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OSTRACODS FROM THE UPPER EOCENE OF EAST POLAND

Abstract. — Ostracods of the Upper Eocene epicontinental deposits of east Poland are described. Of the 40 species, referred to 32 genera, *Flexus erikae* and *Pterygocythereis siemienensis* are the new ones. Age, palaeogeography and palaeoecology of the studied assemblage are discussed.

INTRODUCTION

The present paper is the first elaboration of Eocene ostracods from the territory of Poland. The ostracod material dealt with here derives from east Poland, the Siemień locality near Lublin. In an earlier paper by this author (Szczechura 1965) the ostracods of the upper part of the profile at Pamiętowo (northern Poland) have been regarded to be Eocene in age. That age has been then established on the basis of foraminifera (Brotzen & Pożaryska 1961). Actually, on the basis of a more detailed analysis of foraminifera (Pożaryska & Szczechura 1968) it is known that the upper part of that column as well as its lower part, represent Paleocene.

The Eocene sediments of Poland are fragmentarily preserved and almost unelaborated. They are poor in microfossils and as a rule devoid of ostracods. Also the Eocene glauconitic sands exposed at Siemień locality are poor in ostracods although they contain relatively large quantities of foraminifera.

The assemblage collected by the author consisting of 467 single valves or extremely rare complete carapaces forming an ostracode association has been selected from several samples of total weight of about 5 kg. The samples have been taken from a profile about 7 meters thick, consisting mainly of glauconitic sand and marl covering Cretaceous beds and overlied by the Quaternary sediments. The samples although taken from various horizons are treated as one because of a low frequency of the ostracods.

A more detailed description of the outcrop, i.e. its location, lithology and age analysis is given in papers by Woźny (1966) and by Pożaryska

(1977). The foraminifera derived from the same outcrop have been described by Pożaryska (Pożaryska & Locker 1971; Pożaryska 1977), while Coccolithophorida by Locker (Pożaryska & Locker 1971). Both these authors also deal with the age of the studied samples from Siemień. Aside of pelecypods, (described by Woźny 1977) foraminifera, coccolits and ostracods the Eocene sediments at Siemień contain also problematic calcareous microfossils, described by the present author (Szczechura 1969) as well as remnants of bryozoans, corals and fish teeth listed by Woźny (op. cit.).

The material here described is housed at the Institute of Palaeobiology of the Polish Academy of Sciences in Warsaw (abbr. ZPAL).

The samples from which the ostracods have been recovered, were obtained due to courtesy of the Board of Directors of the Geological Institute in Warsaw and Prof. W. Pożaryski (same institution), Prof. K. Pożaryska and M. Sc. E. Olempska (both of the Institute of Palaeobiology, Polish Academy of Sciences, Warsaw). Prof. K. and W. Pożaryski have lend their comparative material from the Eocene of Belgium. The present author had also at her disposal some comparative material from the Eocene of Ukraine (USSR) kindly sent by dr. V. Scheremeta (Paleontological Institute of University of Lvov), from the Eocene of F.R.G., received from dr B. Moos (Niedersächsisches Landesamt für Bodenforschung, Hannover), and from the Eocene of G.D.R. from dr. E. Pietrzeniuk (Institut für Paläontologie und Museum der Humboldt-Universität, Berlin). To all the mentioned persons and institutions the present author is most thankful. Photographs were taken by Mrs. M. Radzikowska. Drawings inked Mrs. K. Budzyńska after the author's sketches. SEMicrographs were done at the Polytechnic School in Warsaw.

MATERIAL

The collected ostracod remnants consist mainly of adult detached valves, less frequently complete carapaces; juvenile valves are much less common.

Well preserved individuals mainly have been determined and counted whereas the partly preserved valves that are relatively frequently found have been left in the residuum. Poor calcification of the valves is striking, which is particularly well observable on the representatives of the genera *Pterygocythereis, Flexus, Occultocythereis* etc. what may be explained by unfavourable environmental conditions.

40 ostracod species (among which two are new) have been distinguished out of which only 26 have specific classification. They represent 32 genera. The systematic position of 3 species could not be established on the generic level. The number of species and genera distinguished in this relatively small assemblage proves a taxonomic wealth of it i.e. its high diversity.

A systematic by Hartmann and Puri (1974) with only slight simplification has been applied in this paper.

The abbreviations used are: a — adult, j — juvenile, C — complete carapace, L — left valve, R — right valve, F — female, M — male.

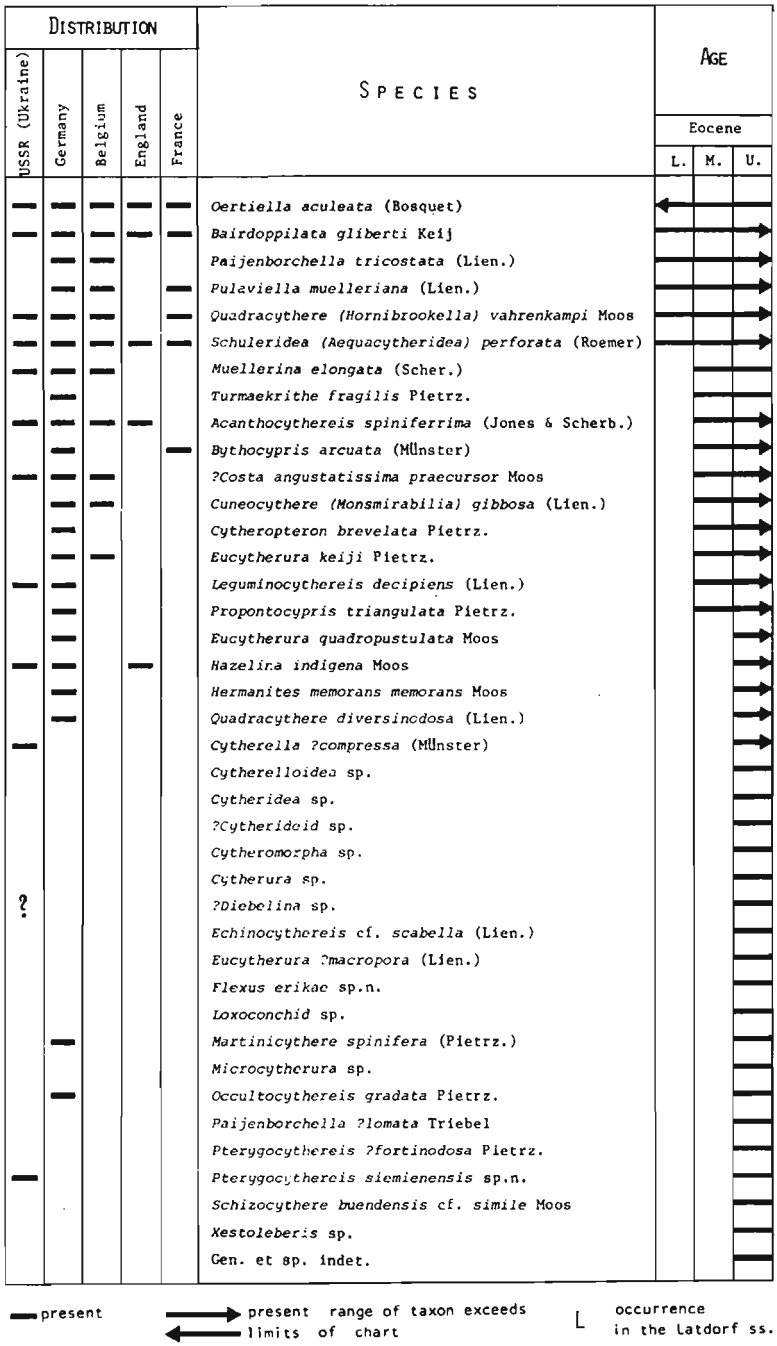
STRATIGRAPHY, PALAEOGEOGRAPHY AND PALAEOECOLOGY

The ostracods described in the present paper are confined to the Paleogene of Europe. Among 22 species that occur in the Eocene at Siemień and are known from the Paleogene outside Poland, 4 ones occur in the whole Eocene passing its lower or upper boundary, or being limited to that epoch (see table 1); 10 species apear in Middle Eocene, and 5 — i.e. less than 25 percent are known entirely from the Upper Eocene. Simultaneously 2 species out of the above mentioned are known only from Latdorf beds, which — according to some authors — represent Lower Oligocene, but according to others including the present author — belong to the Upper Eocene. Thus the Upper Eocene age of the sediments at Siemień suggested by the ostracods confirms earlier conclusions by Woźny (1966, 1977), Pożaryska and Locker (1971) and Pożaryska (1977). The stratigraphic conclusions here presented are based on the chronological distribution of the ostracod species which sometimes show but restricted regional extent, and more precisely — are based on their integrated extents. It is noteworthy that some species, e.g. *Leguminocythereis decipiens* and *Muellerina elongata*, appear earlier i.e. already in the Middle Eocene in SE Europe, in Ukraine (Scheremeta 1969) but in the Upper Eocene in Germany and in E Poland. The same can be said about some other species, such as e.g. *Paijenborchella tricostata* and *Eucytherura quadropustulata*, which occur in E Poland in the lower horizon of the Upper Eocene but in Northern Europe (Germany) they are known in Latdorf beds, i.e. at least the uppermost Eocene. The stratigraphic position of the sediments at Siemień defined as the lower part of the Upper Eocene i.e. the lower part of the *Globigerapsis semiinvolutus* Zone is suggested by planktonic foraminifera (Pożaryska *in*: Pożaryska & Locker 1971; Pożaryska 1977) and coccolits on the basis of which their age has been precised as corresponding to the *Discoaster taninodifer* Zone (Pożaryska & Locker 1971). It comes from the above that ostracods are not a precise stratigraphic indicator particularly so when compared to foraminifera and nannoplankton.

The ostracod assemblage of Siemień is most similar to those of the Eocene of Germany fromwhere Pietrzeniuk (1969) has described ostracods found in so called Eocene 5, classifying it to the Lutetian and Bartonian, and Moos (1963—1973) described as ostracods from Latdorf beds classifying them to the Lower Oligocene. At least 22 species out of 40 described

Table 1

STRATIGRAPHICAL AND REGIONAL DISTRIBUTION OF THE STUDIED OSTRACODS



in the present paper are common in the Eocene at Siemień and in Germany (table 1).

Eleven species are in common for Siemień and Ukraine (Scheremeta 1969); the same number of common species occurs at Siemień and Belgium (Keij 1957). Some of them are recorded also from the Eocene of Transylvanian Basin, Romania (Bombita *et al.* 1975), and from Turkey (Sonmez 1964). This resemblance is particularly striking in the case of ostracod assemblage described by Keij from the glauconitic sands known as the sand of Wemmel and sand of Lede, both assigned to the Upper Eocene. The Polish ostracods are very similar to those found in sandy-argillaceous sediments of the Ukrainian Shield in the vicinity of Mandrikovka and Kiev area (a series classified to Bartonian). The ostracod assemblages occurring in the Upper Eocene of Germany, Belgium and Ukraine are much more numerous than that of Poland not only in their number of species but also in the number of individuals.

The similarities of the Eocene ostracod microfauna of Ukraine, Belgium and Germany were noted by Pietrzeniuk (1969) and by Scheremeta (1969). The last mentioned author regarded Ledian, Wemmelian and Lattorfian as facies variants of the Upper Eocene sediments chronostratigraphically corresponding to the Bartonian and correlating with the Upper Eocene shallow marine sediments of the Ukrainian Shield.

The Polish ostracod assemblage is much less similar to that from the Eocene of England (Hampshire Basin) described mainly by Haskins (1968—1971) and by Keen (1968). There are also only a few common forms with the Eocene of France. The ostracods from the Paris and Aquitanian basins have been described mainly by Ducasse (1967—1972) and Apostolescu (1954, 1956). The common forms are: *Bairdoppilata gliberti, Schuleridea* (*Aequacytheridea*) *perforata* and *Oertiella aculeata* i.e. long lasting and cosmopolitan species hence of no greater value for more detailed interregional, as well as stratigraphic correlation.

It results from the above considerations that the Eocene locality of E Poland may be regarded as a link between SE Europe (Ukraine) and NW part of the Europe (Germany, Belgium), thus, being geographically connected with an area of epicontinental sea that formed in Northern and Central Europe shallow, rather small basins of relatively quickly changing extens during the earlier Eocene.

Both the type of sediment in which the ostracods are preserved, and the associated microfauna and macrofauna invariably point to shallow marine environment. This conclusion is supported by the general character of the ostracod assemblage i.e. prevalence of heavily ornamented, eye-bearing forms and their considerable taxonomic diversity.

As it was already mentioned, less than 500 ostracod individuals have been picked up from the samples representing Upper Eocene among which 32 genera have been distinguished. The most frequent genera are: *Schizo-*

cythere, Bairdoppilata (these two predominating), *Schuleridea, Eucytherura, Quadracythere* and *Hazelina*. The genera mentioned are represented by more than 30 specimens each. Less common are: *Cytheropteron, Pterygocythereis, Paijenborchella, Acanthocythereis, ?Costa, Cytherella and Oertiella*, each of them being represented by less than 30 and more than 10 specimen. The remaining genera of less than 10 specimen form 14.5 percent of the whole assemblage and are not considered here. The percent share of the most numerous genera in the Siemień taphocenosis is as follows:

Schizocythere	14.3%
Bairdoppilata	13.3%
Schuleridea	8.1%
Eucytherura	8.0%
Quadracythere	8.0%
Hazelina	7.7%
Cytheropteron	5.7%
Pterygocythereis	4.7%
Paijenborchella	4.0%
Acanthocythereis	3.4%
?Costa	2.9%
Cytherella	2.8%
Oertiella	2.6%
Total	85.5%

Schizocythere is known both from shallow and deep sea, but its subspecies occurring at Siemień (*S. buendensis* cf. *simile*) seems to be related to *S. buendensis simile* decribed by Moos (1969) from Latdorf beds i.e. from the facies similar to that represented by sediments at Siemień, regarded as littoral. This genus is also a dominant in the Lutetian of Belgium in arenaceous sediments which among others were regarded as these of very shallow water by Keij (1957).

Bairdoppilata according to Maddocks (1969) is defined as a genus connected with tropical and subtropical regions and very shallow waters. Its representative which occurs in the sediments at Siemień i.e. *B. gliberti* Keij is known to occur in the Eocene littoral and sublittoral sea of France, England and Germany; in Ukraine (USSR) Scheremeta (1969) described it from Eocene of the Crimea and the Peri-Black Sea Depression which, according to him, "are represented by comparatively deep argilo-carbonaceous rocks..." (op. cit. p. 247). According to Kornicker (*in*: Sohn 1964, p. 533) *Bairdia* (*Bairdoppilata*?) "is restricted to marine or certainly to water having not less than 31—32‰ salinity". Similar distribution as *Bairdoppilata gliberti* shows *Schuleridea* (*Aequacytheridea*) *perforata*, which usually accompanies the former in the Eocene of Europe.

Eucytherura according to Morkhoven (1963) lives in the sea below 50 m. The species occuring at Siemień i.e. *E. keiji* and *E. quadropustulata*

are also known to occur in shallow water Upper Eocene sediments of Germany, among others in Latdorf beds.

Quadracythere is commonly known to be a shallow water form, according to Morkhoven (op. cit.) predominantly epineritic. Two species known at Siemień: *Q.* (*Hornibrookella*) *vahrenkampi* and *Q. diversinodosa* are also characteristic in Lattorfian and in the so called "Calauer type" of the Eocene sediments in Germany and in the Mandrikovka beds in Ukraine i.e. in littoral facies. *Hazelina indigena* and *Cytheropteron brevelata* show similar distribution as the above mentioned species of *Quadracythere*, but *C. brevelata* is unknown in the USSR.

Pterygocythereis, according to Morkhoven (1963) occurs at depths from 10 to 150 m, thus it is also a shelf genus and seems to be connected with arenaceous sediments. Unfortunately its representative in Poland is unknown outside this country thus nothing can be said about its palaeoecology.

Paijenborchella occurs both in shallow and deep marine facies. *P. lomata* that occurs in the Polish Eocene is rather an ubiquite species as in the Eocene of the Aquitanian Basin it occurs in deeper facies (Ducasse 1969) whereas in Germany and Ukraine it is known in littoral facies. Also for *Acanthocythereis* it is difficult to define preferred paleoecologic conditions. This genus is known both from shallow and deeper sea; its species in the Polish Eocene i.e. *A. spiniferrima* seems to be rather cosmopolitan and its distribution is controlled neither by facies nor to a larger extent by the depth. It is known to occur both in the shelf sediments in England and Germany and in deeper facies in the Crimea.

Doubtful generic assignment of the species refferred to genus *Costa* does not allow to discuss its ecology. Although it seems important that *Costa* is characteristic in deeper and warm sea as. e.g. Paleogene and Neogene sediments of the Tethys. *?Costa angustatissima praecursor* Moos occurs among others in Lattorfian and in older Eocene of Germany where it is connected with littoral sediments as it is the case in the Eocene of Belgium and Ukraine.

Cytherella — a genus of fairly large tolerance to depth and salinity (Morkhoven 1963) brings nothing new to the ecology of the ostracod assemblage in question. Also *Oertiella* may be shallow and / or deep water form but its representative at Siemień i.e. *O. aculeata* is known mainly in shallow and both warmer and cooler Paleogene sea of continental Europe.

Summing up the above considerations and taking into account the fact that there are no ostracods characteristic of deeper sea at least a more open one as e.g. *Bradleya, Cardobairdia, Krithe, Argilloecia* etc. it is no doubt that the Polish assemblage characterizes a near-shore zone of full salinity and considerable mobility, depth not greater than 50 m i.e. high neritic of weak connection with the open sea and of temperature difficult to define on the basis of the ostracods but rather moderately warm i.e.

about 16—18° centigrade. The assemblage of Siemień characterizes an epicontinental sea.

Similar ecological conditions are suggested by Pożaryska (1977) on the basis of foraminifera and Woźny (1966; 1977) on the basis mostly of molluscs. The latter author, however, presumed higher temperatures for the Upper Eocene sea of E Poland.

SYSTEMATIC DESCRIPTIONS

Order **Podocopida** Müller, 1894
Suborder **Platycopa** Sars, 1866
Family **Cytherellidae** Sars, 1866
Genus *Cytherella* Jones, 1894
Cytherella ?compressa (Münster, 1830)
(pl. 16: 4—8)

?1969. *Cytherella compressa* (Münster); Pietrzeniuk: 9, pl. 1: 1, 2, pl. 23: 1, 2.

Material. — 6 right and 7 left, adult valves, in most cases well preserved. Dimensions (in mm):

	ZPAL. No. O. XI/13 aLVF	O. XI/11 aRVF	O. XI/12 aRVM	O. XI/14 aLVM
Length	0.725	0.725	0.725	0.650
Height	0.400	0.450	0.425	0.350

Description. — Valve almost regularly ovate, most inflated posteriorly, laterally compressed, smooth. Right valve of female slightly arched dorsally, almost straight ventrally, nearly evenly rounded anteriorly and posteriorly. Left valve has almost parallel dorsal and ventral margins, slightly obliquely rounded posterior end and broadly rounded anterior end which is weakly rimmed. Sexual dimorphism well pronounced by somewhat truncated posteriorly dorsal margin and less inflated postero-ventral part of the valve in males. Inner side of the valve typical for genus.

