (Reuss, 1850)–Kheil, pp. 218–219, pl. 2c, fig. 1.
1969. Henryhowella asperrima (Reuss, 1850)–Carbonnel, p. 120, pl. 13, fig. 25.
1970. Echinocythereis asperrima (Reuss)–Trelea et al., p. 113, pl. III, fig. 13a; pl. IV, figs. 13b–c.
1975. Henryhowella asperrima (Reuss, 1850)–Faupel, p. 57, pl. 9, figs. 2a–b.
1975. Henryhowella asperrima (Reuss)–Brestenská, p. 393, pl. 7, figs. 1–6.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, with a wider arch in its upper half. The protruded caudal angle is situated at 0.3 length. The dorsal outline is straight from 0.4 to just behind 0.9 length, with some unevenness caused by the ornamentational elements. The dorsal outline rounds with a 120° angle into the posterior outline, which is nearly straight in the beginning, then somewhat asymmetrically rounded. The posterior outline rounds more or less gradually into the hardly convex ventral outline. The height is situated anteriorly.

The caudal angle is less protruded in the right valve, the upper part of the posterior and ventral outlines is concave, and the ventral outline is asymmetrically sinuous.

Dorsal view. The anterior end is truncate, with a cut corresponding to one-third of the maximal width. The surface rises with c. 15° angle to 0.6 length, then slopes with c. 30° angle to 0.9 length, and the terminal part is parallel, in a width corresponding to one-third of the maximal width. The anterior tubercle of the median protrusion stands out at 0.4 length. This protrusion corresponds to the hollow subcentral tubercle.

2. Ornamentation. The surface of the valves is reticulate, with numerous blunt spines. Longitudinal protrusions run dorsally between 0.4 and 0.9 length, medianly between 0.4 and 0.8 length, and ventrally between 0.5 and 0.8 length, with superimposed larger tubercles. The median protrusion is divided into two stronger tubercles. The reticulation is arranged concentrically in the anterior area. Blunt anteromarginal and posteromarginal ridges also appear.

3. Dimensions (in mm):

	instars:
L: 0.71 – 0.67	L: 0.42 – 0.59
H: 0.39 – 0.37	H: 0.27 – 0.34
L/H: 1.72 – 1.82	L/H. 1.73 – 1.46

4. Inner lamella: The marginal zone is broad, the inner margin coincides with the line of concrescence throughout, the selvage runs subperipherally.

5. The partly divided marginal pore-canals are rather numerous anteriorly, and fewer posteriorly.

6. The hinge of the left valve consists of large anterior and posterior sockets, button-shaped anteromedian tooth and posteromedian bar. The anterior tooth of the right valve is two-stepped, and the posterior tooth curves outward.

7. The normal pores are insufficiently visible.

8. The muscle scars cannot be studied in detail.

9. Eye-tubercle occurs, but the conspicuous ornamentation makes it hardly visible.

10. The left valve overlaps the right one.

11. The more elongate specimens are probably the males. The elongation of these specimens is not reflected in the L/H ratio, because of the presence of especially protruded cardinal angle.

12. The degree of the spinuousity, and the coarseness of the reticulation is highly variable. Elongate and thick forms equally appear. The three protrusions are missing in the smaller instars, and the spines completely overlap the reticulation. The asymmetry of the left valve is also somewhat variable.

Remarks

Despite of the recorded high variability, bases for separating distinct subspecies cannot be found.

Geological and geographical distribution

GFR: Oligocene and Miocene; France: Oligocene to Pliocene; Holland: Oligocene and Miocene; Italy: Miocene; Rumania: Miocene; Czechoslovakia: Oligocene and Miocene; Hungary: Oligocene.

Material

12 carapaces, 2 right valves, 7 left valves, 3 fragments and 9 instars.

Subfamily Buntoniinae Apostolescu, 1961

Genus Buntonia Howe, 1935

Buntonia sublatissima arcuatocosta Brestenská, 1975

Pl. VI, figs. 6–7.

1975. Buntonia sublatissima arcuatocosta Brestenská – Brestenská, pp. 395–396, pl. 9, figs. 1–8.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is nearly symmetrically rounded, and curves into the dorsal outline at about 0.5 length. The dorsal outline is convex and courses strongly convergently with the ventral outline in posterior direction. The dorsal outline breaks with a 150° angle at 0.8 length, then with a postjacent straight portion, breaks with 120° angle behind 0.9 length into the posterior outline. The latter is slightly asymmetrical, with a nearly straight upper and a convex lower part. The posterior outline rounds evenly into the convexly-arched ventral outline. 4 spines occur posteroventrally. The height is situated somewhat anteriorly.

The outline of the right valve is similar.

Dorsal view. The periphery is nearly parallel to 0.2 length, then rises with a c. 10° angle. In the next portion the rise decreases from 40° to 0° to about mid-length, then a slope with increasing angle (i. e. from 0° to 45°) follows to 0.9 length. The posterior end is parallelly-sided, with a width corresponding to one-quarter of the maximal width.

2. Ornamentation. The ventrolateral surface is inflated, with 4 distinct, concentric ventral ribs and 2 superjacent, short lateral ribs. A short, arched rib runs form the eye-tubercle toward the inner part of the rib. The other parts of the valve-surface are irregularly pitted and reticulated. Secondary riblets form reticulation also among the ribs. The ornamentation is weak in the anterior area.

3. Dimensions (in mm): L: 0.51–0.46
H: 0.34–0.31
L/H: 1.50–1.48

4–8. The inner characters are not discernable.

9. Conspicuous eye-tubercle appears in the cardinal angle.

10. The left valve overlaps the right one.

Remarks

The specimens from Budapest agree well with the description and figures of Brestenská.

Geological and geographical distribution

Czechoslovakia: Rupelian to Egerian.

Material

1 left valve and 1 carapace.

Subfamilia incerta

Genus Occultocythereis Howe, 1951

Occultocythereis rupelica n. sp.

Pl. VII, fig. 1.

Derivatio nominis: After the age of the type locality.
Holotypus: A right valve.
Locus typicus: Budapest, Borehole H – 9.
Stratum typicum: Rupelian between 29.4 and 31.4 m depth.
Diagnosis: A conspicuously attenuated form with arched, spinuously terminating dorsal ridge, and with tubercle-like remnants of the anterior and posterior ends of the median ridge.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is nearly symmetrically rounded. The cardinal angle, behind a short, depressive portion, protrudes just behind 0.3 length, then the dorsal outline is nearly straight. It is formed, between 0.5 and 0.8 length, by the slightly concave dorsal ridge, then courses with a 160° break to 0.9 length. The dorsal outline rounds with a c. 130° angle into the posterior outline, of which upper half is strongly concave, lower half is convex, and evenly rounds into the nearly straight dorsal outline. The anterior outline and the lower line of the posterior outline are fringed by coarse denticulation. The height is situated anteriorly.

The outline of the left valve is similar.

Dorsal view. The periphery is parallel up to 0.2 length, with a width corresponding to the half of the maximal width, then rises unevenly with c. 15° angle to 0.7 length. Behind a postjacent abrupt recession, it ends with a parallel portion of width corresponding to one-quarter of the maximal width.

2. Ornamentation. The ornamentational elements are conspicuous ridges. An anteromarginal ridge courses from the dorsal 0.25 length to the ventral 0.3 length. Marginal ridge is visible posteriorly and weakly ventrally. The dorsal ridge arises in front of 0.4 length, at the three-quarter of the local height. Its run is nearly perpendicular to the dorsal outline

in the beginning, then curves to form the outline itself from 0.5 length. It breaks, with c. 80° angle at 0.8 length, and merges into the surface at two-third of the local height. A strong spine is situated upon the break. The ventral ridge runs between 0.4 and 0.7 length, arising near, and coursing parallelly to the ventral outline, then curving upward, terminates abruptly at the one-quarter of the local height. Two longitudinal riblets course upon the ventral ridge. The place of the median ridge is marked by a tubercle at the half of the local height, in front of the end of the ventral ridge. A smaller swelling, situating upon the subcentral tubercle around 0.3 length, also appears. The valve-surface is distinctly depressive below the dorsal ridge, along the anteromarginal ridge, and posteroventrally. The depression is intersected by a weak protrusion anterodorsally.

3. Dimensions (in mm): L: 0.57 – 0.54
H: 0.30
L/H: 1.90 – 1.80

4 – 8. The inner characters cannot be studied.

9. The eye-spot is well-visible in the cardinal angle.

10. The left valve overlaps the right one.

Comparison

This form is distinguished from the similar O. bituberculata (Reuss, 1850) with its lower posterior area, its arched anterior half and the spinuous posterior break of the dorsal ridge, its distinct tubercle in front of the end of the ventral ridge, marking the posterior end of the median ridge, and its other, elongate swelling on the subcentral tubercle, marking the anterior part of the median ridge. The anterior and posterior spines are also more conspicuous. The lack of the connection between the marginal and ventral ridges distinguishes this form from subspecies O. mutabilis abducta Triebel, 1961.

Material

2 carapaces, 2 right valves.

Family Xestoleberididae Sars, 1928

Genus Xestoleberis Sars, 1866

Xestoleberis sp.

A single, deformed carapace from the X. obtusa Lienenklaus, 1900 group.

Superfamily Cypridacea Baird, 1845

Family Pontocyprididae G. W. Müller, 1894

Genus Argilloecia Sars, 1866

Argilloecia sp.

Remarks

One of the six specimens shows muscle scars characteristic to this genus. Being all specimens carapaces, the other inner characters cannot be studied. The presence of a new species is possible, because the straight course of the dorsal line of the posterior outline, the place of the posterior point in c. one-third of maximal height, together with concave ventral outline in both valves are features unknown in the hitherto described species.

Material

6 carapaces.

Family Candonidae Kaufmann, 1900

Subfamily Paracypridinae Sars, 1923

Genus Paracypris Sars, 1866

Paracypris ? rupelica n. sp.

Pl. VII, figs. 2–3.

Derivatio nominis: Referring to the age of the type bed.
Holotypus: A right valve.
Locus typicus: Budapest, Borehole H–1.
Stratum typicum: Rupelian, between 25 and 28 m depth.
Diagnosis: Species with asymmetrical anterior outline, with somewhat posteriorly narrowing shape, and with grooves in the hinge of both valves.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, and around the three-quarter of the maximal height joints to the dorsal outline with a slight break. The dorsal outline is widely-arched, its anterior portion is straight. The dorsal outline evenly rounds into the posterior outline, which narrowly curves at one-quarter of the maximal height, with wider arch again in the lower line, and gradually rounds into the hardly convex ventral outline. The round of the ventral outline into the anterior is more widely arched than that of the anterior into the dorsal (asymmetry!). The height is situated around the middle.

The dorsal outline of the right valve is more widely arched (more flattened), with concave anterior portion. The asymmetry of the anterior outline is more distinct, because of the strong break of the anterior–dorsal transition. The ventral outline bears a distinct, nearly symmetrical central sinus.

Dorsal view. The periphery rises decreasingly from c. 45° to 0° to 0.6 length, then slopes increasingly, from c. 0° to 45° to the end of the valve.

2. Ornamentation. The surface of the valves is smooth.
3. Dimensions (in mm): L: 0.93 – 0.90
H: 0.48 – 0.44
L/H: 2.09 – 1.88
4. The inner lamella is broad throughout, with strong anterior-anteroventral and weaker posterior-posteroventral vestibula.
5. The marginal pore-canals are rather numerous, partly divided, with funnel-shaped junction into the vestibulum.
6. The hinge is apparently anodont. The bigger left valve bears a groove, and the right valve also shows a weak groove, which is parallel to and superjacent of the rim fitting into the groove of the left valve.
7 – 8. The normal pores and the muscle scars are insufficiently visible.
9. The eye-spot is absent.
10. The left valve overlaps distinctly the right one ventrally and dorsally.

Comparison

The here described form differs from the similar P. contracta (Jones) in having asymmetry in the anterior outline and less-narrowing posterior outline. The features of the hinge may suggest a representation of a new genus.

Material

1 left valve, 2 right valves.

3. Ostracods from the Tard Beds of Buda

Subclass Ostracoda Latreille, 1806

Order Podocopida G. W. Müller, 1894

Suborder Podocopa Sars, 1866

Superfamily Bairdiacea Sars, 1866

Family Bythocyprididae Maddocks, 1969

Genus Bythocypris Brady, 1880

Bythocypris ? sp.

A specimen with shape suggesting the B. arcuata (Münster, 1830) group.

Dimensions (in mm): L: 1.09
H: 0.52
L/H: 2.10

Material: A single carapace.

Superfamily Cytheracea Baird, 1850

Family Leptocytheridae Hanai, 1957

Genus Callistocythere Ruggieri, 1953

Callistocythere sp.

Pl. VII, fig. 4.

Poorly-preserved carapaces from the C. canaliculata (Reuss, 1850) group.

Family Cytherideidae Sars, 1925

Subfamily Cytherideinae Sars, 1925

Genus Eucytheridea Bronstein, 1930

Eucytheridea reticulata Goerlich, 1953

Pl. VII, figs. 5–7.

1953. Cytheridea (Eucytheridea) reticulata Goerlich–Goerlich, pp. 137–138, pl. 5. figs. 40–42.
1956. Eucytheridea cf. reticulata Goerlich, 1953–Oertli, p. 42, pl. 3, figs. 71–72.
1964. Eucytheridea reticulata Goerlich–Scherer, pp. 15–16, pl. 2, figs. 7–9.

Description

1. Shape. Outer lateral view. The anterior outline of the right valve is distinctly asymmetrical in its roundness, with truncate upper half. The anterior outline rounds into the concave dorsal outline with a c. 140° angle just behind 0.3 length. The dorsal outline joints with a c. 150° angle to the asymmetrically rounded posterior outline at 0.8 length. The lower quarter of the posterior outline is narrowly-arched, and abruptly merges into the ventral outline, which diverges from the dorsal outline posteriorly. The ventral outline is slightly concave between 0.2 and 0.7 length. The height is situated anteriorly.

The caudal protrusion is stronger and the ventral concavity is weaker in the left valve.

Dorsal view. The peiphery rises decreasingly from 60° to 0° angle to 0.2 length, then courses nearly perpendicularly to 0.7 length, and finally slopes increasingly from 0° to 60°. The rise and slope are moderate in the right valve, forming 45–50° angles.

2. Ornamentation. The surface of the valves is coarsely pitted, with weaker pitting in the anterior and posterior areas. The pitting is absent at the caudal angle. The ornamentation forms reticulated pattern in the ventral area.

3. Dimensions (in mm):

	adults:	instars:
L:	0.78–0.59	L: 0.40–0.41
H:	0.32–0.40	H: 0.27–0.26
L/H:	2.05–1.65	L/H: 1.54–1.52

4. The wide inner lamella is very broad anteriorly and bears a narrower vestibulum ventrally. The selvage is conspicuous, with inwardly-removed portions in its anterior and posterior parts.

5. The marginal pore-canals are not seen.

6. The hinge of the right valve consists of anterior and posterior, coarsely crenulate teeth and median crenulate groove.

7. There are relatively few, large normal pores.

8. Muscle scars cannot be studied.

9. Eye-spot is absent.

10. The left valve especially anterodorsally – overlaps the right one.

11. There are several juvenile specimens. These are far thicker in shape and their straight dorsal and slightly convex ventral oulines are distinctly convergent posteriorly. Their inner lamella is undeveloped, and has no vestibulum.

A part of the adult specimens are also thicker in shape. The rise and the slope of the periphery are nearly straight in dorsal view, resulting in a characteristic angular shape.

Remarks

The Budapest form shows a rather wide variability. The type is slightly lower posteriorly.

Geological and geographical distribution

GFR· Rupelian; Switzerland: Rupelian.

Material

8 carapaces, 3 right valves, 5 left valves, 18 instars.

Subfamily Cuneocytherinae Mandelstam, 1959

Genus Cuneocythere Lienenklaus, 1894

Cuneocythere marginata anterodepressa n. ssp.

Pl. VII, figs. 8–10.

?1973. Cuneocythere (Cuneocythere) marginata (Bosquet, 1852) – Moos, pp. 49–50, pl. 6, figs. 10–11.

Derivatio nominis: Referring to the conspicuous anterior depression of the valve.

Holotypus: A carapace.

Locus typicus: Budapest, Borehole Törökvész Street 6.

Stratum typicum: Rupelian, 2,5 m depth.

Diagnosis. A form with a strong depression in the anterior area. The reticulate ornamentation is weaker anteriorly.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is nearly symmetrically rounded, and evenly merges to the very widely arched dorsal outline. The dorsal outline slightly breaks just behind 0.9 length, and rounds into the posterior outline, of which lower part is narrowly arched. The posterior outline meets the nearly straight ventral outline with a slight break. The height is situated anteriorly.

The anterior and the dorsal outlines joint at 0.3 length in a slight depression in the right valve. The dorsal outline is less-arched, and joints to the posterior outline with a stronger break. The upper half of the posterior outline is widely, the lower half is narrowly arched, with a break between them. An other break appears at the joint of the posterior and the slightly and asymmetrically concave ventral outline.

Dorsal view. The periphery is formed by the anteromarginal ridge and the postjacent depression to 0.2 length, then the periphery rises with c. 40° angle in a short portion, and with c. 20° angle to 0.7 length. The next portion slopes increasingly from 0° to 70 – 80° angle, and the terminal portion is a short, parallel part, with width corresponding to one-sixth of the maximal width.

2. Ornamentation. There is a sharp anteromarginal ridge, with postjacent depression in the surface. The valve-surface is coarsely and irregularly reticulated. The reticulation is weaker anteriorly, and the depression is hardly ornamented. The surface is depressed also around the central area, and this sometimes results a weak depression also in dorsal view. The posteroventral area is inflated. The anteromarginal ridge and the depressions are more distinct in the right valve.

3. Dimensions (in mm): L: 0.59 – 0.53
H: 0.35 – 0.32
L/H: 1.69 – 1.61

4. The inner lamella is broad anteriorly and posteriorly, and the inner margin coincides with the line of concrescence. The selvage runs subperipherally.

5. The marginal pore-canals are numerous anteriorly and posteriorly. These are simple and straight, with ampulla in their outer part.

6. The hinge of the left valve is a groove bordered with an inner bar.

7. Normal pores cannot be studied.

8. The muscle scars of the left valve consist of a row of four slightly elongate adductor scars, and in front of these, a curved frontal scar, with anteriorly-arched branches.

9. The eye-spot is represented by a weak, smooth, elongate swelling in the eye-region.

10. The left valve overlaps the right one.

11. The more elongate forms are probably the males.

12. The more elongate specimens show different shape in dorsal view. The rise of the periphery behind the anterior ridge and the depression decreases from 50° to 30° angle to 0.3 length, then is about 10° to 0.6 length,

and the slope is of about 10° to 0.9 length, and is of 50–60° terminally. Concentric arrangement of the reticulation is visible in the anterior area of some specimens. The strength of the reticulation is highly variable.

Remarks

As compared to the type subspecies of C. marginata (Bosquet), the reticulation is weaker anteriorly, and the anterior depression is more distinct in the here described form. The posterior swellings, characteristic to the species C. praesulcata (Lienenklaus) are missing here. Moos' description of the form (1973) lacks the detailed characterization and the dorsal view figure; however, the photographs suggest conspicuous anterior depression, thus it is possible, that this form ranges into this here described new subspecies.

Material

38 carapaces, 7 right valves 6 left valves, 10 fragments.

Family Trachyleberididae Sylvester–Bradley, 1948

Subfamily Trachyleberidinae Sylvester–Bradley, 1948

Genus Pterygocythereis Blake, 1953

Pterygocythereis sp.

The specimens are badly damaged carapaces and fragments, which cannot be determined at the species level. These probably represent several species.

Material: 13 carapaces and 31 fragments.

Genus Brachycythere Alexander, 1933

Brachycythere sp.

Fragments of a species with smooth surface, except a ventral ridge.

Genus Echinocythereis Puri, 1954

Echinocythereis sp.

Fragments of anterior part of an indeterminable species.

Echinocythereis? sp. juv.

The indistinct ornamentational elements and the outline suggest instars of a species from this genus.