Remarks. — Determination of that species is based on description and illustrations of *Cytherella* (*Cytherella*) *compressa* (Münster, 1830) given by Haskins (1968*a*), for the specimens from the Eocene of England. In comparison with Haskin's forms included to that species, male specimens from Poland seem to be more truncated posteriorly; at the same time marginal part of the valve, seen from inside, especially its dorsal margin, is not so thickened as in specimens from England. Thickened interior part of dorsal margin occurs also in specimens from the Oligocene of Belgium assigned by Keij (1957) to *C. compressa*. On the other hand, Pietrzeniuk (1969) illustrated specimens, assigned to *C. compressa*, from the Eocene of Germany, which differ in the details of the general shape of valve, in comparison with the specimens formerly mentioned, being more similar to those from Poland. That is why the specimens from Poland are only tentatively included to *Cytherella compressa*.

Occurrence. — Upper Eocene of Poland (Siemień). *C. compressa* is recorded from the Eocene and Oligocene of Belgium and Holland, Eocene of England and Romania, Eocene — Miocene of Germany.

Genus *Cytherelloidea* Alexander, 1929
Cytherelloidea sp.
(pl. 17: 5, 6)

Material. — 1 left complete and 3 right damaged, adult valves.
Dimensions (in mm):

	ZPAL. No. O. XI/15
	aLV
Length	0.575
Height	0.325

Description. — Valve subrectangular in outline, markedly laterally compressed; dorsal and ventral margins straight, anterior end broadly rounded, posterior end almost vertically truncated. There is well developed elevated marginal rim along the anterior margin, continuing dorsally and less distinctly stretching along the ventral margin, while again high, well pronounced along the posterior margin. Most prominent, however, are two longitudinal ribs, both branching from the posterior rim and almost joining the anterior rim; the lower rib, situated just above the ventral margin, is almost straight, while the upper one is distinctly sinuous below the muscle scar depression and, in front of it, it is joined with the dorsal rim by means of a short, oblique thickening. Surface of valve smooth.

Remarks. — Described valve most probably belongs to male representative of the species, however, the scarcity of the material does not allow to prove it. *Cytherelloidea* sp. is somewhat similar to the specimen figured by Scheremeta (1969), assigned by him to *C. dameriacensis* Apostolescu, 1955, which seems to differ in details of external morphology from the holotype of the latter. Scheremeta's specimen, however, is reticulate in contrast to the smooth form occurring in the Eocene of Poland.

Occurrence. — Upper Eocene of Poland (Siemień).

Suborder **Podocopa** Sars, 1866
Superfamily **Bairdiacea** Sars, 1866
Family **Bairdiidae** Sars, 1888
Genus *Bairdoppilata* Coryell, Sample & Jennings, 1935
Bairdoppilata gliberti Keij, 1957
(pl. 17: 1—4)

1968. *Bairdoppilata gliberti* Keij; Haskins: 3, pl. 2: 29, 30.
?1969. *Bairdoppilata gliberti* Keij; Scheremeta: 57, pl. 2: 15, 16.
?1972. *Bairdia gliberti* (Keij); Khosla: 483, pl. 1: 9.
1972. *Bairdoppilata gliberti* Keij; Ducasse: pl. 3: 3, pl. 4: 1.

Material. — 53 detached, right and left, adult valves, 8 juvenile valves and 1 complete, juvenile carpace, in most cases well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/17	O. XI/20	O. XI/18	O. XI/19
	jLV	aLV	jRV	aRV
Length	0.925	1.225	0.950	1.175
Height	0.600	0.775	0.575	0.675

Remarks. — Specimens attributed to *Bairdoppilata gliberti* Keij, 1957, do not differ from those assigned to that species by another authors, mentioned in the synony-

my, except for that figured by Scheremeta (1969) and Khosla (1972). Specimens figured by these authors seem to have too much rounded free margin in comparison with the holotype of *B. gliberti* as well as with other forms referred to that species. For these reasons, the specimens mentioned are only tentatively included to the synonymy of the discussed species.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene and Oligocene of France and Turkey, Eocene of England, Belgium, Romania and Germany, Lower Eocene of Spain, ?Eocene of Ukraine (USSR) and India.

Family **Bythocyprididae** Maddocks, 1969
Genus *Bythocypris* Brady, 1880
Bythocypris arcuata (Münster, 1830) emend, Keij, 1957
(pl. 15: 9, pl. 16: 1, 2)

1969. *Bythocypris arcuata* (Münster); Pietrzeniuk: 16, pl. 2: 3, 4, pl. 16: 5.

Material. — 1 left and 2 right, adult valves, rather well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/21	O. XI/22
	aRV	aLV
Length	1.025	1.000
Height	0.550	0.500

Remarks. — Specimens from the Eocene of Poland, included to *Bythocypris arcuata* (Münster) do not differ in general outline from those figured and described by Keij (1957) and Pietrzeniuk (1969). Muscle scars of the specimens from Poland are also of the same type (see pl. 15: 9) as in specimen figured by Keij. Their hinge margin and marginal pore canals are, however, invisible.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene of Romania (Transylvanian Basin) Eocene and Oligocene of Germany, Oligocene and Miocene of Holland and Austria, Lower Oligocene and Miocene of France.

Superfamily **Cypridacea** Baird, 1845
Family **Pontocyprididae** Müller, 1894
Genus *Propontocypris* Sylvester-Bradley, 1947
Propontocypris triangulata Pietrzeniuk, 1969
(pl. 16: 3)

1969. *Propontocypris triangulata* Pietrzeniuk: 19: 3: 1, 2, pl. 17: 6.

Material. — 1 left, adult valve and one fragment of juvenile valve.
Dimensions (in mm):

	ZPAL. No. O. XI/24.
	aLV
Length	0.650
Height	0.325

Remarks. — Specimen from the Eocene of Poland, assigned to *Propontocypris triangulata*, does not differ from the holotype of that species, described by Pietrzeniuk (1969) from the Eocene of Germany.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene and Upper Oligocene of Germany.

Superfamily **Cytheracea** Baird, 1850
Family **Trachyleberididae** Sylvester-Bradley, 1948
Genus *Pterygocythereis* Blake, 1933
Pterygocythereis ?fortinodosa Pietrzeniuk, 1969
(pl. 30: 9)

?1969. *Pterygocythereis fortinodosa* Pietrzeniuk: 75, pl. 28: 5, 6.

Material. — 1 markedly damaged adult, left valve.

Description. — Posteriorly damaged left valve has an external and internal features typical for the genus. There are two rows of hook-like dents, along the anterior margin, out of which the inner one, in its upper part passes into the ribbon-like list; in its lower part it joins a spiny ornamentation of the latero-ventral ridge. Central part of the valve bears spiny protuberances, more or less parallel and longitudinal, more numerous in the lower part of the valve.

Remarks. — Specimen from the Eocene of Poland seems to be conspecific with those described from the Eocene of Germany by Pietrzeniuk (1969) as *Pterygocythereis fortinodosa*. The scarcity of the Polish material does not allow, however, to prove that. It is not excluded that specimens from the Eocene of Ukraine (USSR), assigned by Scheremeta (1969) to *P. fimbriata bartonensis* Keij, 1957, and *P. fimbriata spinigera* Keij, 1957, in fact, are taxonomically closer to Pietrzeniuk's species rather than to Keij's ones, because they have distinctly separate elements of latero-ventral ornamentation, i.e. they are spiny and not listed. According to the last features, i.e. listed, or rather comb-like shaped latero-ventral ridge, the specimens from the Eocene of Ukraine, Poland and Germany are similar to *P. fimbriata laminosa*, a subspecies described from the Lower Eocene of England by Haskins (1968b).

Occurrence. — Upper Eocene of Poland (Siemień) and ?Eocene of Ukraine (USSR); *Pterygocythereis fortinodosa* occurs in the Eocene (including Lattorfian) of Germany.

Pterygocythereis siemienensis sp.n.
(pl. 30: 1—4)

Holotype: O.XI/26; pl. 30: 1.
Paratype: O.XI/27; pl. 30: 2.
Type horizon: Upper Eocene.
Type locality: Siemień, E Poland.
Derivation of the name: siemienensis — named after the locality Siemień.

Diagnosis. — Wing-like latero-ventral ridge anteriorly broken up into 5 bladed spines, posteriorly sharply ended by backward directed spine and more or less stout additional spine behind it. Along the dorsal margin there are two comb-like frills; one being the prolongation of the eye tubercle, another forerunning the posterior cardinal angle. Lateral valve surface smooth.

Material. — 15 left and 7 right, adult valves, most of them well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/26	O. XI/27
	aLV	aRV
Length	0.775	0.750
Height	0.450	0.400

Description. — Valve rather thin, delicate, general outline typical for genus. Dorsal margin straight, ventral margin inconspicuously concave frontally. Spur-like

protuberance occurs on dorsal margin of the left valve, just in the anterior cardinal angle. It is followed by comb-like frills, occurring in the left as well as in the right valve, the anterior frill of which makes the prolongation of the eye tubercle, while the posterior one preceeds the posterior cardinal angle. The latter bears more or less developed spine, present only in the left valve. Anterior margin broadly rounded, being fringed with two rows of strong, hook-like, bladed, marginal spines, best developed in the antero-ventral part of free margin. The posterior margin is angled near the half of the high, being truncated in its upper part; it is fringed with some spines. The latero-ventral ridge is complete and smooth only in its posterior part, where it is sharply ended by backward directed spine; one or more, to a different degree stout, spines occur behind the wing-like edge. Lateral valve surface smooth. Duplicature narrow, weakly developed; muscle scars typical for genus, i.e. consisting of four vertically arranged scars, the uppermost of which is divided, and there is a horse-shoe-like scar in front of them. Hinge margin straight, amphidont, weakly developed.

Variation concerns mostly the development of frills along the dorsal margins, which differ both in shape and size, as well as in the size and number of marginal spines along the anterior and postero-ventral margins.

Remarks. — Specimens belonging to *Pterygocythereis siemienensis* sp.n. are similar to those representing *P. cornuta* (Roemer, 1838), a species rather common in the Eocene of Europe. It differs mainly by presence of frill along the dorsal margin as well as by divided — in its frontal part — wing edge. Species from Poland resembles also *Archicythereis* (recte *Pterygocythereis*) *serrata*, a species described from the Upper Cretaceous of Holland by Bonnema (1940); from the latter one, however, the specimens from Poland seem to be more elongated and more heavily ornamented with spines along the free margin; moreover their winged, latero-ventral edge is divided, but it is complete in specimens from the Cretaceous of Holland.

Occurrence. — Upper Eocene of Poland (Siemień). Specimens falling within the variation of *P. siemienensis* occur in comparative sample from the Eocene of Moldavia (USSR).

Genus *Acanthocythereis* Howe, 1963
Acanthocythereis spiniferrima (Jones & Sherborn, 1889)
(pl. 21: 2—6)

?1957. *Trachyleberis (Trachyleberis) spinosa* (Lienenklaus); Keij: 93, pl. 12: 3, pl. 13: 4.

1969. *Trachyleberis spinosa* (Lienenklaus); Pietrzeniuk: 49, pl. 10: 1, pl. 19: 16, pl. 24: 13, 14.

1973a. *Acanthocythereis spiniferrima* (Jones & Sherborn); Moos: 43, pl. 5: 1, 2.

Material. — 8 right and 9 left, adult valves, in most cases well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/30 aLV	O. XI/33 aLV	O. XI/32 aRV	O. XI/34 aRV
Length	0.675	0.700	0.700	0.675
Height	0.375	0.375	0.350	0.350

Remarks. — Determinations of specimens included in *Acanthocythereis spiniferrima* (Jones & Sherborn), from the Eocene of Poland are based on Moos' (1973*a*) revision of this species. Polish specimens seem to be conspecific with those figured and described by Moos, as well as with those recorded by other authors given in the synonymy. Restriction concerning Keij's determination results from his rather schematic figure of the discussed species.

Variation. — Rather considerable variation concerns mostly the number and arrangement of spines on the valve surface; some variation may be observed also in the length/height ratio of specimens.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany, Upper Eocene and Lower Oligocene of Ukraine (USSR), Eocene of England, Oligocene of Belgium.

Genus *Occultocythereis* Howe, 1951
Occultocythereis gradata Pietrzeniuk, 1969
(pl. 26: 7—9)

1969. *Occultocythereis gradata* Pietrzeniuk: 50, pl. 7: 10, 11, pl. 24: 19.

Material. — 2 right and 3 left valves, mostly adult, rather well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/35 aRV	O. XI/36 aLV
Length	0.550	0.525
Height	0.275	0.300

Remarks. — Specimens from the Polish Eocene classified to *Occultocythereis gradata* Pietrzeniuk, 1969, do not differ in external morphology from the holotype of that species, described and illustrated from the Eocene of Germany. The inner valve morphology seems to be incomplete; narrow duplicature and weakly developed hinge, accompanied by a thin, delicate shell, is not typical for the genus to which undoubtedly the discussed species belongs.

Occurrence. — Upper Eocene of Poland (Siemień) and Germany.

Genus *Hazelina* Moos, 1966
Hazelina indigena Moos, 1966
(pl. 23: 1—7)

1966. *Hazelina indigena* Moos: 286, pl. 24: 1—10.
1969. *Hazelina indigena* Moos; Pietrzeniuk: 52, pl. 10: 4, pl. 20: 1, 2, pl. 25: 1—3.
?1969. *Trachyleberis (Costa) edwardsi* (Roemer); Scheremeta: 182, pl. 18: 4, 5.

Material. — 15 right and 16 left, detached adult valves, and 5 complete well preserved carapaces.

Dimensions (in mm):

	ZPAL. No. O. XI/39 aRV	O. VI/40 aLV	O. VI/38 aC
Length	0.600	0.600	0.550
Height	0.300	0.300	0.325

Remarks. — Determination of that species was kindly accepted by its author, i.e. by Dr. Moos (personal communication). Conspecific forms occur in the comparative material from the Upper Eocene of Moldavia (USSR) (see pl. 23: 3) and were stated by Pietrzeniuk (1969) in an Eocene sample from Ukraine (USSR). For these reasons rather schematically figured specimens, described by Scheremeta (1969) from the Eocene of Ukraine as *Trachyleberis (Costa) edwardsi* (Roemer) are tentatively included in the synonymy of *Hazelina indigena* Moos. According to Moos (1966), *Hazelina indigena* can not be identified with *Cytherina* (recte *Hazelina) edwardsi* Roemer, 1838.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany, Upper Eocene of Ukraine and Moldavia (USSR); it has been also recorded in the Upper Eocene of England by Keen (1968).

Genus *Costa* Neviani, 1928
?*Costa angustatissima praecursor* Moos, 1973
(pl. 19: 2—8)

1969. *Hermanites?* aff. *angustatissima* (Lienenklaus); Pietrzeniuk: 57, pl. 11: 11—13, pl. 20: 10.
1969. *Trachyleberis (Costa) costata* Scheremeta; Scheremeta: 181, pl. 8: 1.
1973a. *Costa? angustatissima praecursor* Moos: 38, pl. 4: 4—6.

Material. — 6 left and 8 right, mostly adult valves, rather well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/45 aLV	O. XI/46 aRV
Length	0.550	0.550
Height	0.250	0.275

Variation. — Observed variation concerns length/height ratio within the studied valves not resulting however, as it may be supposed, from the sexual dimorphism. There is also different degree of the valve calcification; thicker valves are more distinctly ornamented. Besides, not all specimens bear posteroventral spine which seems to be rather characteristic for the species.

Remarks. — Specimens from the Eocene of Poland attributed to ?*Costa angustatissima praecursor* Moos, 1973, seem to be conspecific with the holotype and with the specimens included by Pietrzeniuk (1969) to *Hermanites?* aff. *angustatissima*, both from the Eocene of Germany; this latter was included into the synonymy of *Costa? angustatissima praecursor* by Moos (1973a). The same species is described by Scheremeta (1969) from the Eocene of Ukraine as *Trachyleberis (Costa) costata*; its representatives, almost identical with specimens from Poland, were found by the present author in the comparative material from the Upper Eocene of Ukraine.

Occurrence. — Upper Eocene of Poland (Siemień); Eocene of Germany and Ukraine (USSR); representatives of that species were also found by the present author in a sample from the Eocene (Ledien) of Belgium (see pl. 19: 2, 3).

Genus *Oertiella* Pokorny, 1964
Oertiella aculeata (Bosquet, 1852)
(pl. 22: 1—6)

1957. *Trachyleberis (Trachyleberis) aculeata* (Bosquet); Keij: 90, pl. 13: 16, 17, pl. 16: 14, 15.
1965. *Cythereis (Trachyleberis) horridula* (Bosquet); Szczechura: 507, pl. 5: 9, 10, pl. 16: 12—15.
non 1965. *Cythereis (Trachyleberis) aculeata* (Bosquet); Szczechura: 504, pl. 6: 7, 8, pl. 15: 1—8, 11—13.
1966. *"Trachyleberis" aculeata* (Bosquet); Deroo: 169, pl. 27: 850—852.
1969. *Trachyleberis? aculeata* (Bosquet); Pietrzeniuk: 50, pl. 10: 2, pl. 24: 12.
1969. *Trachyleberis (Trachyleberis) aculeata* (Bosquet); Scheremeta: 175, pl. 17: 8, 9.
1971. *Trachyleberis (Trachyleberis) aculeata* (Bosquet); Haskins: 147, pl. 2: 1—10.
1972. *Oertiella aculeata* (Bosquet); Benson: fig. 62.
1973a. *Trachyleberis aculeata* (Bosquet); Moos: 37, pl. 4: 3.

Material. — 7 left and 5 right, adult valves, rather well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/56 aLV	O. XI/55 aRV
Length	0.775	0.750
Height	0.475	0.475

Remarks. — Specimens occurring in the Eocene of Poland referred to *Oertiella aculeata* (Bosquet) are almost identical to those found earlier by the present author (Szczechura 1965) in the Paleocene of Central Poland (see pl. 22: 1) assigned by her to *Cythereis (Trachyleberis) horridula* (Bosquet); they are similar in size, general shape and ornamentation of the valve, i.e. almost identical number and arrangement of main spines. At the same time, they have similar number and arrangement of pore canals when seen from inside. Taking into consideration the variation of both species they may be regarded as conspecific.

According to Deroo (1966), *"Trachyleberis"* (recte *Oertiella*) *aculeata* differs from *"Trachyleberis"* (recte *Oertiella*) *horridula*, the species described from the European Cretaceous in the shape of valve and in details of ornamentation. In Margerie's (1968) opinion, *Oertiella horridula* is a subspecies of *O. aculeata*. Anyhow, both species are related one to another, and Liebau (1971) speaks about a phylogenetic row *Oertiella horridula — aculeata*.

Occurrence. — Paleocene of Polish Lowlands and Upper Eocene of E Poland (Siemień); Paleocene and Eocene of Belgium, Holland, Ukraine (USSR) and France; Eocene of Germany, England and Spain, Eocene and Oligocene of Turkey.

Genus *Leguminocythereis* Howe & Law, 1936
Leguminocythereis decipiens (Lienenklaus, 1894)
(pl. 29: 2—5)

1894. *Cythere decipiens* Lienenklaus: 182, pl. 13: 8 (see Cat. of Ostracodes).
1969. *?Leguminocythereis decipiens* (Lienenklaus); Pietrzeniuk: 78, pl. 5: 10, pl. 22: 15, pl. 28: 13.
1969. *Leguminocythereis? decipiens* (Lienenklaus); Moos: 17, pl. 2: 13—17.
1969. *Leguminocythereis decipiens* (Lienenklaus); Scheremeta: 145, pl. 13: 10.