Family Loxoconchidae Sars, 1925

Genus Loxoconcha Sars, 1866

Loxoconcha delemontensis hungarica n. ssp.

Pl. VIII, figs. 1–6.

Derivatio nominis: Referring to the locality being in Hungary.
Holotypus: A carapace.
Locus typicus: Budapest, Borehole Törökvész Street 8.
Stratum typicum: Rupelian, 3.5 m depth.
Diagnosis: A form with sharply-arched ventral rib upon the protruded ventrolateral extension, with obliquely truncate upper part of the anterior outline, and with pointed posterior outline, of which upper third is concave, lower two-third is hardly convex.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, and breaks, with a c. 140° angle, at about 0.2 length, into the straight dorsal outline. The ornamentation rises slightly above the dorsal outline behind 0.7 length. The dorsal outline rounds with a c. 130° angle at about 0.9 length into the posterior outline. The upper, shorter line of the posterior outline is concave, and curves with a narrow arch into the nearly perpendicular, straight lower line. The posterior outline evenly rounds into the ventral outline, from just behind 0.7 length. The ventral outline bears a shallow concavity between 0.7 and 0.3 length. The ventral outline rounds with a narrow arch into the anterior outline. The height is situated anteriorly.

The outline of the right valve is similar.

Dorsal view. The anterior part of the periphery is a parallelly-sided portion to 0.1 length, with width corresponding to one-fifth of the maximal width. The next portion, between 0.2 and 0.3 length, rises with 45–50° angle, then hardly rises to 0.6 length. The postjacent portion slopes increasingly, from 0° to 45°, and the posterior termination is similar to that of the anterior. A very weak depression appears around mid-length.

2. Ornamentation. The surface of the valves is covered with conspicuous and generally disordered reticulation (however, some concentric arrangement appears ventrally). The ventrolateral extension bears a rib, which sharpens from 0.2 length, arising above the ventral outline and forming this latter between 0.3 and 0.5 length, then, with a dorsally-curved arch, merging into the surface between 0.7 and 0.8 length, at lower third of the local height. A slightly strengthened rib runs dorsally, between 0.5 and 0.8 length. Conspicuous anteromarginal and weaker posteromarginal rib appears. A weak, triangular depression, narrowing toward the muscle scars, appears dorsally. The reticulation is missing in the flattened anterior and posterior terminations. The cardinal angle is slightly protruded.

3. Dimensions (in mm): L: 0.47 – 0.46
H: 0.26
L/H: 1.81 – 1.77

4 – 8. The inner characters cannot be studied sufficiently.

9. The distinct eye-tubercle is situated in the cardinal angle.

10. The left valve slightly overlaps the right one.

11. The elongate specimens are probably the males.

12. The elongation of the specimens is variable. The ventrolateral extension is weaker in the elongate specimens.

Comparison

The similar L. favata Kuiper is more compressed in dorsal view, and lacks the distinctly sharpened ventral ornamentation. The protruded, sharpened ventral rib is missing in the species L. sulvata Haskins. The type subspecies L. delemontensis delemontensis Oertli shows nearly symmetrical anterior outline and less-pointed posterior outline.

Material

33 carapaces, 1 left valve, 1 fragment.

Loxoconcha sp.

Pl. IX. fig. 6.

Finelly-pitted form from the L. punctatella (Reuss, 1850) group.

Family Cytheruridae G. W. Müller, 1894

Subfamily Cytheropterinae Hanai, 1959

Genus Cytheropteron Sars, 1866

Cytheropteron emmeneggeri Scherer, 1964

Pl. VIII, figs 7 – 11.

1964. Cytheropteron emmeneggeri Scherer – Scherer, pp. 16 – 17, pl. 2, figs. 10 – 14.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is asymmetrically rounded, becoming narrowly-arched at the joint to the ventral outline, while the transition is gradual into the convex arch of the dorsal outline. The dorsal outline is depressed between 0.6 and 0.8 length. Behind a weak posterodorsal protrusion the two, nearly perpendicular lines of the posterior outline are nearly straight, the upper line being much shorter. The posterior outline encloses a c. 130° angle at about 0.8 length with the ventral outline. The ventral outline is formed by the ventrolateral extension between 0.7 and 0.25 length, while its anterior part is nearly straight. The height is situated somewhat behind mid-length.

The upper part of the anterior outline, as well as the upper line of the posterior outline, is depressive in the right valve, and this latter results in a pointed caudal end.

Dorsal view. The periphery rises decreasingly from 45° to 30° to 0.3 length, then is formed to 0.8 length by the two tubercles and the intervening depression described below in the ornamentation. The terminal portion, behind an arched backward curve, slopes with 40° angle to the end of the valve.

2. Ornamentation. The most conspicuous ornamental element is the ventrolateral extension. This bears two tubercle-like swellings between 0.3 and 0.8 length, with an intervening depression. The anterior tubercle is half in size of the posterior one. The middle part of the valves is coarsely reticulated, the reticulation being distinct also on the conspicuous break and backward curve of the ventral surface, and here appear especially strong, longitudinal ribs. The posterior tubercle ends perpendicularly to the surface, the rise of the anterior tubercle is less abrupt. The anterior and posterior area is smooth.

3. Dimensions (in mm): L: 0,53 – 0,50
H: 0,31
L/H: 1,71 – 1,61

4. The inner lamella is rather broad anteriorly and posteriorly, and a larger anterior and a narrow posterior vestibulum appears.

5. The few marginal pore-canals are simple and straight.

6. The anterior and posterior hinge element is coarsely crenulate bar in the left valve.

7. The relatively numerous normal pores are large.

8. The muscle scars cannot be studied sufficiently.

9. The eye-spot is absent.

10. The left valve overlaps the right one.

12. The reticulation is somewhat weaker in some specimens, and the lateral surface-break is distinctly edge-like on the tubercles, resulting in a more or less fused element. These specimens do not show depression of the periphery in dorsal view. The different forms appear within the same sample together.

Remarks

The here described from differs distinctly from the similar C. (C.) brevalata Pietr., in the character of the ventrolateral extension, the swelling and the details of the reticulation. The type description does not mention the bifurcating extension. The conspicuous above-mentioned variability of this feature precludes the possibility to designate a new subspecies.

Geological and geographical distribution

Switzerland: Rupelian.

Material

89 carapaces, 11 right valves, 11 left valves, 5 fragments.

Cytheropteron sp.

Pl. VIII, fig. 12.

A badly-preserved form from the Cytheropteron triangulare Lienenklaus, 1900 group.

Superfamily Cypridacea Baird, 1845

Subfamily Paracypridinae Sars, 1923

Genus Paracypris Sars, 1866

Paraycpris? sp. 1.

Pl. VIII, fig. 13.

Tringular, centrally rather high form (2 carapaces), which shows some similarity to the species P. whitecliffensis Haskins, 1968 in outline.

Paracypris? sp. 2.

A poorly-preserved carapace with outline similar to that in the forms fo this genus.

Subfamily Candoninae Kaufmann, 1900

Genus Candona Baird, 1845

Candona fertilis Triebel, 1963

Pl. VIII, fig. 14; Pl. IX, fig. 1.

1963. Candona (Pseudocandona) fertilis fertilis Trievel – Triebel pp. 167–168, pl. 27, figs. 19–22; pl. 28, figs. 23–29.
1963a. Candona (Pseudocandona) fertilis Triebel – Triebel, text-fig. 39.
1969. Candona (Pseudocandona) fertilis fertilis Triebel – Carbonnel and Ritzkowski, pp. 63–64, p13, fig. 8.
1972. Candona (Pseudocandona) fertilis fertilis Triebel – Keen, pp. 282–283, pl. 49, figs. 1, 2, 5, 7, 9.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve rounds at c. 0.1 length into the firstly somewhat convex dorsal outline, which rounds, form 0.6 length, with a narrowing arch, into the posterior outline. The posterior outline breaks into the ventral outline, which shows a conspicuous, rather symmetrical concavity.

The right valve has similar outline, with a deeper ventral concavity.

Dorsal view. The rise of the periphery decreases from 40° to 0° to 0,6 length, then the slope increases from 0° to 45° at the end.

2. Ornamentation. The surface of the valves is smooth.

3. Dimensions (in mm): L· 1.00
H: 0.58
L/H: 1.72

4–8. The inner characters cannot be studied in details.

9. Eye-spot is absent.

10. The left valve overlaps the right one.

Remarks

As compared to the type, these forms lack the distinct breaks in the dorsal side, and the anterodorsal truncate part is also missing. The conspicuous variability, known also from the literature, makes the designation of a new subspecies uncertain.

Geological and geographical distribution

GFR. Rupelian and Chattian.

Material

2 carapaces.

Candona? aff. recta Lienenklaus, 1905

Pl. IX, figs. 2–3.

Description

1. Shape. Outer lateral view. The anterior outline of the left valve is somewhat asymmetrically rounded, with a narrower arch in its lower half. The anterior outline curves into the nearly straight dorsal outline just behind 0.2 length. The dorsal and the posterior outline encloses a 130–140° angle at 0.7 length. The upper part of the posterior outline is nearly straight, and narrowly rounds, at the third of the maximal height, into the ventral outline. This latter is nearly straight, with a weak concavity around the middle. The height is situated posteriorly.

The upper part of the posterior outline is straighter in the right valve, and encloses a blunter angle with the dorsal outline. The concavity of the ventral outline is deeper.

Dorsal view. The periphery rises decreasingly from 30° to 0° to the mid-length, then slopes increasingly, from 0° to 30°.

2. Ornamentation. The surface of the valves is smooth.

3. Dimensions (in mm): L: 1.06–1.00
H: 0.51–0.47
L/H: 2.13–2.08

4. The inner lamella is broad anteriorly, with a large vestibulum, and is somewhat narrower posteriorly, also with vestibulum. The marginal zone is relatively wide posterior-posteroventrally and anterior-anteroventrally.

5. The numerous marginal pore-canals are generally simple and straight, sometimes appear as bifurcating, and with funnel-shape extensions toward the vestibulum also occur.