Material. — 1 complete carapace, 1 right and 3 left, adult valves, rather well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/58 aCF	O. XI/59 aRVM	O. XI/60 aLVF	O. XI/61 aLVM
Length	0.700	0.775	0.725	0.800
Height	0.425	0.425	0.450	0.450

Remarks. — Specimens included to *Leguminocythereis decipiens* (Lienenklaus) from the Upper Eocene of Poland are diversified in size, especially in height/length ratio, which results most probably from sexual dimorphism. The shorter ones, probably female representatives of the species, seem to differ neither from those described by Pietrzeniuk (1969) from the Eocene of Germany as *?Leguminocythereis decipiens* (Lienenklaus) nor from that one figured by Scheremeta (1969) from the Upper Eocene of Ukraine, regarded as *Leguminocythereis decipiens*.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany, Upper Eocene of Ukraine (USSR).

Genus *Echinocythereis* Puri, 1954
Echinocythereis cf. *scabella* (Lienenklaus, 1900)
(pl. 29: 1)

Material. — 1 damaged, badly preserved, right valve.

Dimensions (in mm):

	ZPAL. No. O. XI/62
	aRV
Length	0.850
Height	0.500

Remarks. — The only specimen found, assigned to *Echinocythereis* cf. *scabella* (Lienenklaus), is fragile, thin-shelled, probably not completely calcified. Its shape and ornamentation, however, seem to be characteristic for *E. scabella*. Specimen from Poland is reticulated, bearing short, tiny inframural spines, best developed in the lower, anterior and posterior parts of the valve; the most admarginal region of the anterior end is smooth. It appears to fall within variation of the discussed species, presented by Moos (1973a). The state of preservation of the specimen, being at disposal of the present author, does not allow her to make additional remarks.

Occurrence. — Upper Eocene of Poland (Siemień). *Echinocythereis scabella* (Lien.) is known from the Eocene of Holland and Belgium, Upper Eocene of Ukraine (USSR), Upper Eocene — Miocene of France, Eocene and Oligocene of Germany.

Genus *Diebelina* Pietrzeniuk, 1969
?*Diebelina* sp.
(pl. 28: 1)

?1969. *Quadracythere diversinodosa* (Lien.), Scheremeta: 210, pl. 20: 6, 7.

Material. — 1 complete carapace and 1 left valve, both adult, rather poorly preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/63	O. XI/64
	aC	aLV
Length	0.560	0.550
Height	0.310	0.325

Description. — Valve of middle size, having general shape and ornamentation rather typical for *Diebelina* genus. Dorsal margin of the left valve straight and distinctly converging posteriorly with almost straight ventral margin. Anterior end broadly rounded and markedly rimmed, posterior end elongated, sharply angulate near the middle, rimmed and weakly dentate. Posterior cardinal angle well developed, much better than the anterior one. Latero-ventral ridge somewhat alate, sharp, extending almost from anterior margin up to 2/3 of the valve length, where it is sharply ended and slightly prolongated upward. Eye tubercle and muscle node distinct, high and tuberculate. Another protuberance occurs in postero-dorsal part of the valve, in front and below the posterior cardinal angle; it is connected with posterior margin by a small and oblique ridge. Surface of the valve nearly smooth except for a few small singular knobs, most characteristic of which appear to be those in the postero-dorsal and postero-ventral regions. Duplicature moderately wide, of the similar width along entire free margin. Muscle scars and marginal pore canals invisible. Hinge of amphidont type.

Remarks. — *?Diebelina* sp. seems to be conspecific with specimens described from the Upper Eocene of Ukraine by Scheremeta (1969) as *Quadracythere diversinodosa* (Lien.). Specimens figured by this author agree in shape and ornamentation with those found in the Polish Eocene named here as *?Diebelina* sp., but they differ greatly in many respects from true *Quadracythere diversinodosa* (Lien.), described also from Upper Eocene of Poland (see p. 73). The figures and descriptions of *Q. diversinodosa*, given by Scheremeta (1969), however, are insufficient to be sure about the conspecific state to the compared forms. *?Diebelina* sp. reminds somewhat *Diebelina koeneni* (Moos), but it differs from the latter in general outline, i.e. being more triangular and more elongate posteriorly. Its ornamentation is different as well; there is different arrangement of ornamental tubercles in both species.

It is worth to notice that *Diebelina* Pietrzeniuk, 1969, is a synonym of *Martinicythere*, genus erected by Bassiouni, 1969; their common type species is that one described by Moos (1969) as "n.gen. *koeneni*". The question arises about the higher systematic position of the discussed genus. Pietrzeniuk (1969) places her new genus in Trachyleberidae, following the Moos's (1969) suggestion, while Bassiouni (1969) attributes his new genus to Hemicytherinae. Both genera are maintained in Hartmann's and Puri's (1974) newest classification of Ostracoda in which they have been assigned to different tribes. Specimens from Poland are not sufficiently well preserved to discuss their systematic position on higher systematic level.

Occurrence. — Upper Eocene of Poland (Siemień), ?Upper Eocene of Ukraine (USSR).

Family **Hemicytheridae** Puri, 1953
Genus *Muellerina* Bassiouni, 1965
Muellerina elongata (Scheremeta, 1969)
(pl. 26: 1—6)

1969. *Trachyleberis (Costa) elongata* Scheremeta: 183, pl. 18: 2, 3.
1969. *Muellerina sinecosta* Pietrzeniuk: 85, pl. 12: 11, pl. 20: 12.

Material. — 5 right valves, adult and juvenile, in some cases somewhat damaged. Dimensions (in mm):

	ZPAL. No. O. XI/65
	aRV
Length	0.625
Height	0.300

Remarks. — Specimens from Poland are almost identical to that one figured by Scheremeta (1969), described from the Upper Eocene of Ukraine as *Trachyleberis (Costa) elongata* and only slightly differ from that figured by Pietrzeniuk (1969), determined by her as *Muellerina sinecosta*; in contrast with specimen figured by the last author, the Polish specimens show more distinct furrow behind the muscle field. Weak furrow, bordering posteriorly the muscle field, is also observed in specimen found by the present author in comparative sample from the Wemmel sand, Belgium (see pl. 26: 6). Specimen from Belgium is smaller than those occurring in the Polish Eocene. Determination of that species is adopted here after Scheremeta (1969), although in the same year Pietrzeniuk (1969) erected new, undoubtedly synonymic species. The priority is difficult to establish.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene of Ukraine (USSR), Belgium and Germany.

Genus *Martinicythere* Bassiouni, 1969
Martinicythere spinifera (Pietrzeniuk, 1969)
(pl. 15: 11, pl. 25: 6—11)

1969. *Muellerina spinifera* Pietrzeniuk: 86, pl. 12: 12, pl. 20: 8, 9, pl. 24: 15, 16.

Material. — 4 left and 4 right, adult and juvenile valves, most of them well preserved.

Dimensions (in mm):

	ZPAL. No. O.XI/74	O. XI/75
	aRV	aLV
Length	0.590	0.600
Height	0.310	0.350

Remarks. — Specimens from the Upper Eocene of Poland, assigned to *Martinicythere spinifera* (Pietrzeniuk, 1969) almost do not differ from its holotype. Their taxonomic features, however, are in accordance rather with *Martinicythere* than with *Muellerina*, the only exception being not ribbed latero-ventral border in specimens of the discussed species. The development of that border seems, however, to be insignificant for taxonomic assignment of the specimen at the generic level. It must be noticed here that *Martinicythere*, genus erected by Bassiouni, 1969, is congeneric with *Diebelina*, erected by Pietrzeniuk, 1969, both having the same type species, (cf. Remarks on p. 70).

Occurrence. — Upper Eocene of Poland (Siemień) and Germany.

Genus *Hermanites* Puri, 1955
Hermanites memorans memorans Moos, 1965
(pl. 15: 10, pl. 27: 4—7)

1965. *Hermanites memorans memorans* Moos: 607, pl. 36: 1—7.
1969. *Hermanites memorans memorans* Moos; Pietrzeniuk: 61, pl. 13: 7, 8, pl. 21: 16, pl. 27: 15, 16.

Material. — 4 left and 4 right valves, including juvenile one, rather well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/79	O. XI/78	O. XI/80
	aRVM	aRVF	aLVF
Length	0.775	0.750	0.725
Height	0.400	0.400	0.425

Remarks. — Specimens from the Upper Eocene of Poland seem to be undoubtedly conspecific with those described by Moos (1965) and Pietrzeniuk (1969) from the Eocene of Germany, as *Hermanites memorans memorans*. However, distinct difference may be observed when muscle scars in specimen figured by Pietrzeniuk (1969) and those seen in the Polish specimen are compared (see pl. 15: 10). There are two small, singular, frontal scars in specimens figured by Pietrzeniuk, while in the Polish specimen they differ in shape, the lower one being horse-shoe-like. They are very similar to those figured by Moos. Polish specimens are distinctly dimorphic.

H. memorans memorans is very similar to *Triginglymus cribratus* Apostolescu (1956), species described from the Lower Eocene of France, recorded also from the Paleocene of Poland, Ukraine (USSR), Holland and Belgium. Both species seem to be closely related.

Occurrence. — Upper Eocene of Poland (Siemień), Upper Eocene (including Lattorfian) of Germany.

Genus *Quadracythere* Hornibrook, 1952
Quadracythere diversinodosa (Lienenklaus, 1894)
(pl. 28: 2—9)

1894. *Cythere diversinodosa* Lienenklaus: 212, pl. 15: 1.
1963. *Quadracythere diversinodosa* (Lienenklaus); Moos: 28, pl. 1: 10, 15.
non 1969. *Quadracythere diversinodosa* (Lienenklaus); Scheremeta: 210, pl. 20: 6, 7.

Material. — 3 right and 4 left, adult valves, and 11 juvenile valves, only in few cases somewhat damaged.

Dimensions (in mm):

	ZPAL. No. O.XI/87 aRV	O. XI/86 aLV
Length	0.625	0.625
Height	0.350	0.375

Remarks. — Determination of Polish specimens, attributed to that species is based on the Moos's (1963) analysis of the neotypes of *Cythere* (recte *Quadracythere*) *diversinodosa* Lienenklaus, 1894. Specimens figured and described by Moos differ, however, from those figured and described by Scheremeta (1969), from the Eocene of Ukraine, as *Q. diversinodosa*; they differ in general shape and ornamentation. These last features may be compared with those observed in *?Diebelina* sp., a species associated with *Q. diversinodosa* in the Polish Eocene sediments. Further discussion concerning both compared species is given on p. 70.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany.

Quadracythere (Hornibrookella) vahrenkampi Moos, 1965
(pl. 27: 1—3)

1969. *Quadracythere (Hornibrookella) vahrenkampi* Moos; Pietrzeniuk: 72, pl. 13: 5, pl. 27: 11—14.
1969. *Quadracythere (Hornibrookella) vahrenkampi* Moos: 6, pl. 1: 5—11.
?1969. *Quadracythere macropora gamma* Moos: Scheremeta: 211, pl. 20: 4, 5.

Material. — 11 right and 8 left valves, adult and juvenile, in most cases well preserved.

Dimensions (in mm):

	ZPAL. No.O. XI/90 aRV	O. XI/91 aLV
Length	0.675	0.650
Height	0.375	0.375

Remarks. — Specimens from the Upper Eocene of Poland may be easily identified with those assigned by Moos (1965) and Pietrzeniuk (1969) to *Quadracythere (Hornibrookella) vahrenkampi* Moos, as well as — to some extent — with those referred to *Q. macropora gamma* Moos, by Scheremeta (1969). Figures of *Q. macropora gamma* given by the last author are rather schematic and difficult to be compared with the holotype of that species because of inaccurate photographs published by Moos (1965). However, there are many common taxonomic features in specimens from the Eocene of Germany and Poland, referred to *Q. (H.) vahrenkampi* and — on the other hand — in specimens from Ukraine assigned to *Q. macropora gamma*. The presence of *Q. (Hornibrookella) vahrenkampi* in the Eocene sample from Ukraine was stated by Pietrzeniuk (1969).

Occurrence. — Upper Eocene of Poland (Siemień), Upper Eocene (including Lattorfian) of Germany and Ukraine (USSR), Eocene of France, Belgium and Romania (Transylvanian Basin).

Family **Cytheruridae** Müller, 1894
Genus *Cytherura* Sars, 1866
Cytherura sp.
(pl. 21: 1)

Material. — 1 juvenile left valve, somewhat damaged.

Dimensions (in mm):

	ZPAL. No. O. XI/93
	jLV
Length	0.275
Height	0.125

Description. — Valve small, thin. General outline typical for genus; dorsal and ventral margins almost parallel, the latter one only slightly incised near the middle; anterior end broadly rounded, posterior end elongated, somewhat caudate in the half. Valve moderately inflated, especially posteriorly, behind and below the central, shallow sulcus bearing short, ala-like protuberance. Valve surface covered with fine ribs more or less horizontally arranged, of which those in the lower part of the valve are especially well marked and somewhat coincide with the outline of postero-ventral protuberance. Inner side typical of immature form, i.e. without distinct duplicature and simple, very weakly differentiated hinge; muscle scars invisible.

Remarks. — Lack of adult specimens prevents one making comparisons with hitherto described specimens of the genus *Cytherura*.

Occurrence. — Upper Eocene of Poland (Siemień).

Genus *Cytheropteron* Sars, 1866
Cytheropteron (Cytheropteron) brevelata Pietrzeniuk, 1969
(pl. 15: 4; pl. 25: 1—4)

1969. *Cytheropteron (Cytheropteron) brevelata* Pietrzeniuk: 104, pl. 8: 5—8, pl. 17: 10, pl. 23: 13, 14.

1973*a*. *Cytheropteron* (*Cytheropteron*) *brevelata* Pietrzeniuk; Moos: 55, pl. 8: 1—3.

Material. — 27 detached valves, adult and juveniles, most of them well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/96	O. XI/98
	aRV	aLV
Length	0.400	0.400
Height	0.250	0.250

Variation. — Considerable variation within this species concerns mostly the valve ornamentation and the degree of development of alar protuberances which differ in size and shape, i.e. are more or less sharply ended. What concerns the ornamentation, it takes reticulation-like pattern or distinctly separated pits.

Remarks. — When compared with specimens figured by Pietrzeniuk (1969), described by this author as *Cytheropteron* (C.) *brevelata*, a part of Polish specimens included to this species is much more distinctly and more coarsely pitted.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany.

Genus *Eucytherura* Müller, 1894
Eucytherura keiji Pietrzeniuk, 1969
(pl. 31: 1)

1969. *Eucytherura keiji* Pietrzeniuk: 99, pl. 12: 10, pl. 21: 8.
1973*b*. *Eucytherura keiji* Pietrzeniuk; Moos: 91, pl. 1: 18.

Material. — 3 detached, adult valves, well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/99 aRV	O: XI/100 aLV
Length	0.325	0.350
Height	0.175	0.230

Remarks. — Specimens from the Eocene of Poland, attributed to *Eucytherura keiji*, seem to differ neither from its holotype, nor from specimens referred to the same species by Moos (1973b) from Latdorf beds. Additional remarks — see below.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene (including Lattorfian) of Germany, Eocene and Middle Oligocene of Belgium.

Eucytherura ?macropora (Lienenklaus, 1894)
(pl. 31: 2—7)

?1894. *Cytheropteron macropora* Lienenklaus: 246, pl. 17: 4.
?1969. *Eucytherura macropora* (Lienenklaus); Pietrzeniuk: 100, pl. 17: 15, pl. 21: 9.
?1973*b*. *Eucytherura macropora* (Lienenklaus); Moos: 84, pl. 1: 1—5.

Material. — 27 detached valves, including some juvenile ones, rather well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/101 aRV	O. XI/102 aLV
Length	0.425	0.425
Height	0.225	0.225

Remarks. — Within the specimens from the Eocene of Poland, tentatively referred to *Eucytherura macropora* (Lien.), a distinct variation is observed, concerning the general outline of valves as well as pattern of reticulation. To make more exact determination of specimens, further research, based on more rich and better preserved material, with use of scanning electron microscope, is necessary.

Eucytherura macropora is very similar in its general shape and ornamentation to *E. keiji* Pietrzeniuk, 1969, what was stated already by Moos (1973). Specimens with distinct roughness of surface, bearing but a weakly developed oblique, median rib, are hardly distinguishable from the latter species.

Occurrence. — Upper Eocene of Poland (Siemień); *E. macropora* is known in the Eocene and Oligocene of Germany.

Eucytherura quadropustulata Moos, 1973
(pl. 31: 8)

1973*b*. *Eucytherura quadropustulata* Moos: 85, pl. 1: 6—8.

Material. — 7 detached, adult valves, most of them well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/107. aRV	O. XI/108 aLV
Length	0.300	0.300
Height	0.175	0.170

Remarks. — General appearance of specimens from the Upper Eocene of Poland well agree with those described by Moos (1973b), as *Eucytherura quadropustulata*. Inconspicuous variability within the Polish specimens attributed to this species, concerning mostly details of the valve ornamentation seems to fall within that species.

Occurrence. — Upper Eocene of Poland (Siemień), Upper Oligocene of Germany.

Genus *Microcytherura* Müller, 1894
Microcytherura sp.
(pl. 15: 7, pl. 32: 1)

Material. — 1 adult, right valve, well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/109 aRV
Length	0.425
Height	0.250

Description. — General outline of valve trapezoid, typical for genus, with distinctly flattened ventral side and broadly arched, somewhat truncated posteriorly, dorsal margin. Posterior end angulate just at the end of ventral margin, anterior end narrowly, slightly obliquely, rounded. Seen from above the valve is nearly semi-circular, with greatest inflation posteriorly; the length of the valve being almost two times greater than its width. Valve surface smooth. Hinge tripartite, weakly differentiated, consisting of anterior and posterior elongate dents and weakly marked furrow in the middle. Duplicature narrow. Strong selvage distinctly removed from the outer margin in anterior as well as in the posterior end. Muscle scars obscured.

Remarks. — Specimen determined here as *Microcytherura* sp. is very similar to those known from the Upper Cretaceous of Europe as *Xestoleberis supplanta* Veen, 1936 (see Herrig 1966), but which, according to the present author, represents the genus *Microcytherura*. Also Deroo (1966) excluded *Xestoleberis supplanta* from the genus *Xestoleberis*, transferring it into the genus *Uroleberis*. In contrast to *X.* (recte *Microcytherura*) *supplanta*, specimen from the Eocene of Poland is lower, having less triangular dorsal margin and differs in outline of free margin and valve inflation.

Occurrence. — Upper Eocene of Poland (Siemień).

Family **Cytherideidae** Sars, 1925
Subfamily **Cytherideinae** Sars, 1925
Genus *Cytheridea* Bosquet, 1852
Cytheridea sp.
(pl. 15: 1, pl. 30: 5)

Material. — 1 adult left valve, well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/9 aLV
Length	0.600
Height	0.350

Description. — Valve solid, triangularly-ovate in lateral outline, elongate, with distinct anterior and posterior cardinal angles, highest anteriorly in 1/3 of the length; in dorsal view it is moderately and rather evenly inflated. Anterior end well rounded, weakly denticulated, posterior end obliquely truncated, slightly angulately rounded in postero-ventral region of the valve. Ventral margin almost straight, somewhat coinciding with straight dorsal one. Valve surface covered with about 16 distinctly and coarsely pitted subvertical furrows out of which those ones in the posterior part of the valve are less pronounced and gently disappearing distally; in front of the valve the arrangement of furrows repeats the anterior margin outline.

Duplicature moderately wide, being wider anteriorly where small vestibule occurs. Hinge of the left valve consists of terminal elongated and dentate sockets, out of which the anterior one is better developed, and of median dentate list which seems to be undifferentiated. Muscle scars of the main group consist of four vertically arranged scars; those ones in front of them are invisible. Marginal pore canals obscured.

Remarks. — The described valve is similar to those from the Paleocene of Maryland (USA) assigned by Hazel (1968) to *Phractocytheridea ruginosa* (Alexander, 1934) especially to the female representatives of that species. The differences concern the general outline and ornamentation of the compared forms, Polish species being more quadrate in outline, having at the same time less pronounced ridges between the subvertical, lateral furrows. There are also some less important differences in the details of ornamentation, e.g. arrangement and length of the furrows, pattern of pitting and others. In comparison with another similar species, i.e. *Cytheridea* (*Cytheridea*) *rugosa* Pietrzeniuk, 1969, described from the Eocene of Germany, specimen from Poland is less triangular in lateral outline, having different surface ornamentation disappearing posteriorly; some differences in the morphological features concern also the inner side of the valves of the compared species.

Occurrence. — Upper Eocene of Poland (Siemień).

Genus *Schuleridea* Swartz & Swain, 1946

Schuleridea (Aequacytheridea) perforata (Roemer, 1838)

(pl. 15: 8, pl. 18: 1—7)

1852. *Cytheridea incrassata* Bosquet: 44, pl. 3: 11.

1973. *Schuleridea* (*Aequacytheridea*) *perforata* (Roemer); Malz: 193, pl. 20: 22—25, pl. 21: 37—40.

Material. — 36 detached valves, adult and juveniles, and 2 complete, adult carapaces; most of the specimens well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/2 aCF	O. XI/3 aLVM	O. XI/5 aRVF	O. XI/6 aRVM	O. XI/7 aLVF
Length	0.775	0.850	0.750	0.775	0.775
Height	0.525	0.525	0.500	0.475	0.550

Variation. — It concerns mainly the length/height ratio of the valves and results from sexual dimorphism which is distinctly pronounced in that species; males are longer than females.

Remarks. — *Schuleridea (Aequacytheridea) perforata* (Roemer) is a species which is explicitely understood and shows wide regional and stratigraphic distribution. Ducasse (1968) mentions it among littoral or sublittoral ostracodes but it seems that

it was rather a cosmopolitic form which lived in shallow waters and on the shelf slope as well.

Occurrence. — Upper Eocene of Poland (Siemień), known from England, Germany, Austria, Belgium, France, Switzerland, Holland, USSR (Ukraine) and Romania (Transylvanian Basin); species recorded from the Lower Eocene up to the Miocene.

Subfamily **Cuneocytherinae** Mandelstam, 1960
Genus *Cuneocythere* Lienenklaus, 1894
Cuneocythere (Monsmirabilia) gibbosa Lienenklaus, 1900
(pl. 15: 5, pl. 20: 1—6)

1900. *Cuneocythere gibbosa* Lienenklaus: 539, pl. 21: 10.
1969. *Cuneocythere* (*Monsmirabilia*) *vulgaris* Pietrzeniuk: 38, pl. 6: 4—6, pl. 19: 6, pl. 23; 20, 21.
1973a. *Cuneocythere* (*Monsmirabilia*) *gibbosa* (Lienenklaus); Moos: 50, pl. 7: 4—7.

Material. — 7 detached valves, all adult, most of them well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/110	O. XI/111
	aRV	aLV
Length	0.500	0.500
Height	0.300	0.275

Remarks. — Determination of that species is based on Moos's (1973*a*) description and illustration of *Cuneocythere* (*Monsmirabilia*) *gibbosa* (Lien.), based on the original Lienenklaus's collection. According to Moos, *C.* (*M.*) *vulgaris* described by Pietrzeniuk, 1969, from the Eocene of Germany, is conspecific with Lienenklaus's species; representative of the Pietrzeniuk's species is figured here on pl. 20: 3 and indeed do not differ from Polish specimens of *C.* (*M.*) *gibbosa.* Conspecific forms have been found by the present author in the comparative sample from Wemmel and Ledien layers, i.e. Upper Eocene of Belgium (see pl. 20: 4).

In 1957 Keij described *Cuneocythere* (*Monsmirabilia*) *triebeli,* species found by this author in the Eocene of Belgium, England and Holland. It differs "from the other Eocene member of this subgenus in its egg-shaped outline" (*op. cit.* p. 80). Haskins (1968b), who recorded *C.* (*M.*) *triebeli* in the Eocene of England, accepts Keij's comparison of that species with other forms. According to the present author, *Cuneocythere* (*Monsmirabilia*) *triebeli* and *C.* (*M.*) *gibbosa* are at least closely related; their close relation was suggested already by Moos (1973) who had at her disposal comparative material from the Eocene of England. The sexual dimorphism, stated in this species, is not observed within Polish material; all specimens represent most probably females.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene and Lower Oligocene of Germany, Upper Eocene of Belgium.

?Cytherideid indet.
(pl. 30: 6—8)

Material. — 2 right and 1 left juvenile valves, one of them damaged.

Remarks. — General appearance of the specimens, i.e. mostly their elongate-subtriangular shape and distinct, dense porosity of the valve surfaces suggest that they represent cytherideids; it is difficult, however, to prove it, as these are juvenile forms, with undifferentiated hinge margin and very narrow duplicature. It is quite

possible that they represent at least two different species. The scarcity of the material does not allow, however, to prove it.

Occurrence. — Upper Eocene of Poland (Siemień).

Family **Krithidae** Mandelstam, 1960
Genus *Turmaekrithe* Pietrzeniuk, 1969
Turmaekrithe fragilis Pietrzeniuk, 1969
(pl. 15: 6, pl. 17: 7)

1969. *Turmaekrithe fragilis* Pietrzeniuk: 24, pl. 2: 11—13, pl. 15: 10—12.

Material. — 1 right valve, rather well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/119
	aRV
Length	0.500
Height	0.225

Remarks. — Specimen from Poland, assigned to *Turmaekrithe fragilis* Pietrzeniuk, 1969, appears to possess very close taxonomic features to the holotype and most probably is conspecific with it. However Pietrzeniuk includes into the synonymy of *T. fragilis* also *Cytheridea minuta*, described by Lienenklaus (1905), which, according to Moos (1973a), represents juvenile forms of *Paracyprideis rarefistulosa* (Lienenklaus, 1905). Thus the true taxonomic position of the *Cytheridea minuta* Lien., 1905, seems to be still open.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene of Germany.

Family **Cytherettidae** Triebel, 1952
Genus *Flexus* Neviani, 1826
Flexus erikae sp. n.
(pl. 19: 1, pl. 20: 7, 8)

Holotype: pl. 20: 7, ZPAL, No. O. XI/121.

Paratype: pl. 19: 1, ZPAL. No. O. XI/120.

Type horizon: Upper Eocene.

Type locality: Siemień, E Poland.

Derivation of the name: erikae — named in honour of the ostracod-researcher, Dr. Erika Pietrzeniuk.

Diagnosis. — Lower rib joins posteriorly, almost at the right angle, with the middle one, while anteriorly it adheres to the anterior marginal rim. Below the anterior cardinal angle a looplike protuberance occurs making a connection between the dorsal rib and anterior marginal rim. Ornamentation, especially well developed near the ribs, in form of large, shallow fosses.

Material. — 4 left and 3 right, adult valves, some of them somewhat damaged.

Dimensions (in mm):

	ZPAL. No. O. XI/120	O. XI/121
	aRV	aLV
Length	0.600	0.600
Height	0.250	0.325

Description. — Valve elongated, slim, typical in outline for genus. Left valve with distinct hinge ears, of which the anterior one is better developed. Dorsal and vent-

ral margins weakly convex. The right valve has a nearly straight ventral margin. Anterior end obliquely truncated, somewhat spiny in its lower part, posterior end narrowly rounded, almost smooth. Lateral side of carpace bears three ribs, all of them well visible in dorsal view. Middle and lower ribs join each other posteriorly by a short subvertical rib. Middle rib is somewhat sinuously bent frontally and extends up to the anterior margin, while the lower rib is more straight and distinctly passes into the anterior marginal rim, to which in its upper part a loop-shaped protuberance adheres; the latter continues posteriorly as a dorsal rib which is subparallel to the middle one. Short, straight rib occurs moreover, only in the left valve, between the lower rib and ventral margin. More or less regular, large and shallow fosses occur along and close to the ribs. Anteroventral margin as well as the most distal part of the posterior margin bear some short, tiny spines. Muscle scars difficult to distinguish.

Duplicature narrow, inner margin parallel to the ventral margin. Hinge, in the left valve, consists of posterior socket, posteromedian bar, anteromedian tooth, anterior socket and anterior lobe. Flange, especially along the anterior margin wide, reticulated outside.

Remarks. — *Flexus erikae* sp.n. resembles mostly *Cytheretta seydaensis* Pietrzeniuk, 1969, from which it differs, however, by the presence of connection between the lower and middle ribs, as well as by the presence of loop-like shaped protuberance below the anterior cardinal angle.

Occurrence. — Upper Eocene of Poland (Siemień).

Family **Schizocytheridae** Howe, 1961
Genus *Schizocythere* Triebel, 1950
Schizocythere buendensis cf. *simile* Moos, 1969
(pl. 24: 1—9)

Material. — 29 right and 34 left valves, and 2 complete carapaces of adult specimens, as well as some juvenile detached valves; most of the specimens well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/126	O. XI/127	O. XI/128
	aLV	aC	aRV
Length	0.475	0.450	0.425
Height	0.300	0.275	0.300

Variation. — There is a distinct infraspecific variation within the specimens from the Eocene of Poland. It concerns mostly the valve ornamentation which is more or less prominent and the development of latero-ventral ridge which, in the left valve only, gradually disappears posteriorly or is sharply ended by a spur-like protuberance.

Remarks. — Specimens from Poland are obviously conspecific with those ones referred by Triebel (1950) to *Schizocythere buendensis* although the Polish representatives of the species, especially the right valves, seem to have more broadly rounded anterior ends. They are especially similar and certainly related to a subspecies of *S. buendensis*, described by Moos (1969) from the Latdorf layers of Western Germany as *S. buendensis simile*. From the latter, Polish specimens differ only in details of ornamentation, mainly in the development of tubercles in the dorsal part of the valve; similarity between the Polish specimens and those referred by Moos (1969) to *S. buendensis simile* was kindly stated also by its author (Dr. Moos — personal communication), who proposed to determine the former as *S. buendensis* cf. *simile*.

Occurrence. — Upper Eocene of Poland (Siemień); *S. buendensis simile* is recorded from the Lattorfian of Germany.

Family **Cytheridae** Baird, 1850
Genus *Cytheromorpha* Hirschmann, 1909
Cytheromorpha sp.
(pl. 15: 2, pl. 31: 10)

Material. — 1 left, adult valve, well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/132 aLV
Length	0.325
Height	0.200

Description. — General shape typical for genus, with somewhat posteriorly truncated ventral margin and regular, narrowly rounded posterior end. Greatest inflation occurs in the lower part of the valve, just above ventral margin. Reticulation irregular, faint, especially well developed frontally. Tiny rib extends through the entire length of the valve, crossing distinct but shallow sulcus. Another faint rib stretches posteroventrally, starting in front and below the median sulcus then ending at the posterior margin; it borders the adventral valve inflation. Somewhat damaged outer side of the valve obscures details of the ornamentation in its central part.

Duplicature wide, particularly so anteriorly. Hinge typical of genus, i.e. in the left valve — comprising median bar terminated anteriorly by a socket, with a crescent-shaped tooth in front, while posteriorly ended by a socket with a knob-like tooth inside. Muscle scars invisible.

Remarks. — In comparison with *Cytheromorpha brabantica* Keij, 1957, described from the Eocene of Belgium, a species which seems to be most similar to the Polish one, *Cytheromorpha* sp. is less quadrate in lateral outline, being more narrowly rounded posteriorly. There are also considerable differences concerning ornamentation details of the two compared forms.

Occurrence. — Upper Eocene of Poland (Siemień).

Genus *Paijenborchella* Kingma, 1948
Paijenborchella ?lomata Triebel, 1949
(pl. 32: 4, 5)

?1969. *Paijenborchella lomata* Triebel; Scheremeta: 173, pl. 14: 15.
?1971. *Paijenborchella (Eopaijenborchella) lomata* (Triebel); Moos: 75, pl. 9: 8—10.
?1971. *Paijenborchella lomata* Triebel; Haskins: 220, pl. 1: 10—18.

Material. — 2 right, adult valves, markedly damaged.

Remarks. — In comparison with the figured holotype of *Paijenborchella lomata* Triebel, 1949, the Polish specimens do not possess sharply terminated posteriorly latero-ventral ridge; it is gently flush with the valve surface. Moreover the state of preservation, as well as the scarcity of the material, does not allow to determine them without doubt.

Occurrence. — Upper Eocene of Poland (Siemień); *P. lomata* is recorded from the Eocene of Belgium, England, France, Spain, Romania (Transylvanian Basin), Upper Eocene of Germany (including Lattorfian), Holland and USSR (Ukraine).

Paijenborchella tricostata (Lienenklaus, 1900)
(pl. 32: 6—11)

pars 1900. *Cytheropteron tricostatum* Lienenklaus: 543, pl. 22: 6.
1957. *Paijenborchella* sp. cf. *tricostata* (Lienenklaus); Keij: 158, pl. 21: 8.
1971. *Paijenborchella (Eopaijenborchella) tricostata* (Lienenklaus); Moos: 73, pl. 9: 4—7.

Material. — 10 left and 7 right, adult valves and a few juvenile valves.
Dimensions (in mm):

	ZPAL. No. O. XI/133 aLV	O. XI/137 aRV
Length	0.425	0.400
Height	0.225	0.225

Variation. — Within the collected specimens from the Eocene of Poland considerable variation concerns the size of the individuals as well as their morphology. Median as well as the latero-ventral ridges are of different length, being at the same time elevated and thickened to a different degree.

Remarks. — Determination of that species is based on the description and illustration given by Moos (1971). Specimens from the Eocene of Poland do not seem to differ from those assigned by Moos (1971) to *Paijenborchella tricostata*, or from that described by Keij (1957) as *Paijenborchella* sp. cf. *tricostata* which, according to Moos, represents *P. tricostata*.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene of Romania (Transylvanian Basin), Oligocene of Belgium and Germany.

Family **Xestoleberididae** Sars, 1928

Genus *Xestoleberis* Sars, 1866

Xestoleberis sp.

(pl. 15: 3, pl. 32: 3)

Material. — 1 left, adult valve, well preserved.
Dimensions (in mm):

	ZPAL. No. O. XI/141 aLV
Length	0.500
Height	0.325

Description. — Valve subovate in lateral outline, elongated, highest posteriorly, in 1/3 of the length where it is also most inflated. Dorsal margin somewhat angulate at the maximum height as well as postero-dorsally where it is more rounded. Posterior end broadly rounded, anterior end slightly truncated in its upper part, rather narrowly rounded. Ventral margin almost straight, weakly concave frontally. Valve surface smooth, glossy.

Hinge typical for genus, i.e. consisting of a bar terminated by elongated, shallow sockets. Duplicature well developed along the anterior margin, while narrow in the posterior end.

Remarks. — Specimen attributed to *Xestoleberis* sp., from the Eocene of Poland, is similar in its general shape to representatives of *X. elongata*, a species described by Lienenklaus (1894) from the Oligocene of Germany. The description and illustration of the latter, however, are not sufficient to state their taxonomic relation.

Occurrence. — Upper Eocene of Poland (Siemień).

Genus *Pulaviella* Szczechura, 1965

Pulaviella muelleriana (Lienenklaus, 1900)

(pl. 32: 2, 12)

1900. *Xestoleberis muelleriana* Lienenklaus: 531, pl. 21: 5.
1957. *Xestoleberis muelleriana* Lienenklaus; Keij: 166, pl. 11: 11.
1969. *Xestoleberis muelleriana* Lienenklaus; Pietrzeniuk: 108, pl. 4: 12, 13, pl. 19: 13.

Material. — 2 left, adult valves and 3 juvenile valves, all well preserved.

Dimensions (in mm):

	ZPAL. No. O. XI/142
	aLV
Length	0.425
Height	0.275

Remarks. — Specimens assigned to *Pulaviella muelleriana* (Lien., 1900) show taxonomic features, mainly the hinge type, typical for *Pulaviella* and therefore are included to this genus; they have paleomerodont instead hemimerodont, not like in *Xestoleberis*, type of the hinge. Existence of well visible reniform scar below the eye region, figured also in the specimen belonging to this species by Pietrzeniuk (1969), allows to put the *Pulaviella* genus into the Xestoleberididae. Erecting this genus (Szczechura 1965), the author included it to the uncertain family because of the lack of information concerning muscle scars within the specimens available.

Pulaviella muelleriana seems to be close to *Pulaviella ovata* (Bonnema 1941), species known from the Cretaceous of Europe, from which it differs, however, being smaller, having more rounded anterior end and more angulate postero-ventral margin.

Occurrence. — Upper Eocene of Poland (Siemień), Eocene of France and Spain, Eocene and Oligocene of Germany and Turkey, Lower Oligocene of Belgium.

Family **Loxoconchidae** Sars, 1925

Loxoconchid indet.

(pl. 15: 12, pl. 31: 9)

Material. — 1 right adult and 1 right juvenile valve, rather poorly preserved

Dimensions (in mm):

	ZPAL. No. O. XI/145
	aRV
Length	0.300
Height	0.175

Description. — Valve very small, subovate in outline. Dorsal margin straight, ventral margin slightly incised near the middle, weakly converging to the dorsal one. Anterior and posterior margins broadly rounded, truncated. Valve distinctly, rather uniformly inflated, bearing inconspicuous depression in the upper part of its central region. Short and abrupt, small protuberance occurs postero-ventrally; it is situated in a shallow but well marked depression. Valve surface faintly reticulated. Duplicature relatively large, hinge — as shown on pl. 15: 12. Muscle scars difficult to be seen.

Remarks. — Above described specimen resembles mostly, according to its shape and hinge, specimens referred to the genus *Loxoconcha*. Its hinge, however, differs somewhat from the latters in details, especially in the posterior part; it consists there of the knob-like tooth bordered by distinct sockets, i.e. is a contrary structure to that known in *Loxoconcha*. It is possible that the above described from is another example of the inverse hinge observed in Loxoconchinae (see Triebel & Malz 1969).

Occurrence. — Upper Eocene of Poland (Siemień).

Family uncertain

gen. et sp. indet.

(pl. 25: 5)

Material. — 1 right, presumably juvenile valve, somewhat damaged.

Dimensions (in mm):

	ZPAL. No. O. XI/146
	?jRV
Length	0.375
Height	0.225

Description. — Valve small, subovate in general outline and in view from above. Dorsal and ventral margins almost straight, weakly converging posteriorly; anterior cardinal angle distinctly marked, while the posterior one not so much. Anterior end broadly rounded, posterior end somewhat truncated, angularly rounded near the ventral margin. Valve ornamentation consisting of concentrically arranged pillar-like protuberances, densely distributed overall valve surface, seems to be characteristic. Inner side of the valve obscured, appearing, however, adont hinge margin and very narrow duplicature.