6. The hinge of the left valve consists of a groove for the right valve, below the dorsal edge.

7. A few, scattered normal pores are visible.

8. The six, more or less elongate muscle scars are arranged into two posteroventrally – anterodorsally directed rows in the right valve. 3 scars are situated posteriorly, 2 anteriorly and the more elongate sixth scar is situated superjacently. 3 scars are arranged in an arch anteriory and 2 posteriorly in the left valve.

9. Eye-spot is absent.

10. The left valve overlaps the right one ventrally and dorsally.

12. Sometimes the straight course of the upper half of the posterior outline is less conspicuous.

Remarks

The shape corresponds to that in the description of Lienenklaus (1905). His figures distinctly show the well-developed marginal zone and the pore-canals with extensions near the openings. These features are extreme within this genus. The inner characters, especially those of the marginal zone and the pore-canals, are similary atypical generically in the Budapest specimens, thus the generic arrangement is doubtful. The surfacial tubercles mentioned by Lienenklaus, cannot be traced.

Material

6 carapaces, 4 left valves, 18 fragments.

Family Cyprididae Baird, 1845

Subfamily Eucypridinae Bronstein, 1947

Genus Moenocypris Triebel. 1959

Moenocypris cf. bockenheimensis Triebel, 1963

Pl. IX, fig. 4.

These specimens with invisible inner characters, resemble in shape this species.

Dimensions (in mm): L· 1.45
H· 0.74
L/H: 1.96

Material: 2 carapaces.

Family Cypridopsidae Kaufmann, 1900

Subfamily Cypridopsinae Bronstein, 1947

Cypridopsinae gen. et sp. indet. 1.

Specimens, which resemble the species Curvopsis curvata (Lienenklaus, 1905).

Material: 5 carapaces.

Cypridopsinae gen. et sp. indet. 2.

2 poorly-preserved carapaces with dorsally rounded outline.

Cypridopsinae gen. et sp. indet. 3.

Pl. IX, fig. 7.

4 carapaces and 1 left valve of poor preservation, with dorsally conspicuously broken outline.

Cypridae gen, et sp. indet. 1.

Pl. IX, fig. 5.

A form with invisible inner features, which resembles the Paracypris- or Candona-group.

Material: 1 right valve, 1 left valve and 5 fragments.

Cypridae gen. et sp. indet. 2.

A poorly-preserved specimen, which resembles the genus Moenocypris.

Cypridae gen. et sp. indet. 3.

A badly-preserved specimen with shape resembling the genus Paracypris.

Stratigraphical evaluations

1. The ostracod fauna of the Hárshegy Sandstone of Pilisszentkereszt yielded 5 species which are useful to outline the stratigraphy. The species Schuleridea rauracica Oertli, Leguminocythereis sornena Oertli and Cytheretta variabilis Oertli are known from the Rupelian, Hemicyprideis helvetica (Lienenklaus) from Rupelian to Chattian and Krithe papillosa (Bosquet) from the whole Oligocene and Lower Miocene. These stratigraphical ranges refer the studied beds clearly into the *Rupelian*. The studies on

the other faunal elements of this sequence supported this age determination (Báldi et al., 1967).

2. 8 species from the ostracods of the Kiscell Clay of Buda were suitable to stratigraphical correlation. The species Cytherella draco Pietrzeniuk was hitherto known from the Eocene, Cytherella compressa (Münster) is known from the Bartonian to the Egerian, and C. dentifera Méhes, C. pestinensis Méhes, Buntonia sublatissima arcuatocostata Brestenská range from the Rupelian to the Egerian. Costa hermi Witt has an extremely wide temporal distribution, Krithe pernoides (Bornemann) is represented commonly from the Upper Eocene to Middle Miocene, and Henryhowella asperrima (Reuss) was mentioned from Oligocene to Pliocene.

Those species, which are known from other localities, suggest only the Oligocene age, but studies based on the foraminifers, nannoplanktonic forms and molluscs show clearly the Rupelian. Detailed faunal studies of similar, deep-water Oligocene sediments of the surrounding countries are still missing, thus difficulties appear in the stratigraphic evaluation of the Kiscell Clay fauna. On the other hand, the fauna is relatively rare and its rate of evolution is possibly slower in such an environment.

3. The Tard Beds of Óbuda yielded ostracod species Eucytheridea reticulata Goerlich and Cytheropteron emmeneggeri Scherer, which were known previously from the Rupelian, and subspecies Candona fertilis fertilis Triebel of Rupelian – Chattian age. These suggest similarly Rupelian age.

On the basis of these ostracod studies, the present writer follows the opinion of Keen (1972) regarding these beds as of Oligocene in age. According to this opinion, the Oligocene Stage can be subdivided into only two substages, i. e. the Lower (Rupelian) and Upper (Chattian) Substages. These substages correspond to Kiscellian and Egerian in the Paratethys area, respectively.

The three formations, of which ostracods are here described in this work, are thus the heteropic facies of the Rupelian as interpreted above.

Paleoecological evaluations

1. Hárshegy Sandstone. The sediments of the Pilisszentkereszt sequence probably deposited in a nearshore, enclosed bay, which had connections with the open sea temporally. The conspicuously mixed character of the fauna suggests frequent (seasonal?) marine ingressions. The nearshore, fresh-water basin is indicated by the Hemicyprideis and Miocyprideis species, especially those numerous specimens with phenotypic swellings. On the other hand, the presence of the species of genera Cytheretta, Schuleridea, Echinocythereis, Leguminocythereis, Costa and especially Krithe, prooves normal- or nearly normal-saline marine waters. The proportional distribution of these genera varies within the beds of the sequence. The ratio between the total numbers of the species from the latter and the former genera gives index-numbers, which are as follows, in arising order, from the studied 5 beds: 0.03; 0.11; 0.11; 0.14; 0.76. It is clear, that the marine

influence is of variable, and shows an increasing tendency for the studied interval (i. e. for the Late Rupelian).

Separate valves are represented merely with 0,55% in the fauna, and this suggests a rapid sedimentation (Oertli 1971) also for the fine-grained, distinctly argillaceous interbedings of the Hárshegy Sandstone.

Because of the evidently mixed character of the fauna, precise calculation of diversity seems to be impractical. Especially high specimen numbers appear within the brackish-water forms.

2. Kiscell Clay. The mainly argillaceous sediments of the Kiscell Clay of Budapest deposited in a relatively deep basinal part with open marine connections. The fauna is poor in species-, as well as in specimen-number.

The deep-water, marine environments are proved by the presence of the genera Krithe, Henryhowella, Cardobairdia, Argilloecia, Parakrithe and Agrenocythere (with 39,5% total specimen-proportions). The frequency of the genus Cytherella, with 45,6% in the total specimen-number of the fauna, does not contradict the deep-water sedimentation. Similarly frequent are the species of the genera Buntonia, Paracypris and Bairdia, also in this deep-water environment. The proportion of the mainly shallow-water genus Occultocythereis is of only 1%. The common (i. e. of 11.3%) occurrence of the genus Costa is reasonable, because the close realtives of this genus – according to the data of Benson (1977) – invaded also the extremely deep areas of the Mediterranean Sea during the Miocene. The depth of this part of the basin probably attained the deep sublittoral – bathyal regions during the sedimentation of the Kiscell Clay. The salinity was stable and normal. Disregarding the fragments, the separate valves represent the 41,6% of the studied material. This suggests a far slower sedimentation rate than that of the Hárshegy Sandstone. The still, little agitated water is suggested by the well-preserved fine spines in the Cytherella species.

The specimen-number did not attain 10 (for 100 grams of sediment) in 54 of the studied 67 samples. The maximal number of species within a single sample was 7.

The diversity values (Williams, 1964) in the samples with more than 10 specimens, vary between 0.6 and 6.4 and the faunal distribution also changes spatially and temporally. Thus, within this rather deep marine environment, numbers of different small biotopes existed in close vicinity, and succeeded each other temporally.

3. Tard Beds. Ostracod faunas are known exclusively from the lower part of the Tard Beds, thus only the environment of the initial phase of its depostion can be reconstructed here. The fauna is extremely mixed in the point of view of ecology. Candona, Cypridopsinae and Moenocypris indicate fresh-water (Keen, 1972), but the majority of the available species ranges into marine genera: Cuneocythere, Cytheropteron, Pterygocythereis, Paracypris, Bythocypris, Eucytheridea, Callistocythere and Loxoconcha. The majority of these genera tolerate well the salinity-changes too.

The fresh-water components of the associations can be regarded as derived, transported forms. Plant remains of great quantity were also transported into the basin from the former land.

Most frequent are the Cytheropteron, Cuneocythere and Loxoconcha species, which represent the 64% of the specimen-number of the fauna. These are the best-preserved forms, while the majority of the fresh-water elements are seriously damaged. As compared to the other two asssociations, it is striking, that the characteristic forms of the similarly-aged, shallow-water, near-shore association (i. e. that of the Hárshegy Sandstone), as well as that of the deep-water association (Kiscell Clay), are missing. It is presumable, especially on the basis of the presence of frequent planktonic, e. g. pteropod remains in some beds, that the sediments deposited in relatively deep basinal parts, which were characterized with abnormal hydrochemical and hydrobiological conditions. Under these circumstances the fauna was constituted exclusively by highly tolerant species. The generally unfavourable environment is also suggested by the similar poorness of the other faunal elements.

21,6% of the remains is represented by separate valves. On the basis of this value, the rate of sedimentation was slower than that of the Hárshegy Sandstone, but higher than that of the Kiscell Clay. Because of the mixed character of the fauna – just like in the case of the Hárshegy Sandstone – the precise diversity-calculations appeared as useless here. The specimen-numbers of the certain samples are similar rather to those for the Kiscell Clay, but specimen-numbers above 10 occured only in the 30% of the samples, and exceptionally reached the lower limit of those for the Hárshegy Sandstone samples.