Remarks. — General shape of the valve resembles cytheridied representatives, its ornamentation, however, suggests its assignment to *Echinocythereis*. More material is necessary to establish the taxonomic position of the discussed specimen.

Occurrence. — Upper Eocene of Poland (Siemień).

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JANINA SZCZECHURA

MAŁŻORACZKI Z GÓRNEGO EOCENU WSCHODNIEJ POLSKI

Streszczenie

Szczątkowo zachowane osady górnego eocenu, występujące w odsłonięciach w Siemieniu, we wschodniej Polsce, wykształcone są w postaci piasków glaukonitowych. Zawierają one zarówno mikro- jak i makrofaunę, z której małże, otwornice, kokko-

lity i wapienne mikroszczątki o nieokreślonej pozycji systematycznej zostały opracowane wcześniej (Woźny 1977; Pożaryska 1977; Locker *in*: Pożaryska & Locker 1971; Szczechura 1969). Dokładny wiek osadów ustalono głównie na podstawie otwornic pelagicznych i nannoplanktonu; ustalono iż odpowiada on dolnej części górnego eocenu, a ściślej dolnej zonie *Globigerapsis semiinvolutus* i *Discoaster tani-nodifer*. Małżoraczki potwierdzają górno-eoceński wiek tych osadów.

Małżoraczki, aczkolwiek stosunkowo rzadkie w próbach z Siemienia, łącznie liczą 40 gatunków i reprezentują 32 rodzaje; 2 gatunki: *Pterygocythereis siemienensis* i *Flexus erikae* opisano jak nowe. Dominującymi gatunkami są: *Schizocythere buendensis* cf. *simile* Moos, *Bairdoppilata gliberti* Keij i *Schuleridea* (*Aequacytheridea*) *perforata* (Roemer).

Korelacja regionalna zespołu gatunków rozpoznanych w osadach z Siemienia pozwoliła stwierdzić, że jest on najbardziej podobny do zespołu małżoraczków górno-eoceńskich występujących w RFN i NRD, Belgii i ZSRR (Ukraina), a różni się wyraźnie od zespołu małżoraczków tego wieku, znanych z Anglii i Francji. Polskie stanowisko małżoraczków górno-eoceńskich stanowi więc niejako pomost łączący NW i SE Europy i określa ich zasięg. Na uwagę zasługuje fakt, że pewne elementy tego zespołu małżoraczków opisano z Rumunii (Basen Transylwanii) i z Turcji.

Warunki środowiskowe małżoraczków z Siemienia określa się jako morskie, o pełnym zasoleniu, płytkowodne, o głębokości nie większej niż 50 m. i temperaturze wody umiarkowanie ciepłej tj. max. 16—18 °C.

Niniejsza praca została wykonana w ramach problemu międzyresortowego II/3.

ЯНИНА ЩЕХУРА

ОСТРАКОДЫ ВЕРХНЕГО ЭОЦЕНА ВОСТОЧНОЙ ПОЛЬШИ

Резюме

Частично сохранившиеся отложения верхнего эоцена, которые встречаются в обнажениях в Семеню в Восточной Польше, представляют собой глауконитовые пески. Они содержат как микро-, так и макрофауну, причём моллюски, фораминиферы, кокколиты и известковые микроостатки, неопределённой позиции в систематике были изучены ранее (Возьны 1977; Пожарыска 1977; Локкер: Пожарыска и Локкер 1971, Щехура 1969). Точный возраст отложений был определён, главным образом, на основе пелагических фораминифер и наннопланктона;

он соответствует нижней части верхнего эоцена, а точнее нижней зоне *Globigerapsis semiinvolutus* и *Discoaster taninodifer*. Ракушковые подтверждают верхне-эоценский возраст этих осадков.

Ракушковые, хотя и встречаются довольно редко в пробах Семеня, насчитывают 40 видов и представляют 32 рода, причём 2 вида: *Pterygocythereis siemienensis* и *Flexus erikae* были описаны впервые. Преобладающими видами являются: *Schizocythere buendensis cf. simile* Moos, *Bairdoppilata gliberti* Keij и *Schuleridea* (*Aequacytheridea*) *perforata* (Roemer).

Региональная корреляция собраний распознанных видов в отложениях Семеня даёт возможность утверждать, что такая совокупность ракушковых подобна до верхне-эоценских ракушковых, выступающих в Германии, Бельгии и СССР (Украина), и она резко отличается от совокупности ракушковых этого же возраста известных в Англии и Франции. Польское местонахождение верхне-эоценских ракушковых является как бы связующим звеном для Западной и Восточной Европы и определяет распространение этих ракушковых. Следует обратить внимание на факт, что некоторые элементы этой ассоциации ракушковых были описаны в Румынии (Трансильванский бассейн) и в Турции.

Условия существования ракушковых Семеня можно охарактеризовать как морские, большой солёности, мелководные, не превышающие глубины 50 м, а также умеренно тёплые, т.е. максимальная температура воды 16—18° С.

EXPLANATION OF PLATES

All the figured specimens, unless stated otherwise, are from the Upper Eocene of Siemień

Plate 15

1. *Cytheridea* sp.: inner side of alV, ZPAL O. XI/9.
2. *Cytheromorpha* sp.: inner side of alV, ZPAL O. XI/132.
3. *Xestoleberis* sp.: inner side of alV, ZPAL O. XI/141.
4. *Cytheropteron brevelata* Pietrz.: inner side of aRV, ZPAL 94.
5. *Cuneocythere (Monsmirabilia) gibbosa* (Lien.): inner side of aLV, ZPAL O. XI/110.
6. *Turmaekrithe fragilis* Pietrz.: inner side of aRV, ZPAL O. XI/119.
7. *Microcytherura* sp.: inner side of aRV, ZPAL O. XI/109.
8. *Schuleridea (Aequacytheridea) perforata* (Roemer): inner side of aLV, ZPAL O. XI/1.

9. *Bythocypris arcuata* (Münster): muscle scars of aRV, ZPAL 23.
10. *Hermanites memorans memorans* Moos: muscle scars of aRV, ZPAL O. XI/108.
11. *Martinicythere spinifera* (Pietrz.): muscle scars of aLV, ZPAL O. XI/76.
12. *Loxoconchid* sp.: hinge margin of aRV, ZPAL O. I/144.

Scales correspond to 0.1 mm

Plate 16

1, 2. *Bythocypris arcuata* (Münster): *1* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/21, × 45; *2* inner (*a*) and outer (*b*) sides of aRV, ZPAL O. XI/22, × 45.

3. *Propontocypris triangulata* Pietrz.: inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/24, × 60.

4—8. *Cytherella ?compressa* (Münster): *4* inner side of aLVF, ZPAL O. XI/10, × 65; *5* outer side (*a*) and dorsal view (*b*) of aRVF, ZPAL O. XI/11, × 65; *6* outer (*a*) and dorsal view (*b*) of aRVM, ZPAL O. XI/12, × 60; *7* outer side (*a*) and ventral view (*b*) of aLVF, ZPAL O. XI/13, × 60; *8* outer side of aLVM, ZPAL O. XI/14 × 65.

Plate 17

1—4. *Bairdoppilata gliberti* Keij: *1* outer side of jLV, ZPAL O. XI/17, × 60; *2* outer side of jRV, ZPAL O. XI/18, × 60; *3* outer side of aRV, ZPAL O. XI/19, × 60; *4* outer (*a*) and inner (*b*) sides of aLV, ZPAL, O. XI/20, × 60.

5, 6. *Cytherelloidea* sp.: *5* outer side of aLV ZPAL O. XI/15; *6* outer side of the damaged aRV, ZPAL O. XI/16, × 70.

7. *Turmaekrithe fragilis* Pietrz.: *7* inner (*a*) and outer (*b*) sides of aRV, ZPAL O. XI/119, × 80.

Plate 18

1—7. *Schuleridea (Aequacytheridea) perforata* (Roemer): *1* outer, lateral side (*a*), dorsal side (*b*) and ventral side (*c*) of aCF, ZPAL O. XI/2, × 60; *2* inner (*a*) and outer (*b*) sides aLVM, ZPAL O. XI/3, × 60; *3* inner side of aRVM, ZPAL O. XI/4, × 60; *4* outer side of aRVF, ZPAL O. XI/5, × 60; *5* outer side of aRVM, ZPAL O. XI/6, × 60; *6* outer side of aLVF ZPAL O. XI/7, × 60; *7* outer side of aLVM, ZPAL O. XI/8, × 70; SEMicrograph.

Plate 19

1. *Flexus erikae* sp.n.: inner (*a*) and outer (*b*) sides of aRV, paratype, ZPAL O. XI/120, × 85.

2—8. *?Costa angustatissima praecursor* Moos: *2* outer side of aLV, ZPAL O. XI/50, × 75; *3* outer side of aRV, ZPAL O. XI/51, × 75; *4* outer (*a*) and inner (*b*) sides of aRV, ZPAL O. XI/46, × 75, × 90; *5* outer side of aLV, ZPAL O. XI/45, × 85; *6, 7*, outer sides of jRV, ZPAL O. XI/47, 48, × 80, × 75; *8, a* outer side of aLV, × 105, and *b* fragment, × 200, ZPAL O. XI/49; SEMicrographs.

2, 3 specimens from the Upper Eocene (Ledien) of Belgium (Forest loc.)

Plate 20

1—6. *Cuneocythere* (*Monsmirabilia*) *gibbosa* (Lien.): *1, 3, 4, 6*, outer sides of aRV, ZPAL O. XI/110, 114, 115, × 95 and O. XI/113, × 115 — SEMicrograph; *2* outer side of aLV, ZPAL O. XI/111, × 100; *5* inner side of aLV, ZPAL O. XI/112, × 90.

7, 8. *Flexus erikae* sp.n.: *7* outer (*a*) and inner (*b*) sides of aLV, holotype, ZPAL O. XI/121, × 85; *8* outer side (*a*) of aLV, × 80 and frontal part (*b*) of the same specimen seen from the outer side, × 210, ZPAL O. XI/122. SEMicrographs.

3 specimen from Eocene of Germany (Bastorf loc.); *4* specimen form the Upper Eocene (Wemmel sand) of Belgium (Wemmel loc.)

Plate 21

1. *Cytherura* sp.: outer side (*a*) and inner side (*b*) of jLV, ZPAL O.XI/93, × 110.

2—6. *Acanthocythereis spiniferrima* (Jones & Sherborn): *2* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/30, × 65; *3* outer side of aLV, ZPAL O.XI/33, × 70; *4, a* outer side of aRV, × 75 and *b* fragment of the central part of the outer side, × 190, ZPAL O. XI/34; *5* outer side of aRV, ZPAL O. XI/31, × 60; *6* outer (*a*) and inner (*b*) sides of aRV, × 65, ZPAL O. XI/32, × 60, × 65.

3, 5 SEMicrographs

Plate 22

1—6. *Oertiella aculeata* (Bosq.): *1, 3* outer sides of aLV, ZPAL O.XI/52, 54, × 50, × 55; *2* outer side of aRV, ZPAL O. XI/53, × 60; *4* outer (*a*) and inner (*b*) sides of aRV, ZPAL O. XI/55, × 60; *5* outer (*a*) and inner (*b*) sides of aLV, ZPAL O. XI/56, × 60; *6, a* outer side of aRV, ZPAL O. XI/57, × 70, *b* details of the surface ornamentation, × 1000, SEMicrographs.

1 specimen from the Paleocene of northern Poland, Pamiętowo boring

Plate 23

1—7. *Hazelina indigena* Moos: dorsal (*a*) ventral (*b*) and outer, lateral (*c*) sides of aC, ZPAL. No. O. XI/38, ×80; *2* inner (*a*) and outer (*b*) sides aLV, ZPAL O. XI/40, × 75; *3, 4* outer sides of aRV, ZPAL O. XI/41, 39, × 70, × 80; *5* outer side of aRV ZPAL O. XI/42, × 110; *6* outer side of aLV, ZPAL O. XI/43, × 110; *7, a* hinge margin of aLV, × 145, *b* inner side of the same specimen, ZPAL O.XI/44, × 90.

5—7 SEMicrographs

3 specimen from the Upper Eocene of Moldavia (USSR)

Plate 24

1—9. *Schizocytere buendensis* cf. *simile* Moos: *1—3* outer sides of jLV, ZPAL O. XI/123—125, × 80, × 80, × 75; *4* outer side of aLV ZPAL O. XI/126, × 75; *5* outer lateral side (*a*) dorsal side (*b*) and ventral side (*c*) of aC, ZPAL O. XI/127, × 80; *6, 7* outer sides of aRV, ZPAL O. XI/128, 129, × 130, × 135; *8* outer side of aLV, ZPAL O. XI/130, × 140; *9, a* hinge margin of aRV, × 120, *b* inner side of the same specimen, ZPAL O. XI/131, × 85.

6—9 SEMicrographs

Plate 25

1—4. *Cytheropteron brevelata* Pietrz.: *1* outer side of the damaged aLV, ZPAL O. XI/95; *2* outer side of aRV, ZPAL O. XI/96; *3* outer side of jRV, ZPAL O. XI/97; *4* outer side of aLV ZPAL O. XI/80, × 80.

5. Gen. et sp. indet.: outer (*a*) and inner (*b*) sides of ?jRV, ZPAL O. XI/146, × 80.

6—11. *Martinicythere spinifera* (Pietrz.): *6—8* outer sides of jRV, ZPAL O. XI/71—73, × 60; *9* outer side of aRV, ZPAL O. XI/74, × 120; *10* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/75, ×80; *11a* outer side of aRV, ZPAL No. O. XI/77, × 100, *b* fragment, × 200, SEMicrographs.

Plate 26

1—6. *Muellerina elongata* (Scher.): *1* outer (*a*) and inner (*b*) sides of aRV, ZPAL, O. XI/65; *2* outer side of the damaged aRV, ZPAL O. XI/66; *3—5* outer sides of jRV, ZPAL O. XI/67—69, × 80; *6* outer side of aRV, ZPAL O. XI/70, × 70.

7—9. *Occultocythereis gradata* Pietrz.: *7* outer side of aLV, ZPAL O. XI/36; *8* inner (*a*) and outer (*b*) sides of aRV, ZPAL O. XI/36, × 80; *9a* outer side of aRV, ZPAL O. XI/37 × 110, *b* fragment, × 200, SEMicrographs.

6 specimen from the Upper Eocene (Wemmel sand) of Belgium (Wemmel loc.)

Plate 27

1—3. *Quadracytere (Hornibrookella) vahrenkampi* Moos; *1* outer (*a*) and inner (*b*) sides of aRV, ZPAL O. XI/90; *2* outer side of aLV, ZPAL O. XI/91, × 80; *3* hinge margin of aRV, ZPAL O. XI/92, × 155.

4—7. *Hermanites memorans memorans* Moos: *4* outer side of aLV, ZPAL O. XI/80, × 60; *5a* outer side of aLV, ZPAL, No. XI/81, × 80, *b* fragment, × 100; *6* inner (*a*) and outer (*b*) sides of aRV, ZPAL O. XI/78, × 60; *7* outer side of aRVM, ZPAL O. XI/79, × 60.

2, 3, 5 SEMicrographs

Plate 28

1. ?*Diebelina* sp.: *1* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/64, × 80.

2—9. *Quadracythere diversinodosa* (Lien.): *2—4* outer sides of jLV, ZPAL O. XI/82—84; *5, 6* outer sides of jLV, ZPAL O. XI/85, 86; *7* outer side of aRV, ZPAL O. XI/89, × 80; SEMicrograph. *8* outer (*a*) and inner (*b*) sides of aRV, ZPAL O. XI/87; *9* outer (*a*) and and inner (*b*) sides of aLV, ZPAL O. XI/88, × 80.

Plate 29

1. *Echinocythereis* cf. *scabella* (Lien.): *1* outer (*a*) and inner (*b*) sides of aRV, ZPAL O. XI/62, × 50.

2—5. *Leguminocythereis decipiens* (Lien.): *2* ventral (*a*), dorsal (*b*) and outer, lateral (*c*) sides of aCF, ZPAL O. XI/58; *3* outer side of aLVF, ZPAL O. XI/60; *4* outer (*a*) and inner (*b*) sides of aRVM, ZPAL O. XI/59; *5* outer (*a*) and inner (*b*) sides of aLVM, ZPAL O. XI/61, × 60.

Plate 30

1—4. *Pterygocythereis siemienensis* n.sp.: *1* inner (*a*) and outer (*b*) sides of aLV, holotype, ZPAL O. XI/26; *2* inner (*a*) and outer (*b*) sides of aRV, paratype. ZPAL O. XI/27, × 60; *3, 4* outer sides of aLV, ZPAL O. XI/28, 29, × 55.

5. *Cytheridea* sp.: *5* outer (*a*) and inner (*b*) sides of aLV, ZPAL O. XI/9, × 85.

6—8. *?Cytherideid* sp.: *6, 8*, outer sides of jRV, ZPAL O. XI/116, 118; *7* outer side of jLV, ZPAL O. XI/117, × 100.

9. *Pterygocythereis ?fortinodosa* Pietrz.: outer side of the damaged, aLV, ZPAL O. XI/25, × 50.

Plate 31

1. *Eucytherura keiji* Pietrz.: *1a* outer side of aRV, ZPAL O. XI/99, × 170, *b, c*, details of ornamentation, × 3000, × 1000.

2—7. *Eucytherura ?macropora* (Lien.): *2* outer side of aRV, ZPAL O. XI/101, × 150; *3* outer side of aLV, ZPAL O. XI/102, × 140; *4* outer side of aRV, ZPAL O. XI/103, × 85; *5, 6* outer sides of aLV, ZPAL O. XI/104, 105, × 85; *7* outer side of jLV, ZPAL O. XI/106, × 70.

8. *Eucytherura quadropustulata* Moos: outer side of aRV, ZPAL O. XI/107, × 70.

9. *Loxoconchid* sp.: outer side of aRV, ZPAL O. XI/145, × 100.

10. *Cytheromorpha* sp.: outer side of aLV, ZPAL O. XI/132, × 110.

1—3 SEMicrographs

Plate 32

1. *Microcytherura* sp.: *1* inner (*a*) and outer (*b*) sides of aRV, ZPAL, O. XI/109, × 65.