Interesting is to compare the diversity values derived from the total specimen- and species-numbers of the three formations. The minimal value (2.7) appears in the Hárshegy Sandstone, and this proves the high specimen-numbers occuring under the great brackish-water influence. The value is somewhat higher (3.9) for the Tard Beds, where the unfavourable conditions resulted in a low specimen-number. The highest value (5.0) was derived for the Kiscell Clay. This fact contradicts to some extent the tendencies recorded in the Hungarian Middle Eocene, where the diversity, with higher specimen-numbers, is conspicuously lower in the deep basinal facies. (This latter tendency is in accordance with the conlusions of Pokorny, 1971). This diversity, which increases with depth, can be due to the circumstance, that the near-shore waters of the Budapest Oligocene were of brackish-water nature. However, the diversity value is higher than even in the similar environments of the Middle Eocene. As a possible cause, one can bear in mind, that the tropical sea changed into boreal in post – Eocene times, and this might have been resulted in the large-scale reduction in the specimen-numbers of the ostracod species. As an other possible cause, one can mention, that the Oligocene basinal facies was deeper than that of the Middle Eocene.

Conslusions

1. The studied ostracod faunas from the Hárshegy Sandstone, Kiscell Clay and Tard Beds around Budapest prove excellently the stratigraphical arrangement of these formations into the lower part of the Oligocene, i. e. into the Kiscellian of the Paratethys, which corresponds roughly to the s. l. Rupelian of W. Europe.

2. The fauna of the Tard Beds came from the base of the Kiscellian sequence, and forms an association from relatively deep-water environment of extreme hydrochemical conditions, and with several fresh-water froms transported from near-shore waters. The greater part of the Kiscellian sequence is represented by the deep-water Kiscell Clay, which formed under re-established normal hydrochemical conditions. This environment is characterized by a diverse ostracod fauna, for the low specimen-number. The ostracods of the Hárhegy Sandstone characterize the small, near-shore, more or less enclosed brackish-water basins of the Late Kiscellian, with extremely high specimen-numbers for certain brackish-water species.

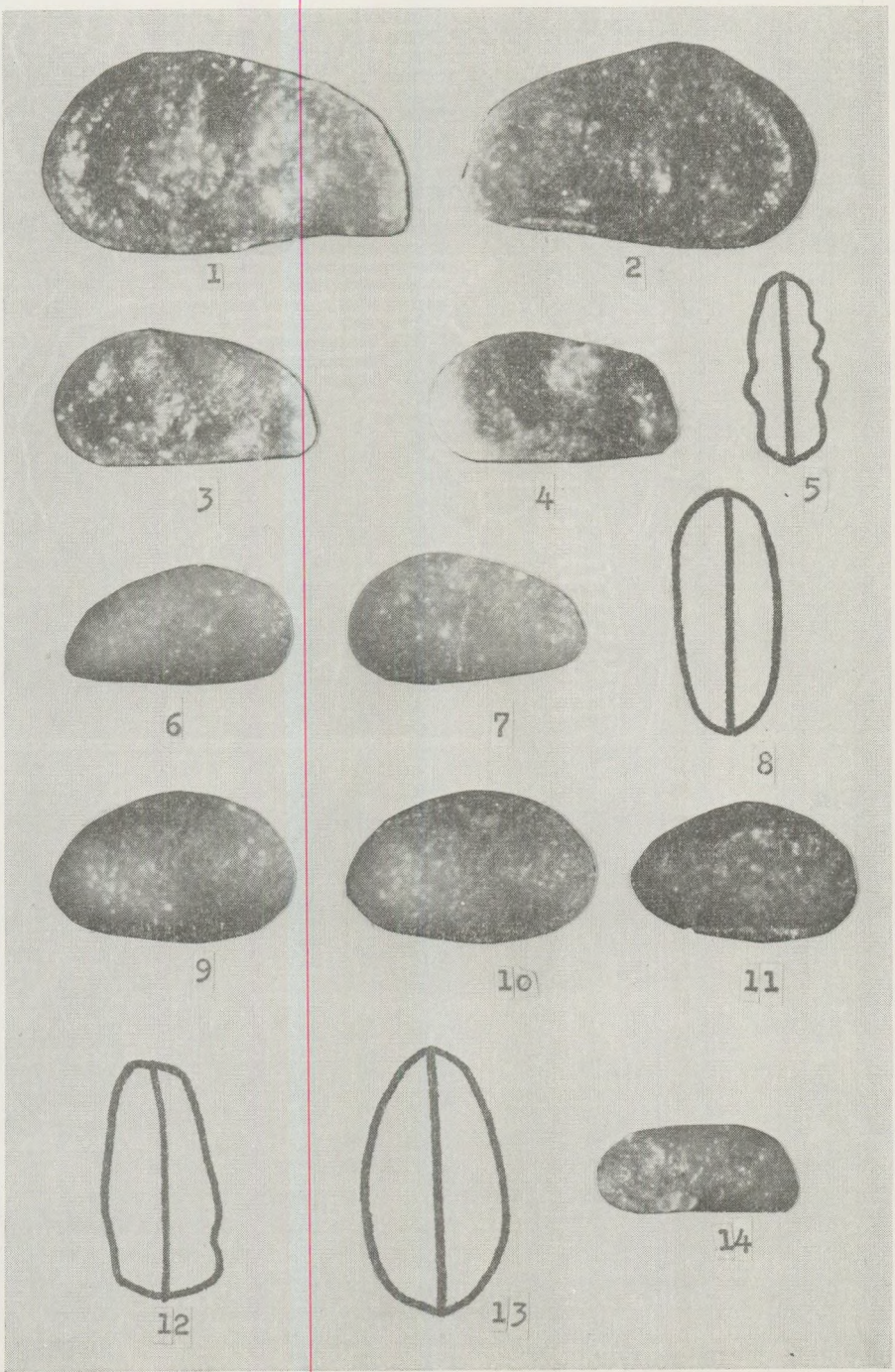
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PLATE I.

Figs. 1 – 2. Hemicyprideis? anterocostata n. sp.
1: Left side of carapace
2: Right side of carapace

Figs. 3 – 5. Hemicyprideis helvetica (Lienenklaus)
3 – 4: Left sides of carapaces
5. Dorsal view of carapace outline

Figs. 6 – 8. Cytherideinae cf. Hemicyprideis parvula Malz et Triebel
6: Left side of carapace
7: Right side of carapace
8: Dorsal view of carapace outline

Figs. 9 – 13. Schuleridea rauracica Oertli

7 – 11 Left sides of carapaces

12 – 13: Dorsal views of carapaces (Fig. 12: posteriorly inflared carapace)

Fig. 14. Krithe papillosa (Bosquet). Left side of carapace

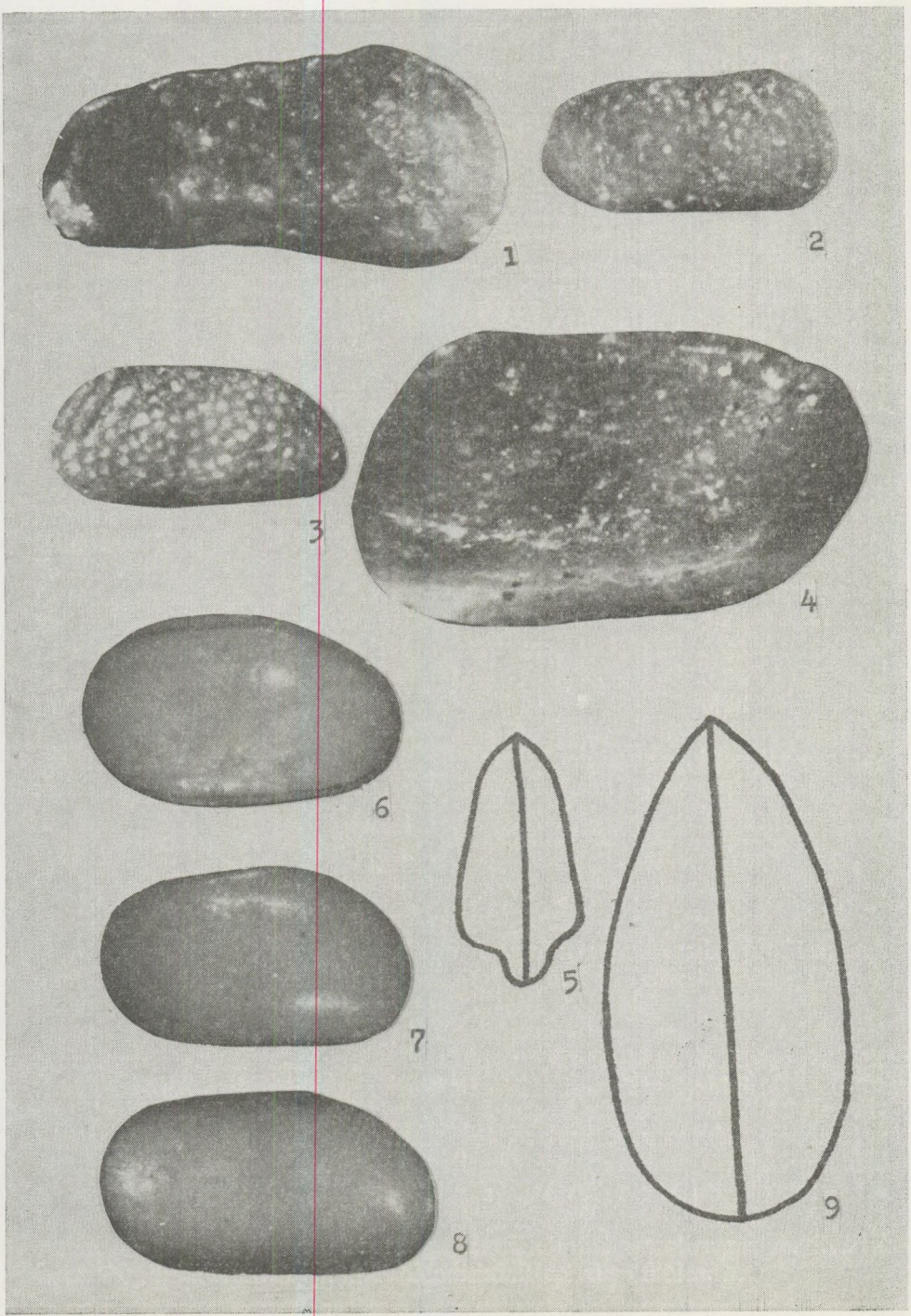
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PLATE II.

Fig. 1. Costa cf. hermi Witt. Right side of carapace

Fig. 2. Echinocythereis cf. ligula (Lienenklaus). Right side of carapace

Fig. 3. Leguminocythereis sorneana Oertli. Left side of carapace

Figs. 4 – 5. Cytheretta variabilis Oertli

4: Left side of carapace

5: Dorsal view of carapace outline

Figs. 6 – 9. Cytheretta compressa (von Münster)

6, 8: Left sides of carapaces

7: Left valve

9: Dorsal view of carapace outline

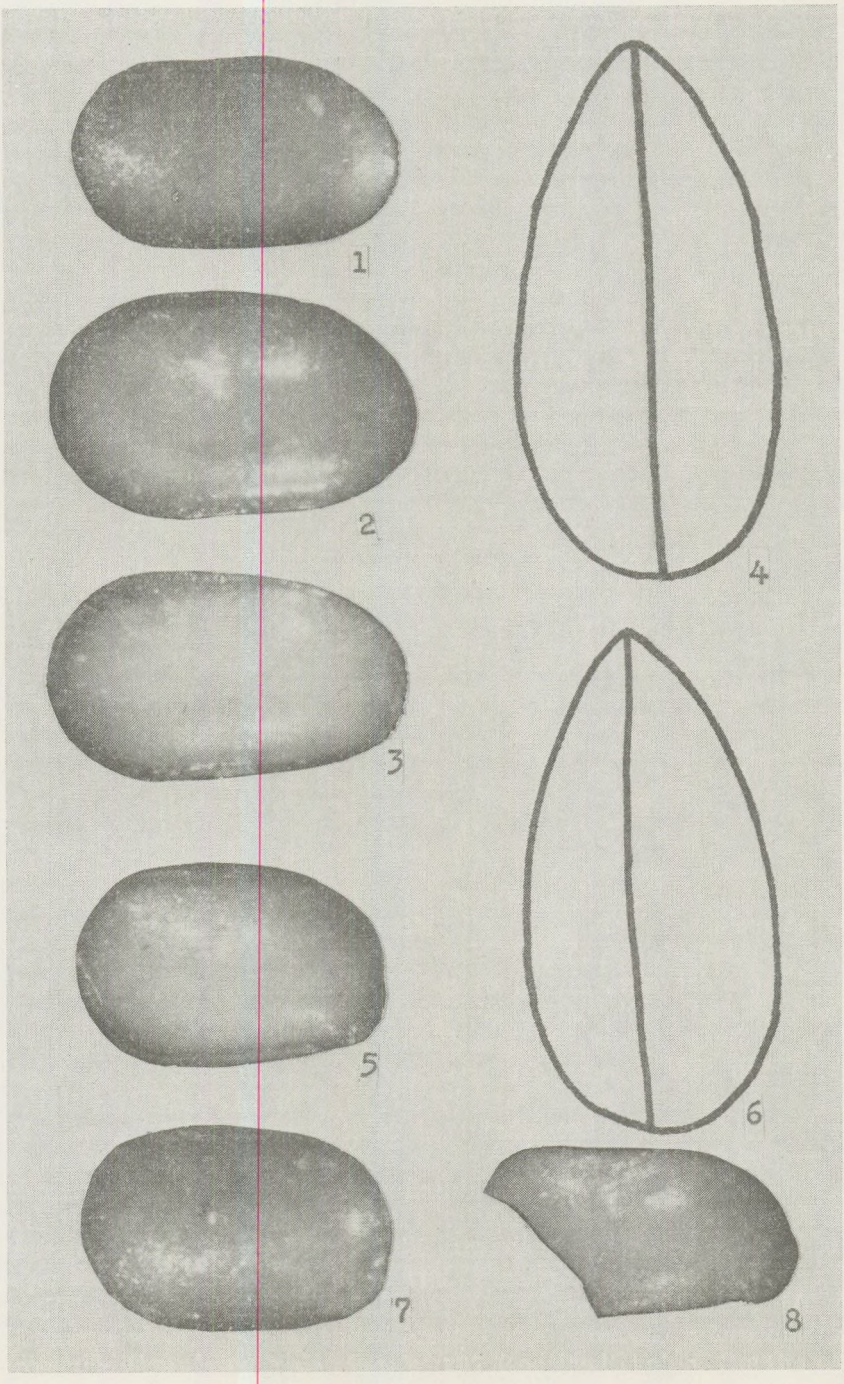
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PLATE III.

Figs. 1 – 4. Cytherella dentifera Méhes
1: Left valve
2 – 3: Left sides of carapaces
4: Dorsal view of carapace outline
Figs. 5 – 8. Cytherella pestinensis Méhes
5, 7: Left sides of carapaces
8: Damaged left valve
6: Dorsal view of carapace outline

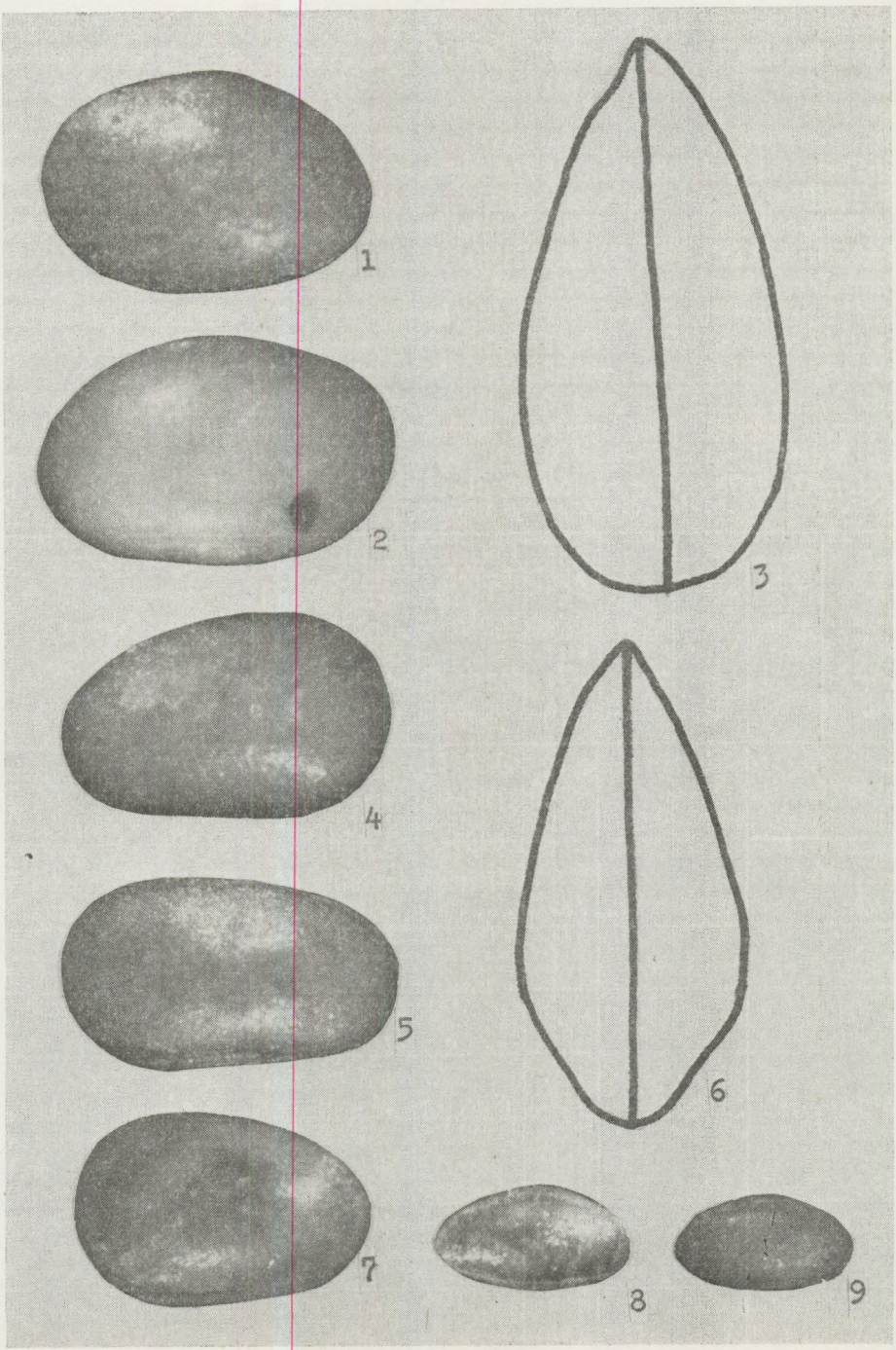
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PLATE IV.