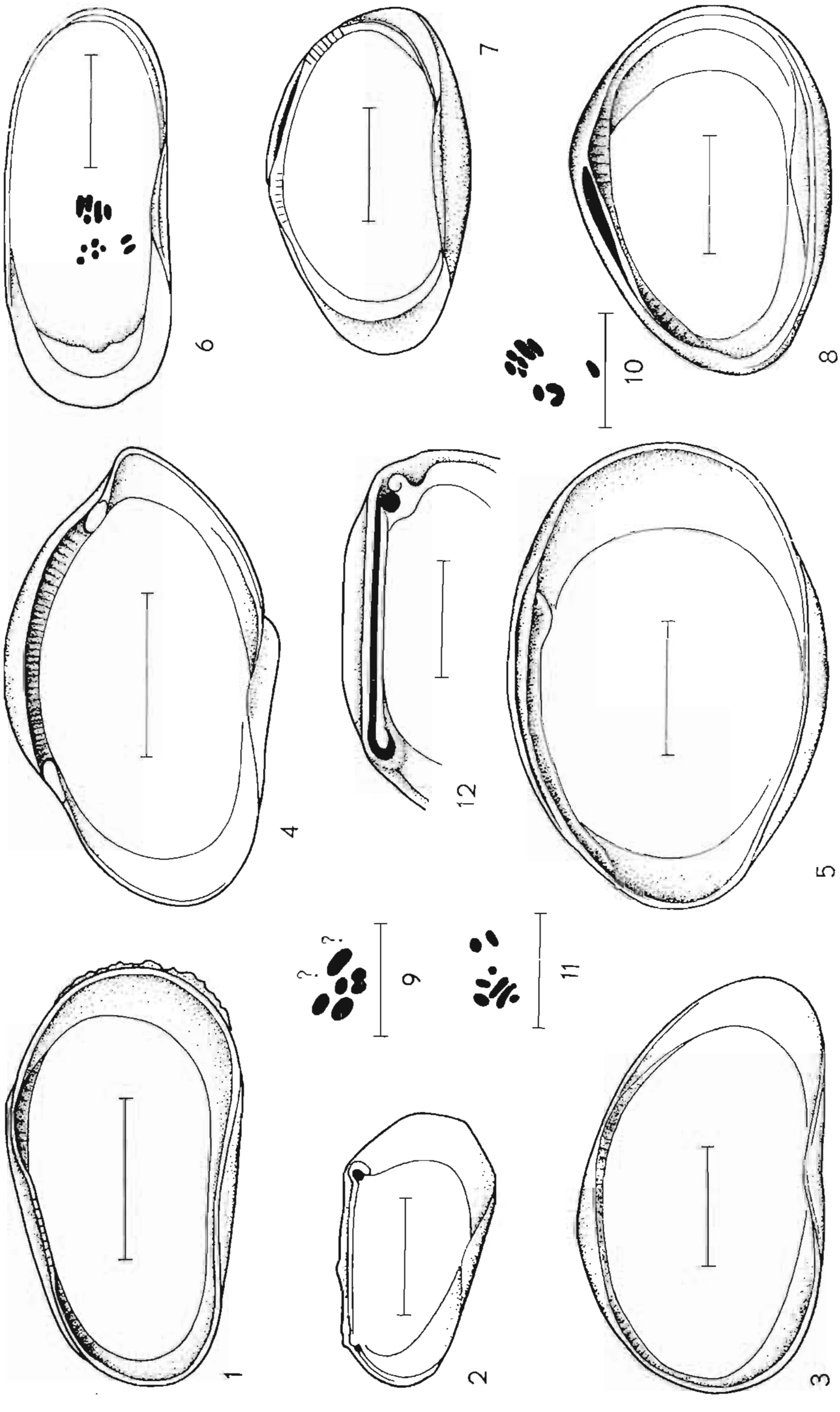
2, 12. *Pulaviella muelleriana* (Lien.); *2* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/142, × 65; *12, a* inner side of aLV, × 140 *b* details of the anterior margin, ZPAL O. XI/143, × 530.

3. *Xestoleberis* sp.: *3* inner (*a*) and outer (*b*) sides of aLV, ZPAL O. XI/141, × 60.

4, 5. *Paijenborchella ?lomata* Triebel; *4, 5* outer sides of aRV, ZPAL O. XI/139, 140, × 60, × 65.

6—11. *Paijenborchella tricostata* (Lien.); *6, 7, 11*, outer sides of aLV, ZPAL O. XI/133, 134, 138, × 60, × 65, × 140; *8* outer side of jLV, ZPAL O. XI/135, × 65; *9, 10* outer sides of aRV, ZPAL O. XI/137, 136, × 70, × 60.

11, 12 SEMicrographs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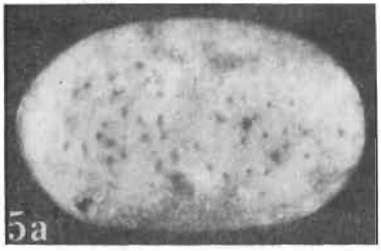
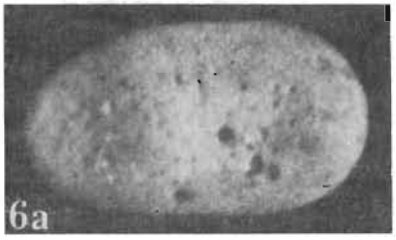
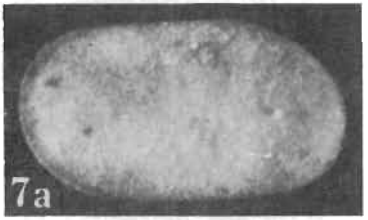
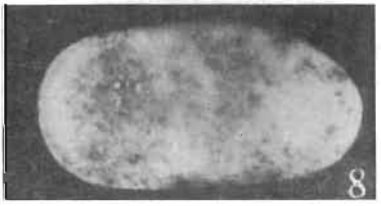
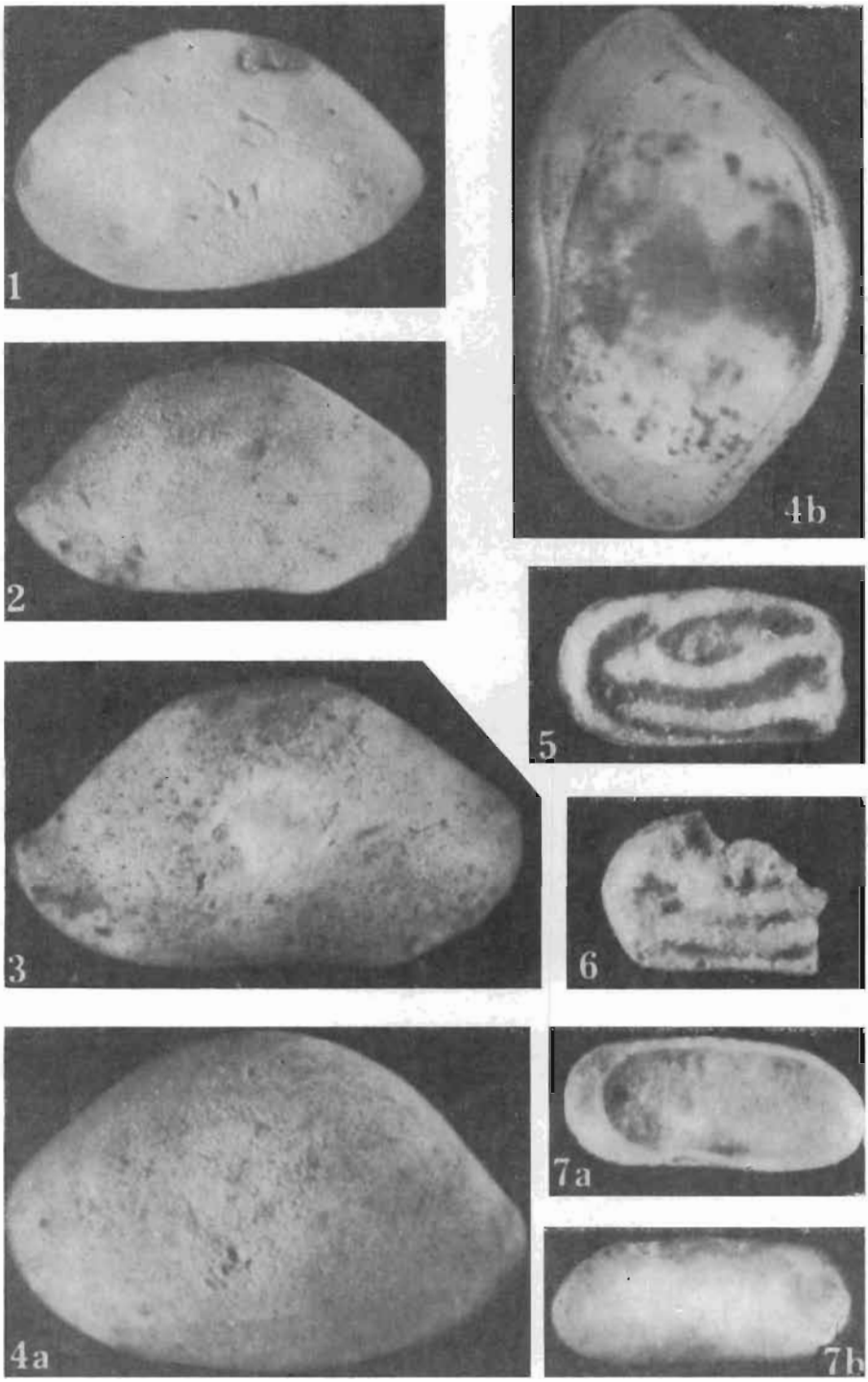








phot. M. Radzikowska



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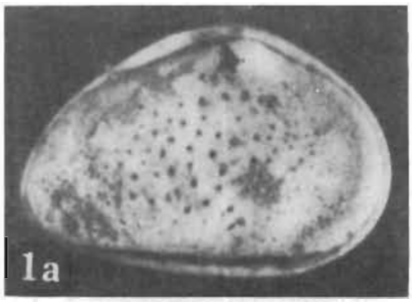

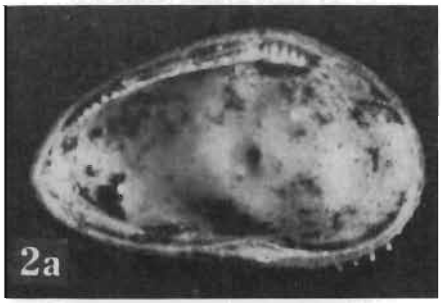

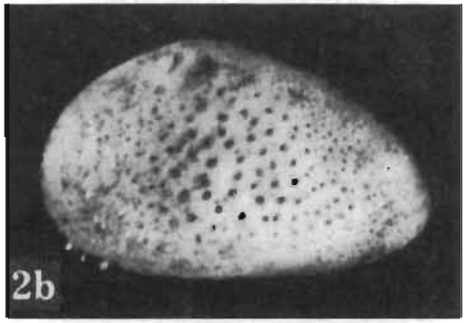

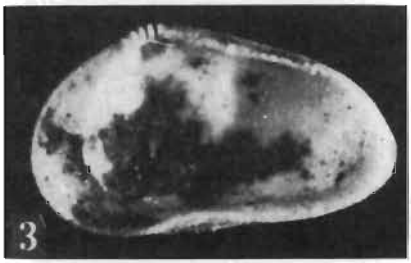

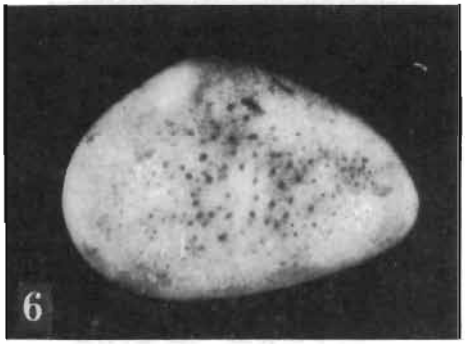

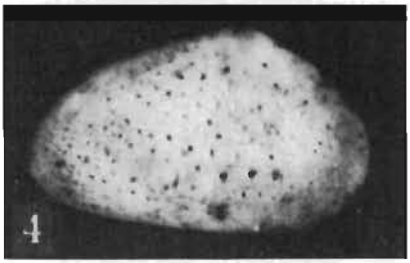

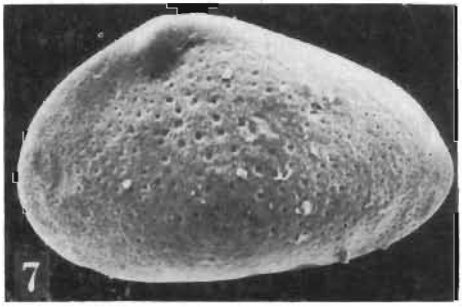

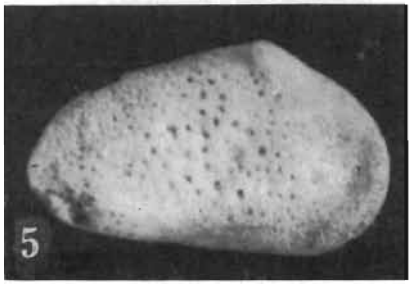

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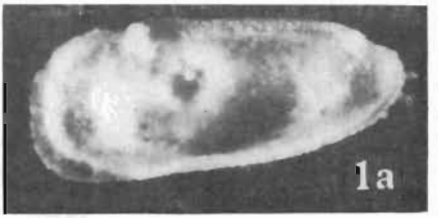

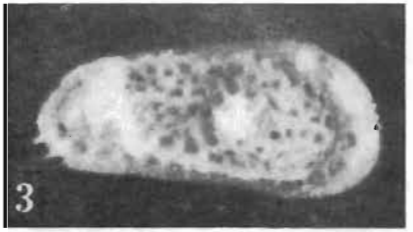

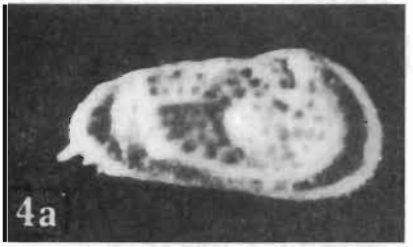

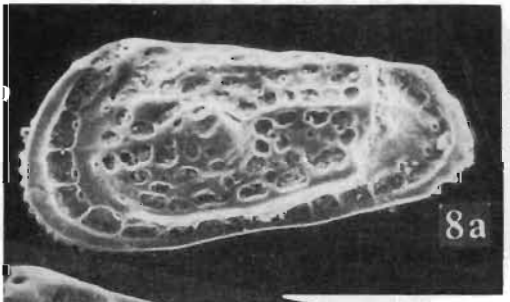

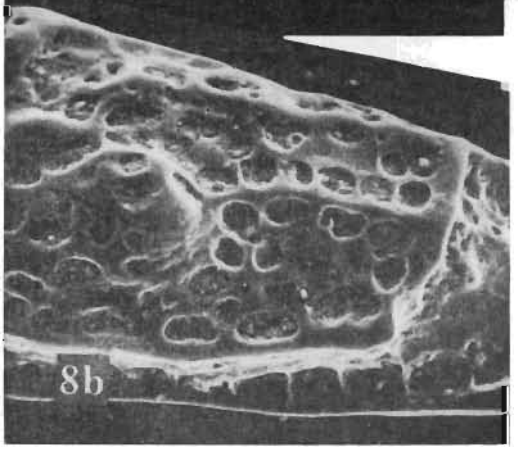

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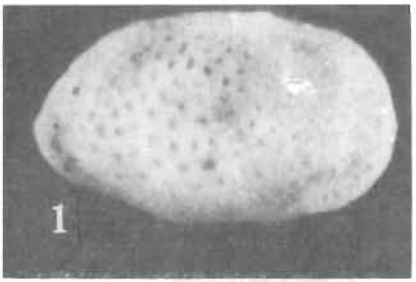

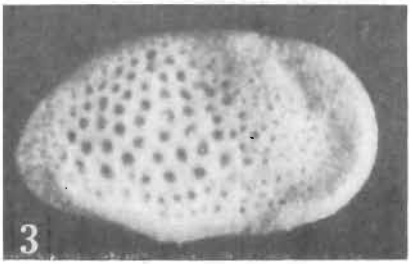

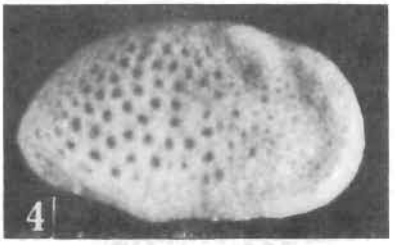

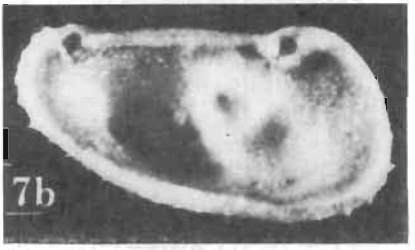

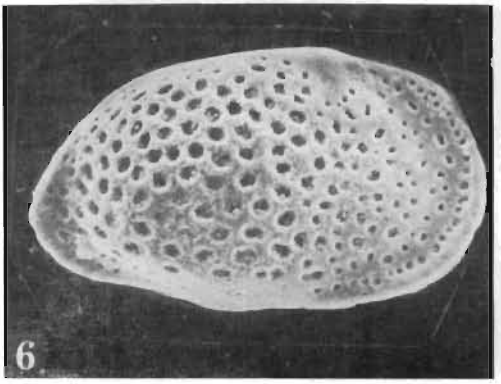

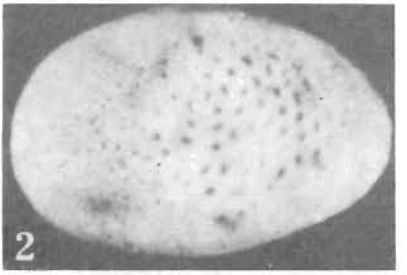

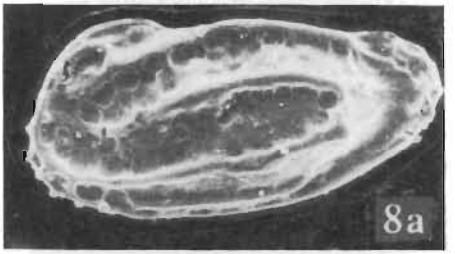

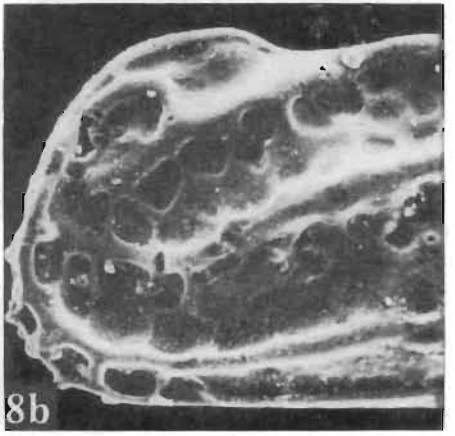

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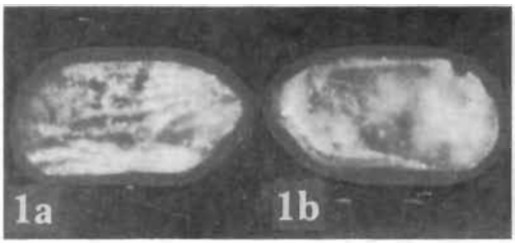