Figs. 1–3. Cytherella draco Pietrzeniuk

1: Left valve

2: Right valve

3: Dorsal view of carapace outline

Figs. 4–7. Cytherella aff. méhesi Brestenská

4: Right valve

5, 7: Left sides of carapaces

6. Dorsal view of carapace outline

Figs. 8–9. Cardobairdia hungarica n. sp. Right sides of carapaces

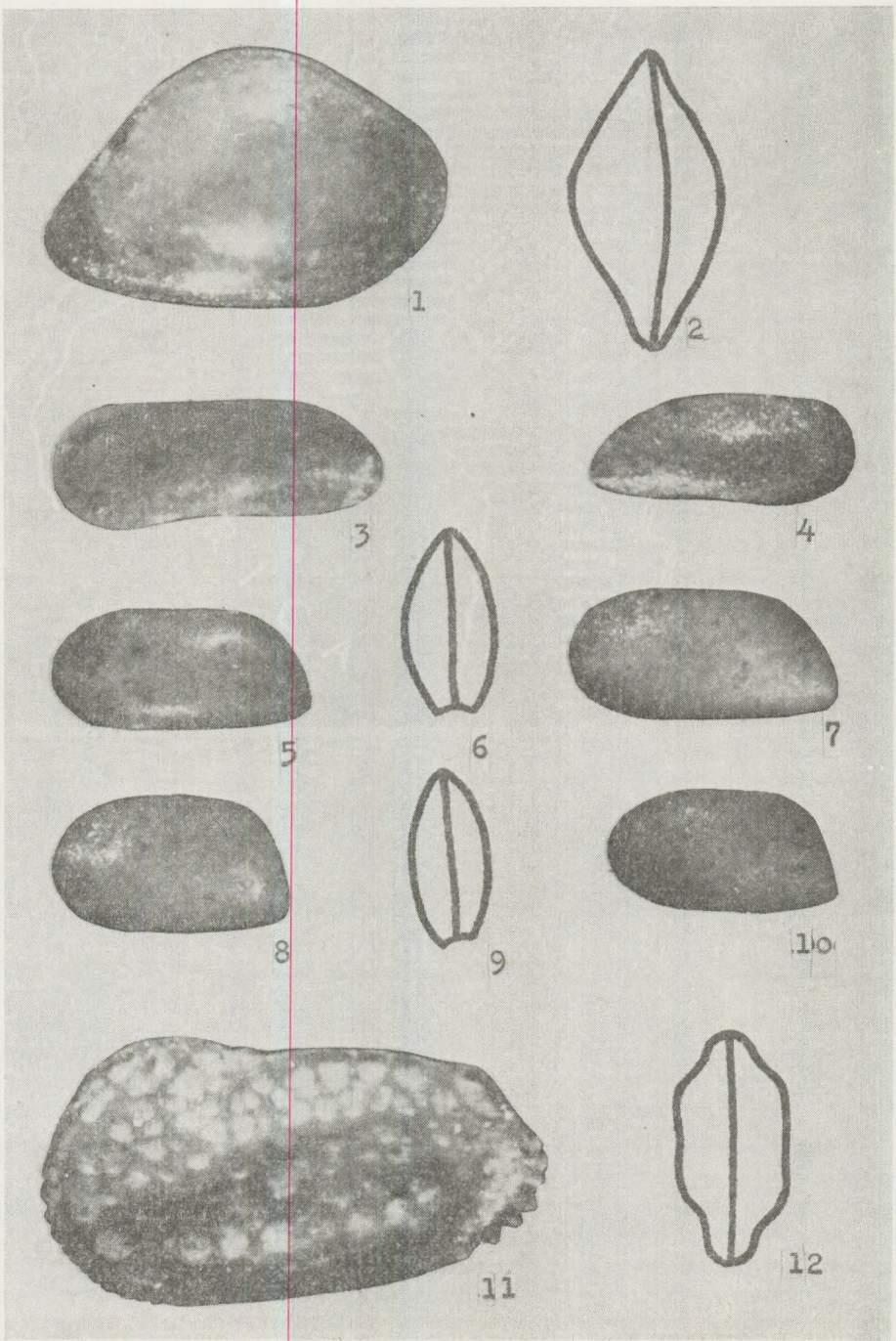
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PLATE V.

Figs.1–2. Bairdia rupelica n. sp.
1: Left side of carapace
2: Dorsal view of carapace outline

Fig. 3. Parakrithe costatomarginata n. sp. Left side of carapace

Figs. 4–10. Krithe pernoides (Bornemann)
4: Right valve
5, 7–8, 10: Left valves
6, 9: Dorsal views of carapace outlines

Figs. 11–12. Costa hermi Witt
11: Left valve
12: Dorsal view of carapace outline

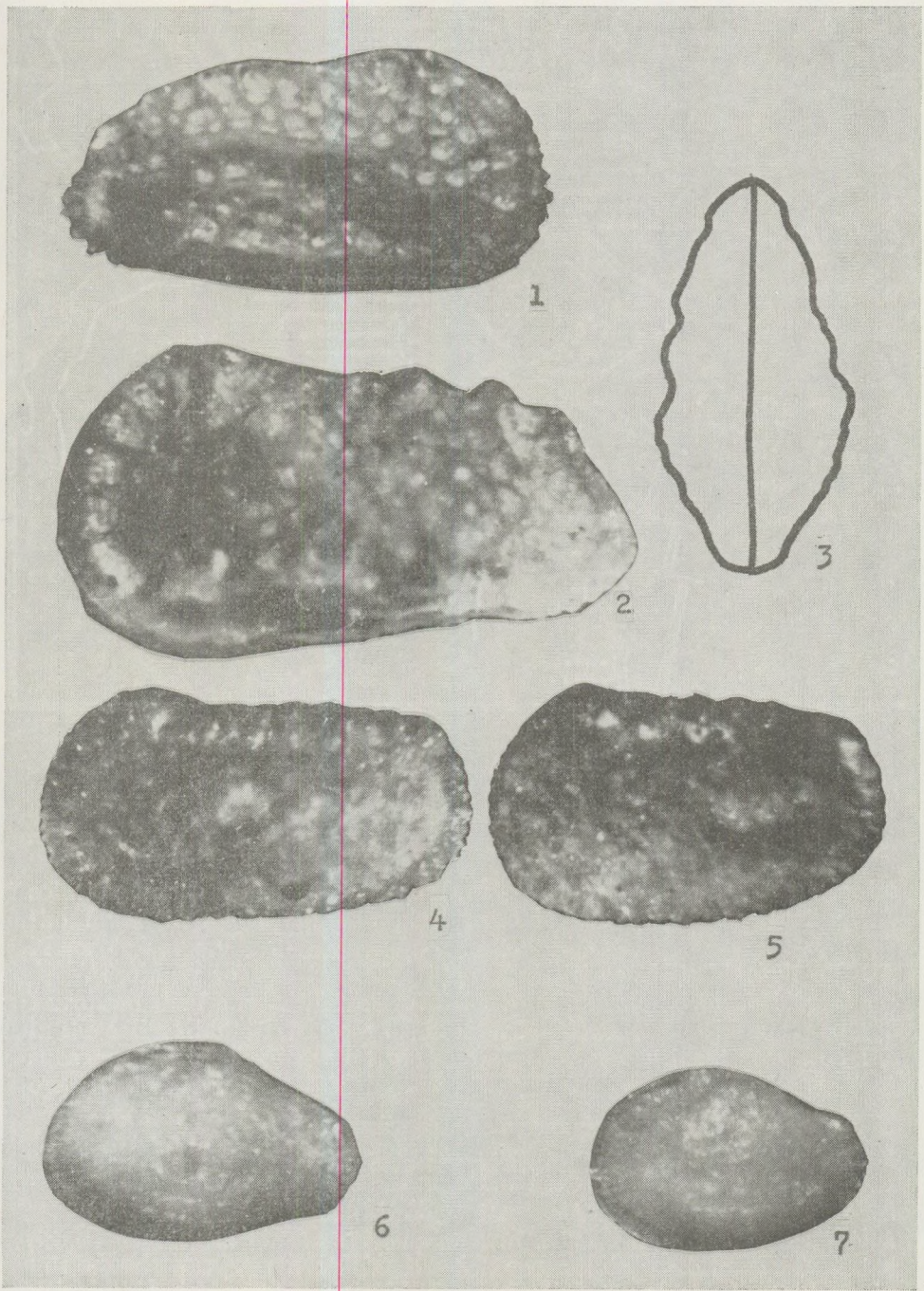
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PLATE VI.

Fig. 1. Costa hermi Witt. Right valve

Fig. 2. Agrenocythere aculeataformis n. sp. Left side of carapace

Figs. 3 – 5. Henryhowella asperrima (Reuss)
3: Dorsal view of carapace outline
4 – 5: Left valves

Figs. 6 – 7. Buntonia sublatissima arcuatocosta Bretenská
6: Left side of carapace
7: Left valve

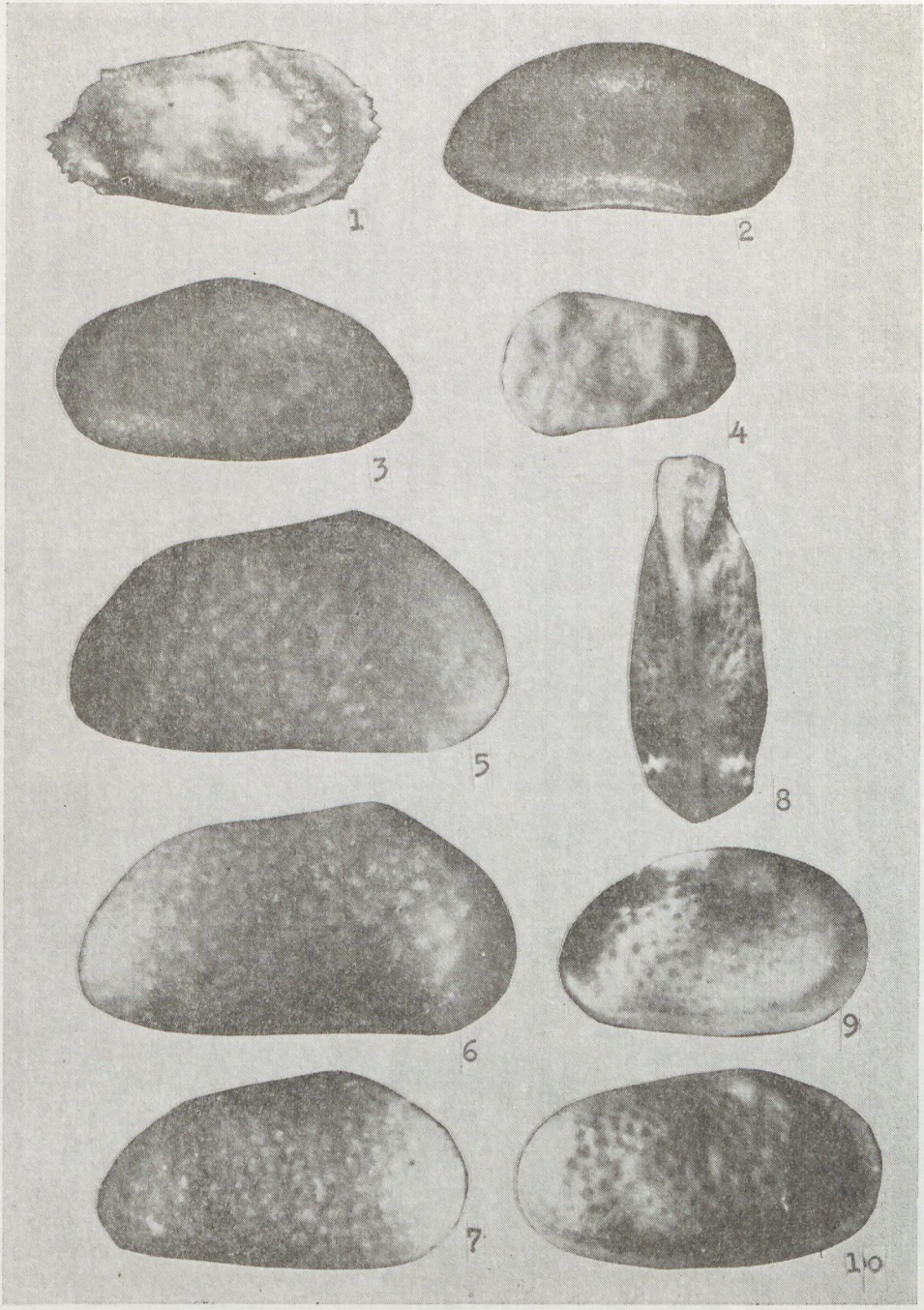
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PLATE VII.

Fig. 1. Occultocythereis rupelica n. sp. Left side of carapace

Figs. 2 – 3. Paracypris? rupelica n. sp.

2: Right valve

3: Left valve

Fig. 4. Callistocythere sp. Left side of carapace

Figs. 5 – 7. Eucytheridea reticulata Goerlich. Right valves

Figs. 8 – 10. Cuneocythere marginata anterodepressa n. ssp.

8: Dorsal view of carapace

9 – 10*:* Right sides of carapaces

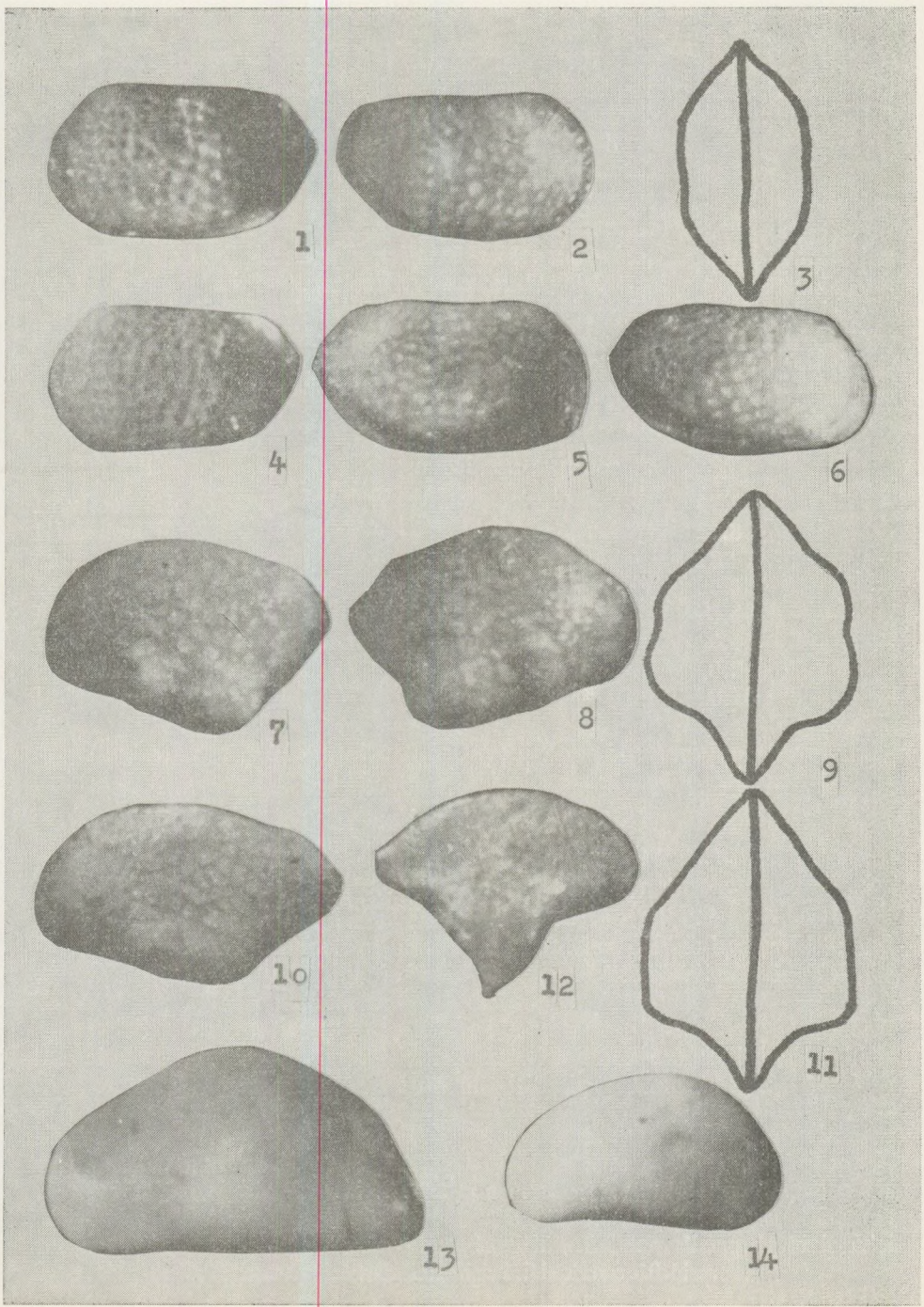
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PLATE VIII.

Figs. 1–6. Loxoconcha delemontensis hungarica n. ssp.
1, 4: Left sides of carapaces
2, 5–6: Right sides of carapaces
3: Dorsal view of carapace outline

Figs. 7–11. Cytheropteron emmeneggeri Scherer
7, 10: Left valves
8: Right valve
9, 11: Dorsal views of carapace outlines

Fig. 12. Cytheropteron sp. Right valve

Fig. 13. Paracypris? sp. 1. Left side of carapace

Fig. 14. Candona fertilis Triebel. Left side of carapace

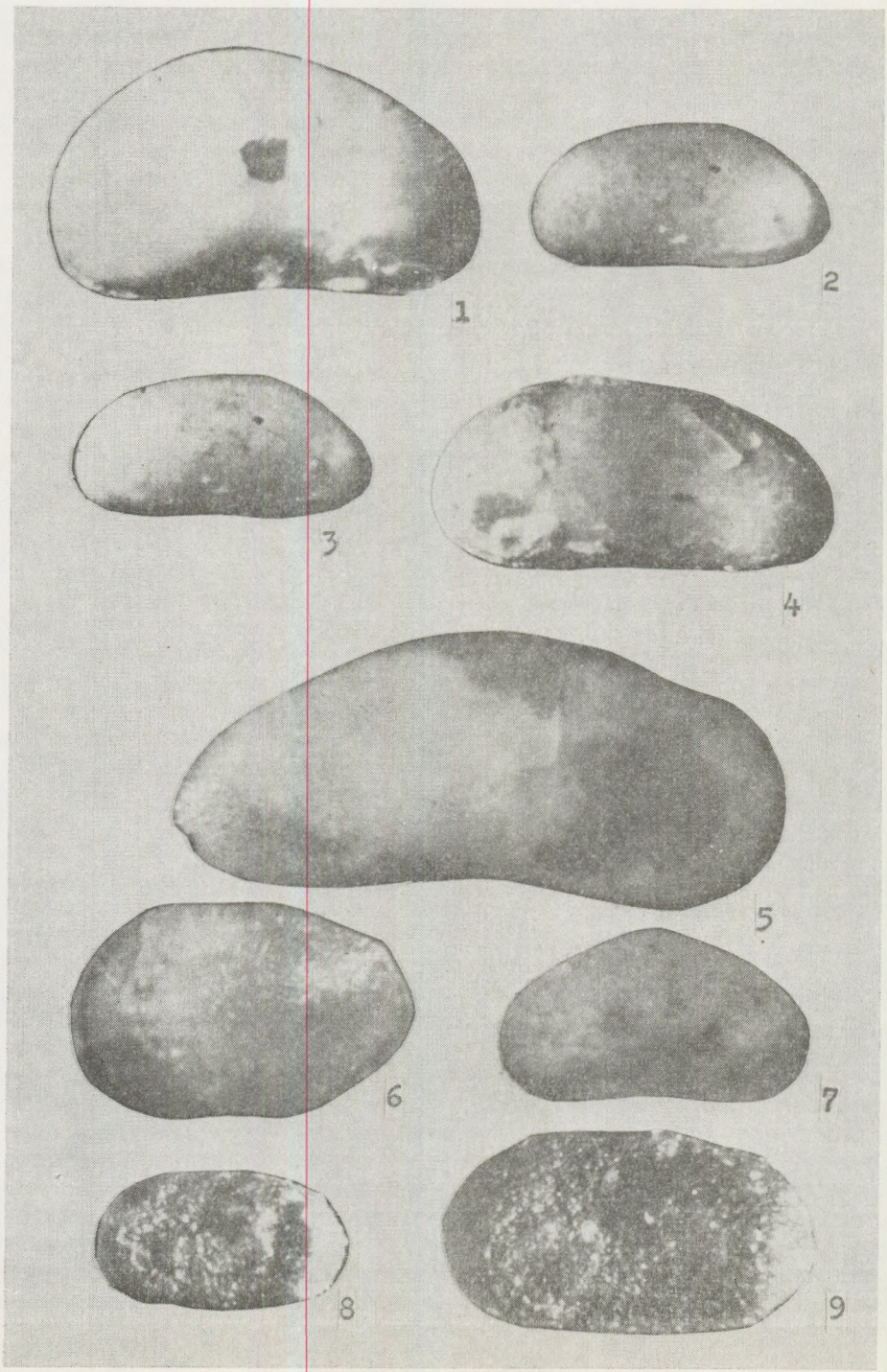
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PLATE IX.

Fig. 1. Candona fertilis Triebel. Right side of carapace

Figs. 2 – 3. Candona? aff. recta Lienenklaus. Left valves

Fig. 4. Moenocypris bockenheimensis Triebel. Right side of carapace

Fig. 5. Cypridae gen. et sp. indet. 1. Right valve

Fig. 6. Loxoconcha sp. Left side of carapace

Fig. 7. Cypridopsinae gen. et sp. indet. 3. Right valve

Figs. 8 – 9. Miocyprideis? rara derupta n. ssp. Left valves

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81.892. Állami Nyomda, Budapest
Felelős vezető: Mihalek Sándor igazgató