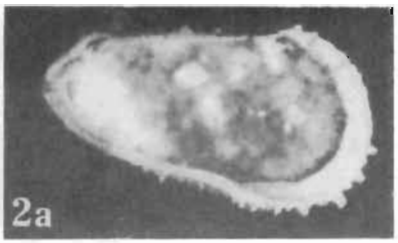

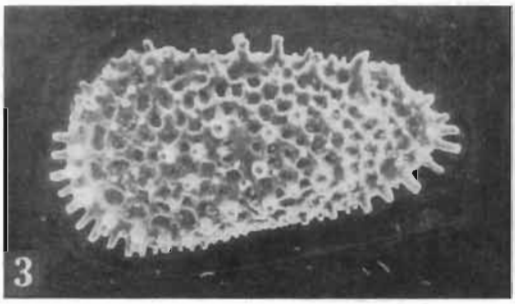

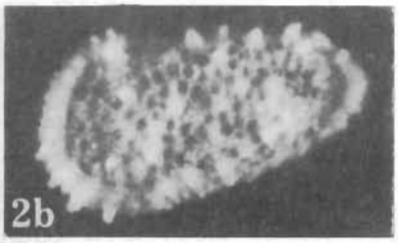

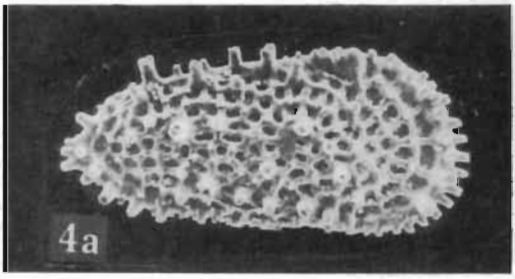

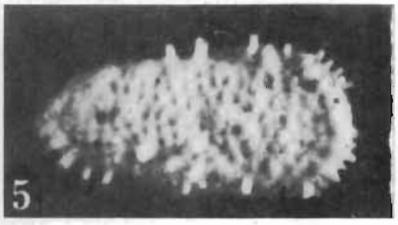

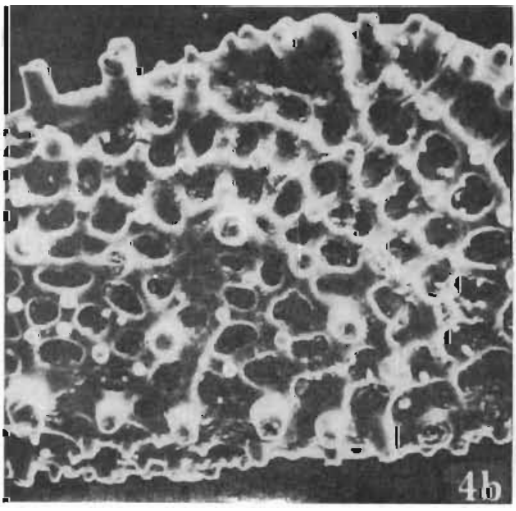

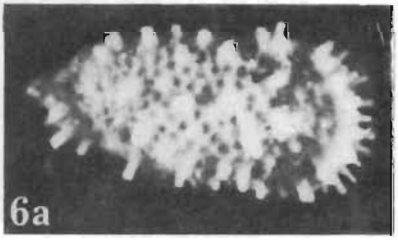

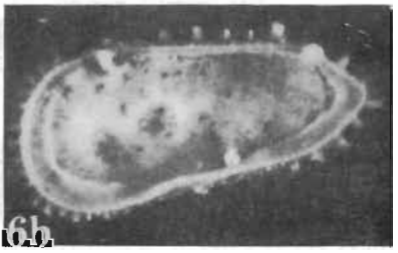

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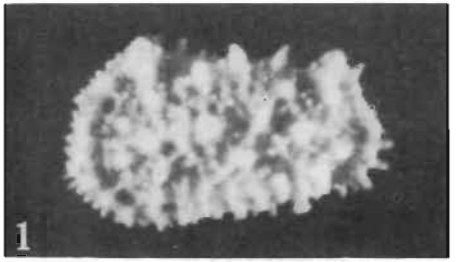

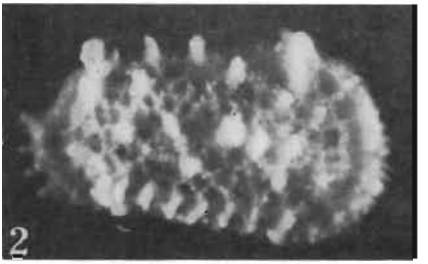

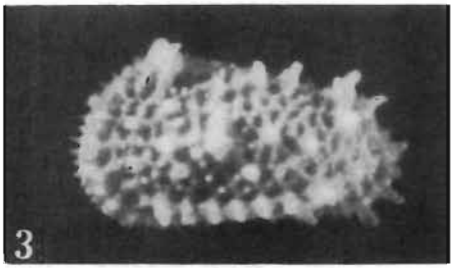

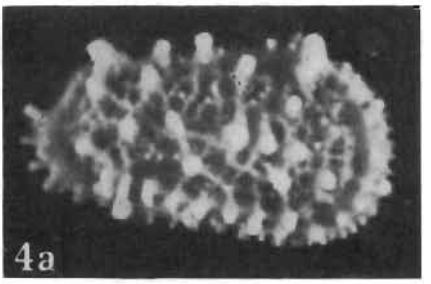

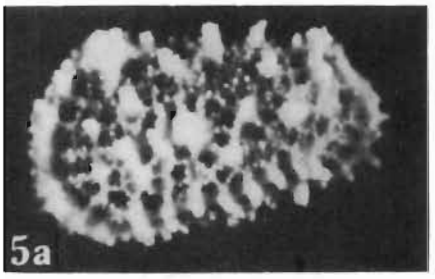

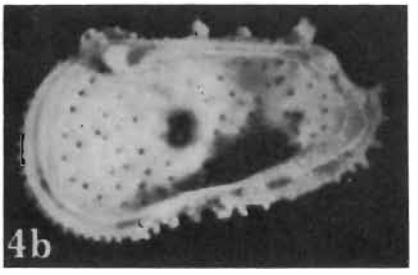

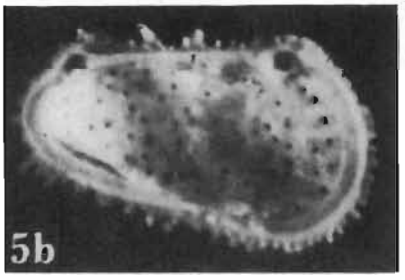

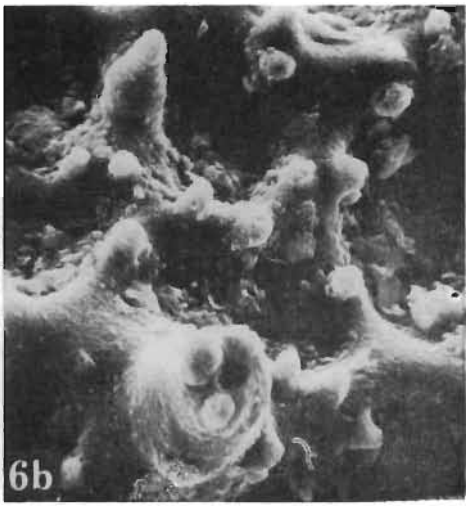

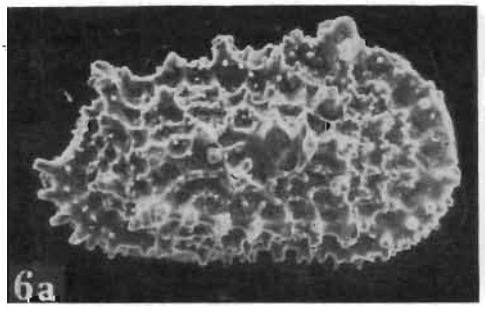

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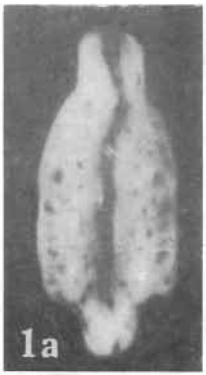

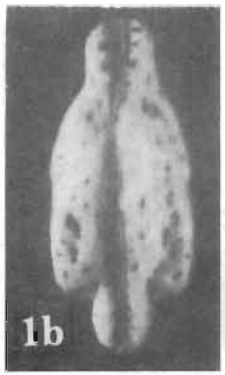

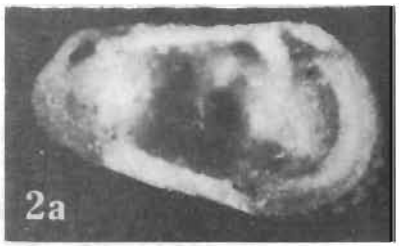

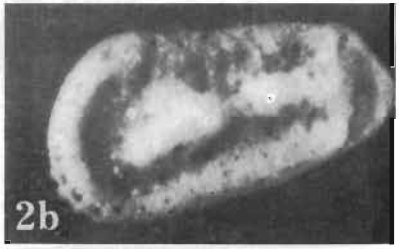

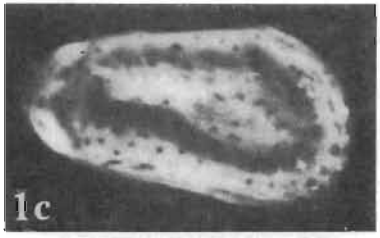

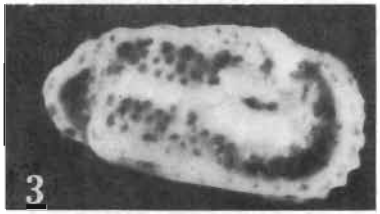

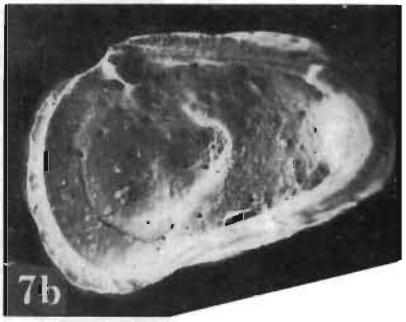

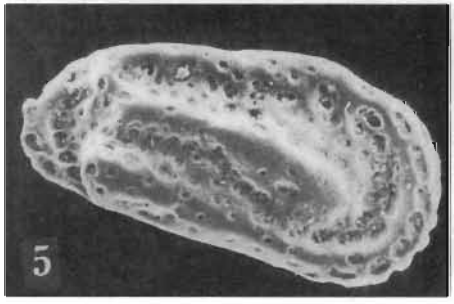

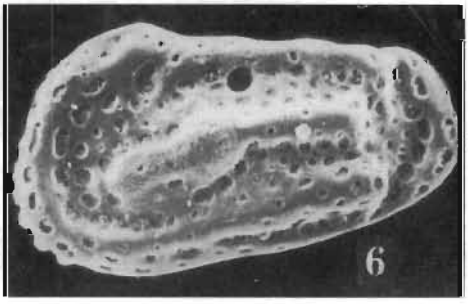

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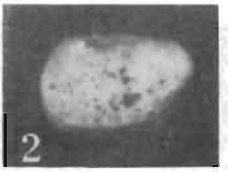

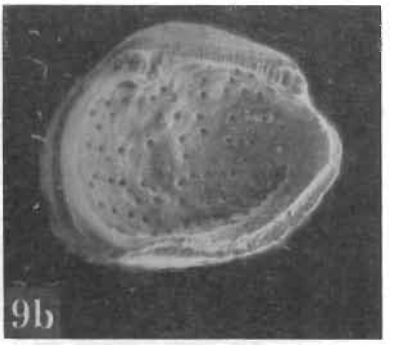

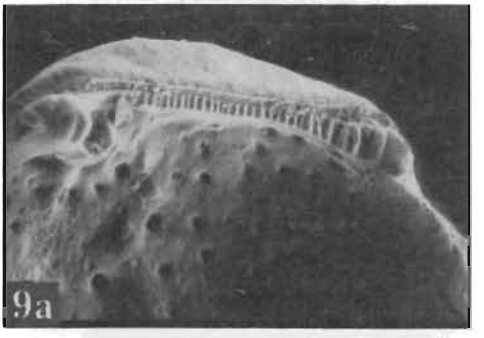

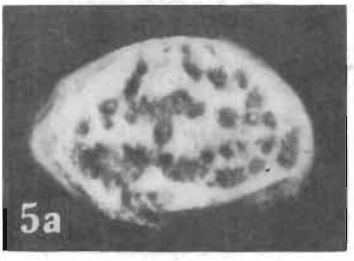

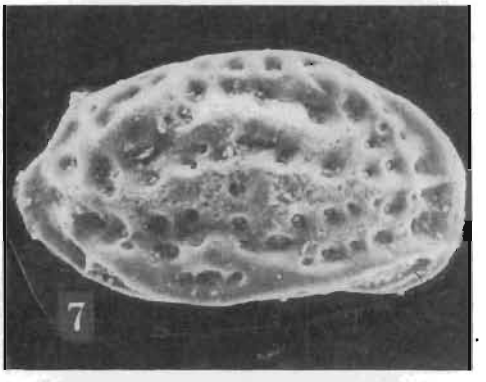

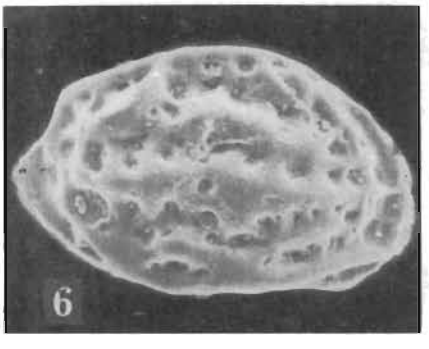

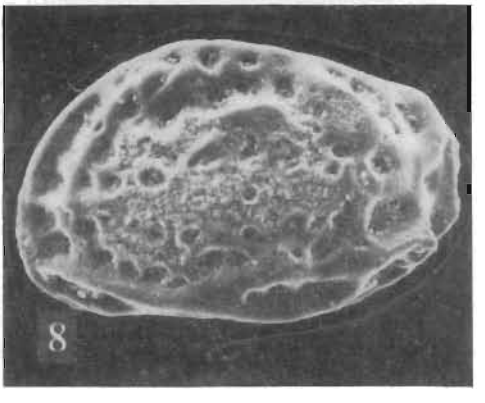

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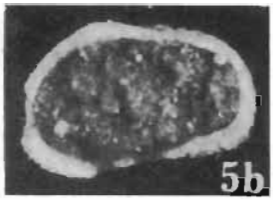

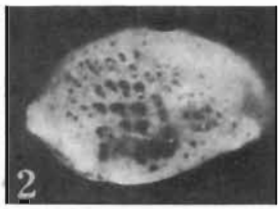

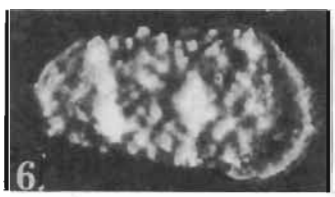

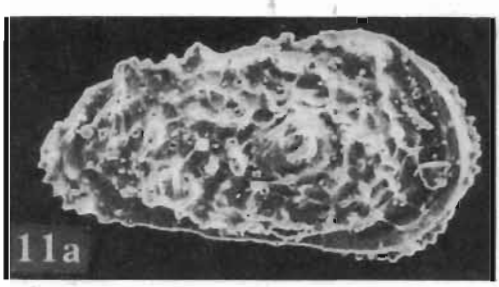

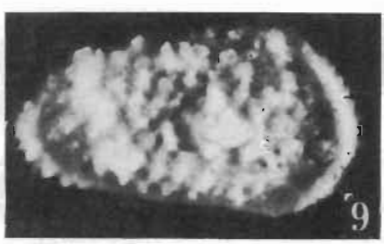

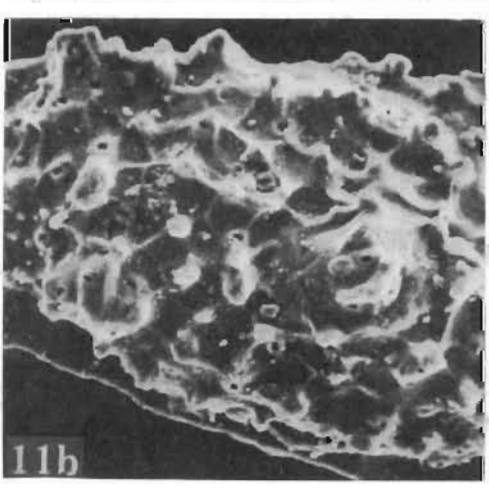

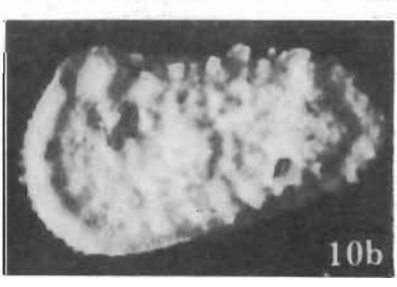

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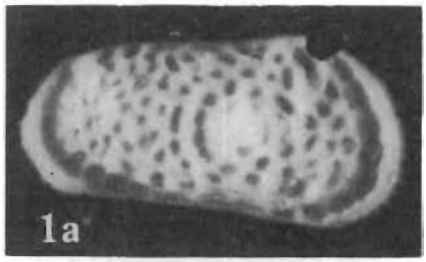
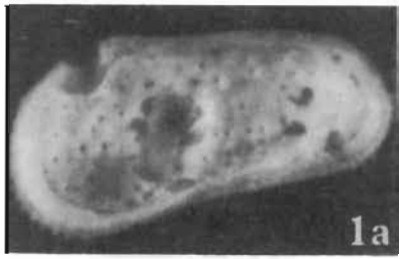
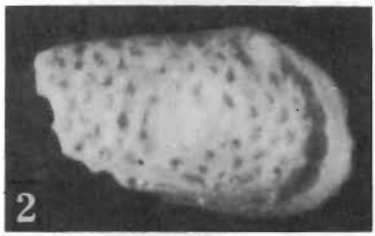
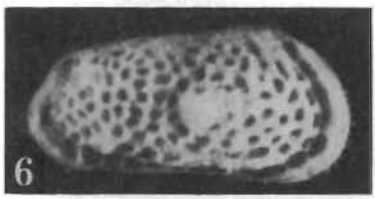
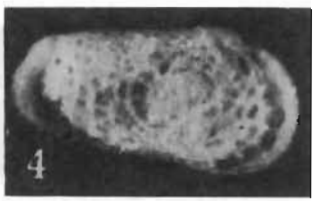
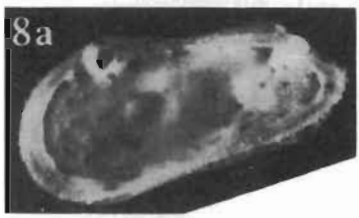


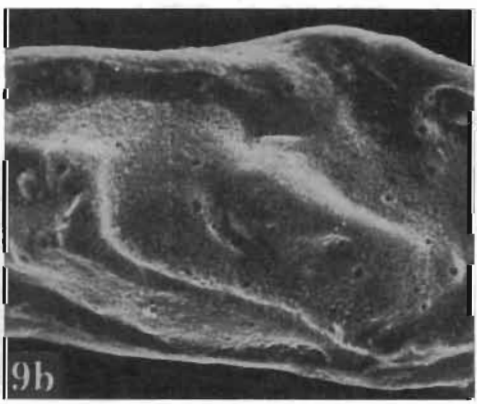


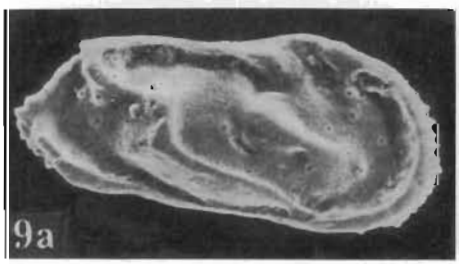




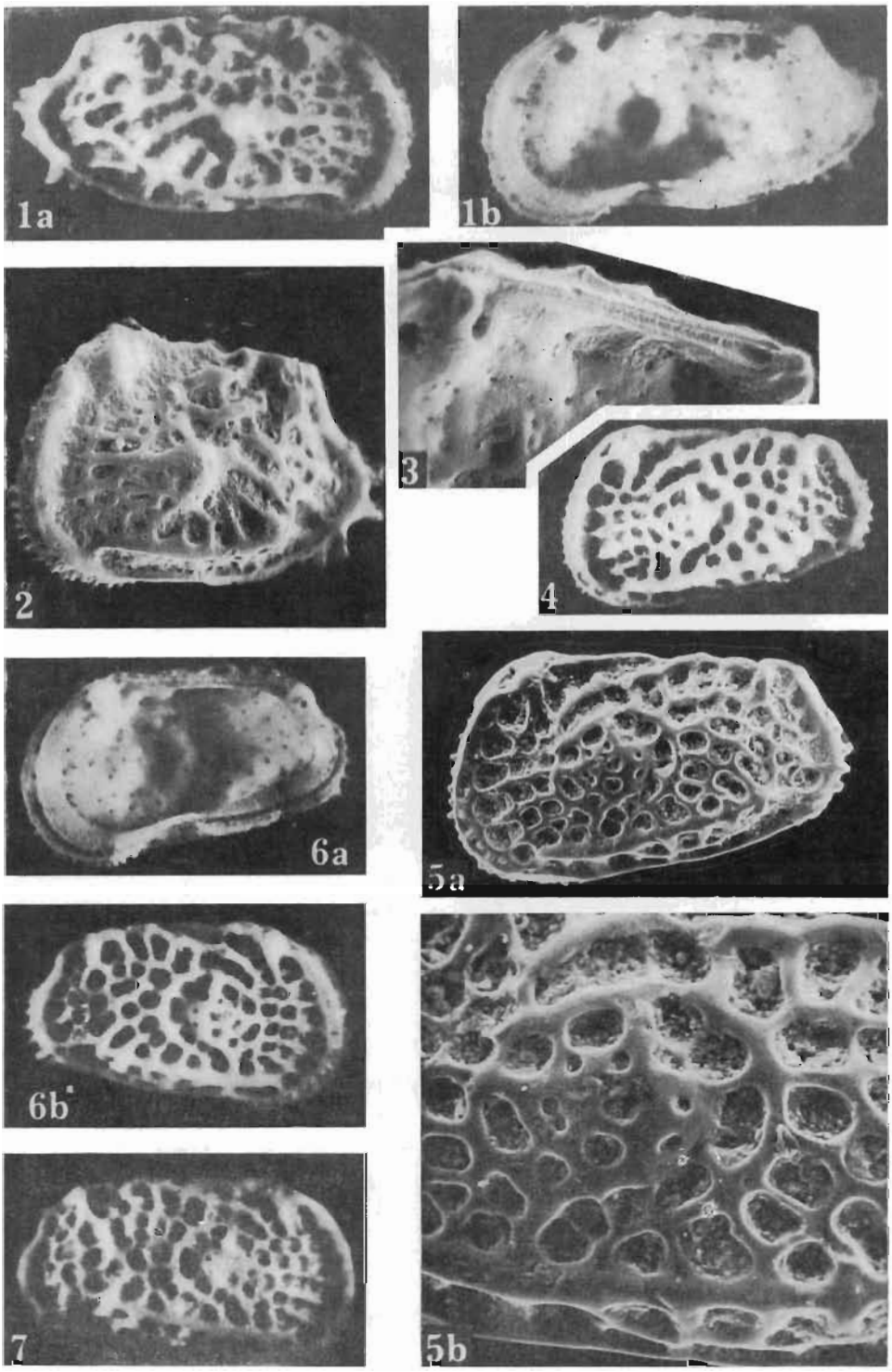




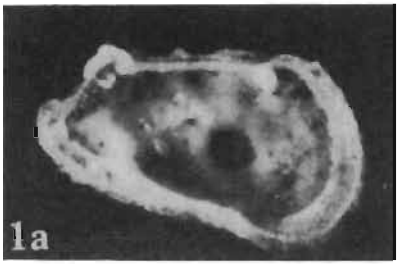


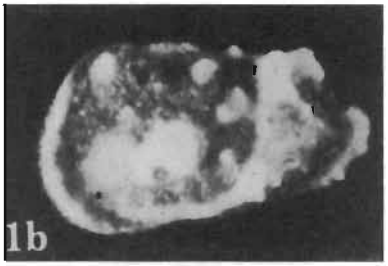


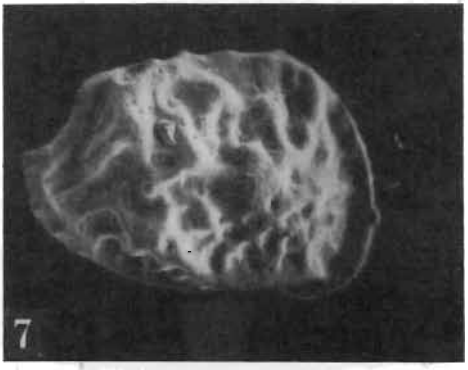
1—8 phot. M. Radzikowska

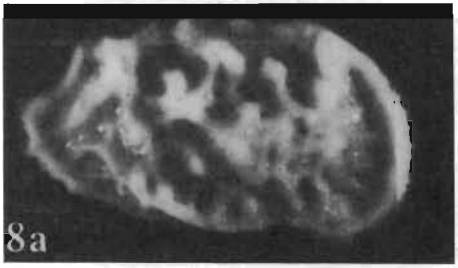


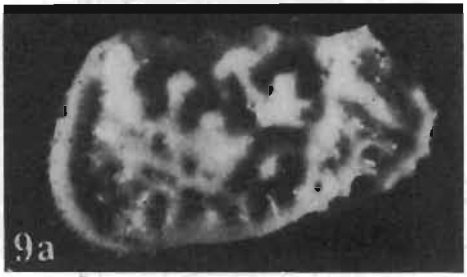
1, 4, 6, 7 phot. M. Radzikowska

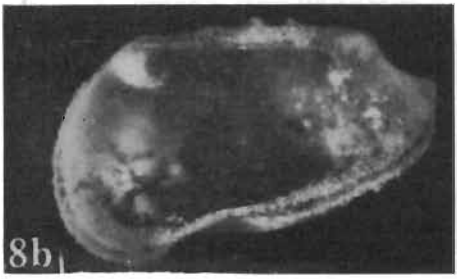


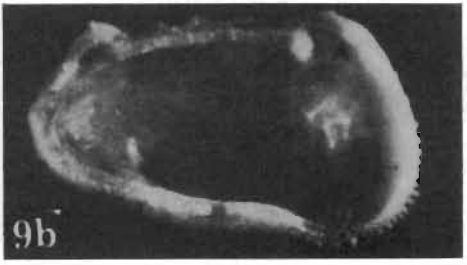




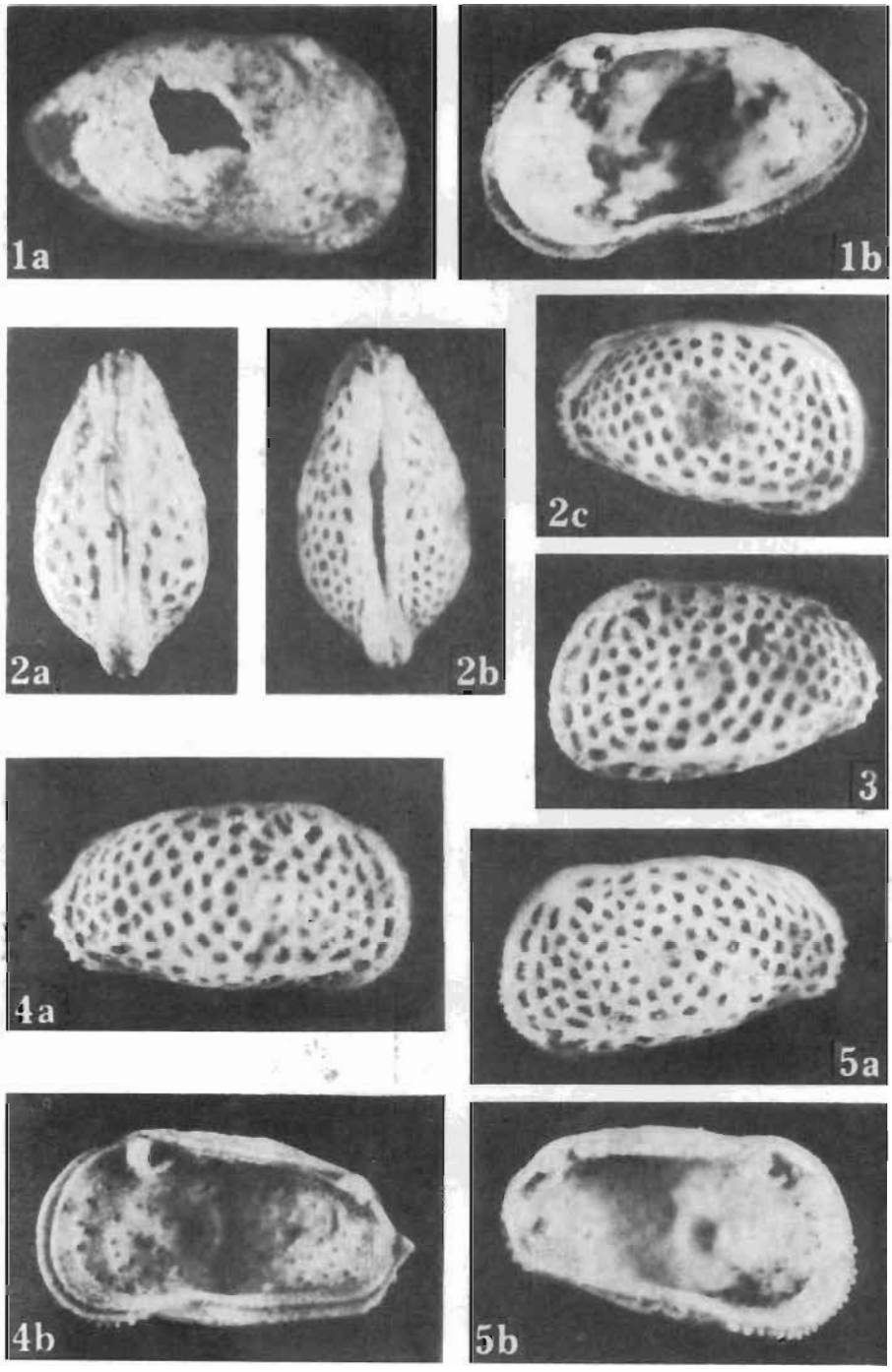




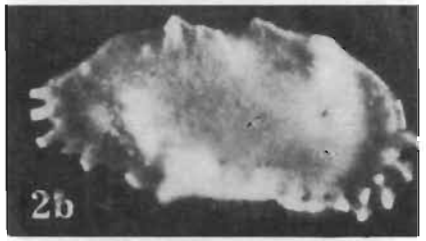


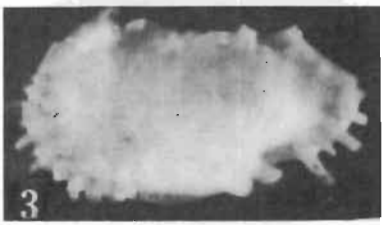


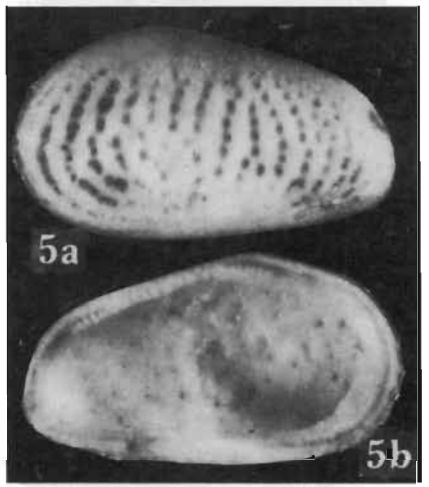
1—6, 8, 9 phot. M. Radzikowska

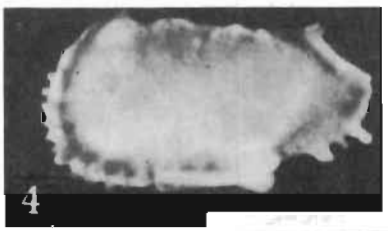


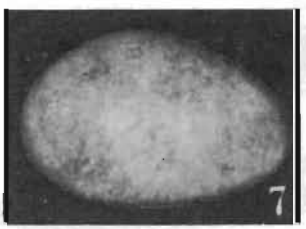
phot. M. Radzikowska

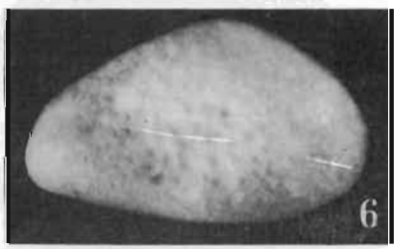


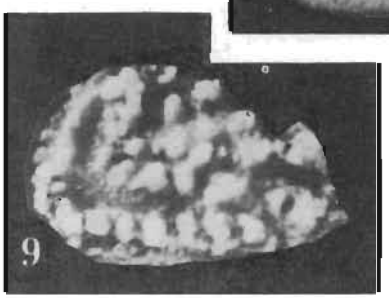


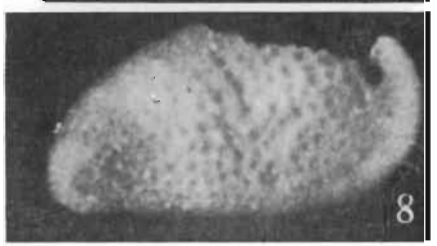












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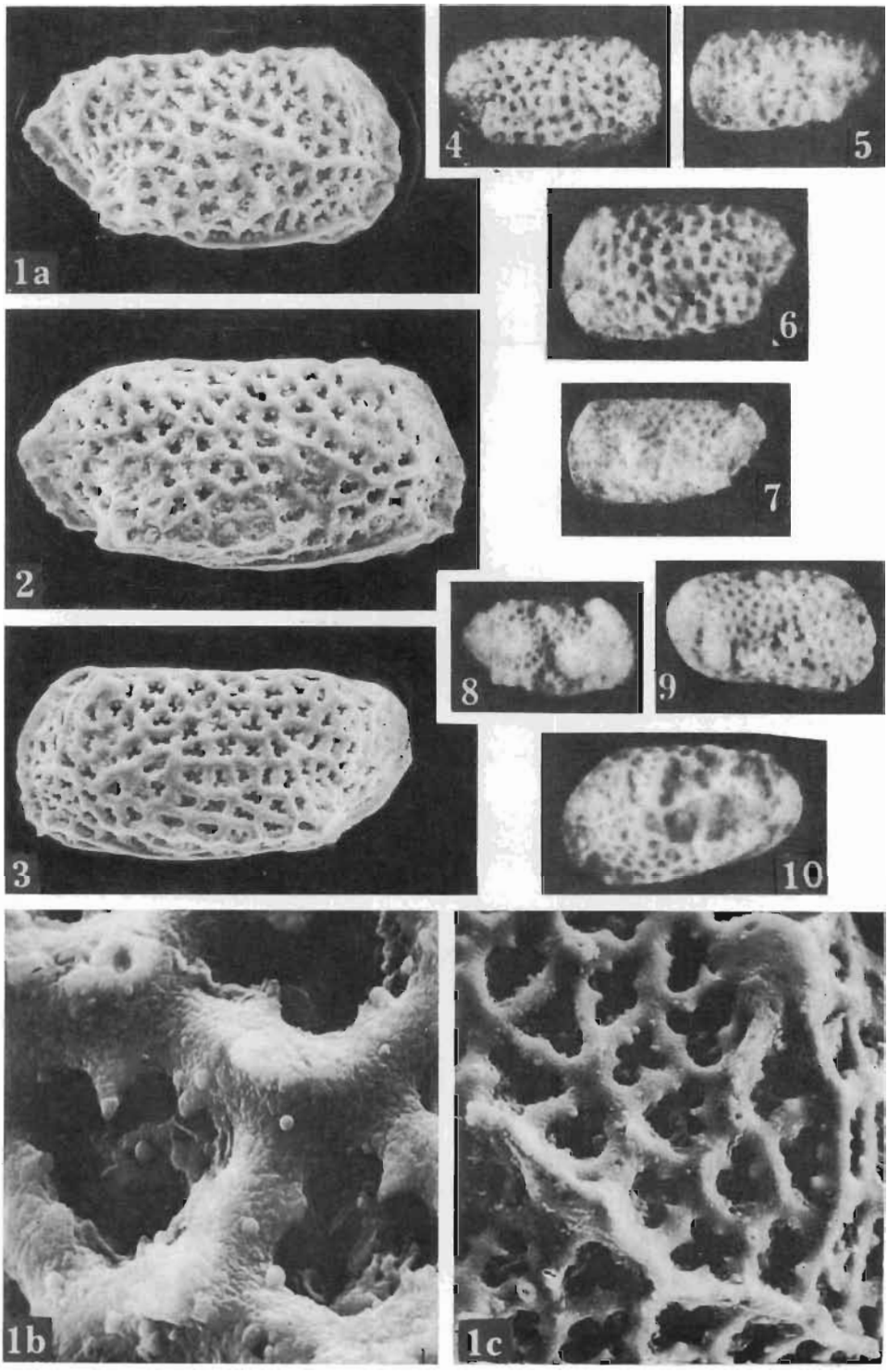
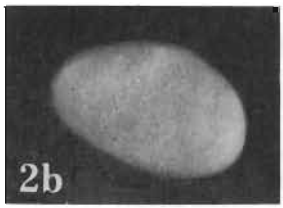
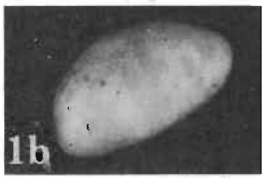
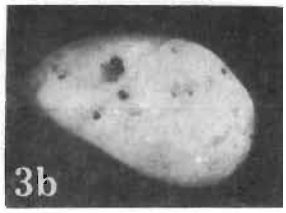
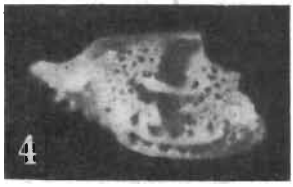


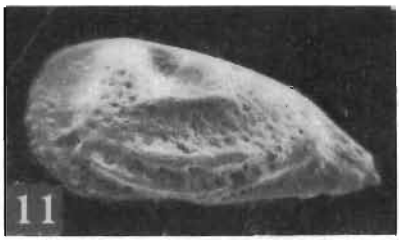
4—10 phot. M. Radzikowska

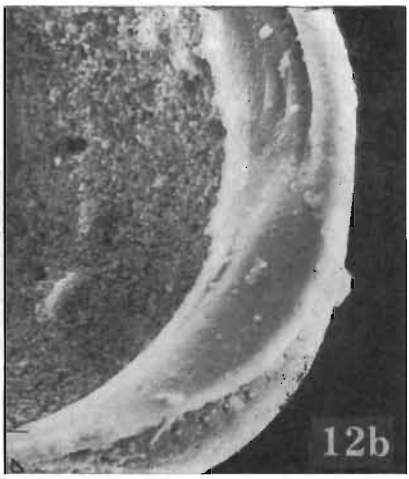


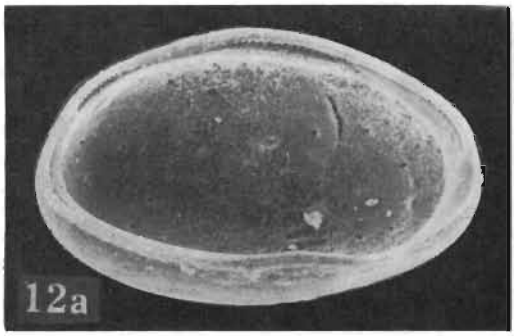












1—10 phot. M. Radzikowska