

FORAMINIFERA AND BRACKISH OSTRACODA FROM THE
PORTLANDIAN OF POLISH LOWLANDS

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Abstract: Foraminifera of the Lower and Middle Portlandian and Ostracods of the Purbeckian facies of the Upper Portlandian of Polish Lowlands were studied; 63 foraminiferal species (including 12 new) and 21 ostracod species (including one new, *Cypridea praealta* sp.n.) are described. Analysis of stratigraphic ranges of the microfauna made it possible to distinguish 5 foraminiferal zones (I—V) of the Lower and Middle Portlandian and 5 ostracod zones (F-B) of the Purbeckian facies of the Upper Portlandian.

The foraminiferal microfauna of the Portlandian of Poland appears most similar to those from the Lower and Middle Volgian of the Russian Platform.

INTRODUCTION

Up to now, the foraminifers of upper part of the Upper Jurassic developed in epicontinental facies in western Europe were only occasionally studied by Guyader (1968), Groiss (1963, 1967 a, b, 1970), Hanzlikova (1965),

Lloyd (1959) and others. The Upper Jurassic foraminifers from Poland were the subject of studies of Bielecka & Pożaryski (1954), Bielecka (1960) and Garbowska (1970). Much more attention has been paid to the foraminifers of the Lower and Middle Volgian of the USSR (Furssenko & Polenova, 1950; Dain, 1934, 1972; Dain & Kusnetzova, 1971; Ivanova, 1971; 1973; Kusnetzova, 1963, 1965, 1969; Mjatiuk, 1939, 1959; and others). The studies dealing with brackish ostracods of Poland (Bielecka & Sztejn, 1966; Marek, Bielecka & Sztejn, 1969) are of regional-stratigraphic character.

The paper presents results of palaeontological and stratigraphic studies on foraminifers of the Lower and Middle Portlandian and brackish ostracods of the Purbeckian facies of the Upper Portlandian (where foraminifers do not occur) of the Polish Lowlands. The analysis of the microfauna was based on core material from boreholes drilled by the Geological Institute (Warsaw) and oil industry in years 1948—1972. The core material was derived from the areas of Kujawy swell, Warsaw basin, Baltic syncline, Łódź and Mogilno basins and Pomerania (NW part of Pomeranian swell, Pomeranian basin and N part of Szczecin basin) (see Text-fig. 1). The ammonite zonal scheme of the Lower and Middle Portlandian (Table IV), proposed by Dembowska (1973), and ostracod zonal scheme of the Upper Portlandian developed in the Purbeckian facies, proposed by Bielecka & Sztejn (1966), are accepted here.

Over 40 borehole profiles (Text-fig. 1) with full or almost full coring were selected out of about 100 borehole profiles covered by the microfauna studies. The profiles selected yield more or less numerous microfaunal assemblages characteristic of a given part of Poland. Several foraminiferal species of the uppermost stage of the Jurassic, including some previously described by Bielecka & Pożaryski (1954) from Upper Jurassic strata of Central Poland, are revised. On the whole, 63 foraminiferal species (including 12 species and 2 subspecies new) and 21 ostracod species (including 1 new) are described (see Tables I—II). The palaeontological material is housed in the Geological Institute, Warsaw (abbr. IG).

The species listed in Table III are not recorded in all parts of the Polish Lowlands. In particular parts a few species are missing. This primarily results from lithofacies differences and location of a given area in relation to the center of the basin. The microfaunal assemblages are the richest in the center, becoming impoverished towards the periphery of the basin.

Acknowledgements. — Warm thanks are due to Professors Olga Pazdrowa and Krystyna Pożaryska for discussions and comments, and to Professor W. Pożaryski thanks to whose encouragement the study was undertaken. The author is very grateful to Dr. J. Dembowska and Doc. Z. Dąbrowska for supply of unpublished geological data and friendly discussions. Thanks are also due to all the colleagues from the Laboratory

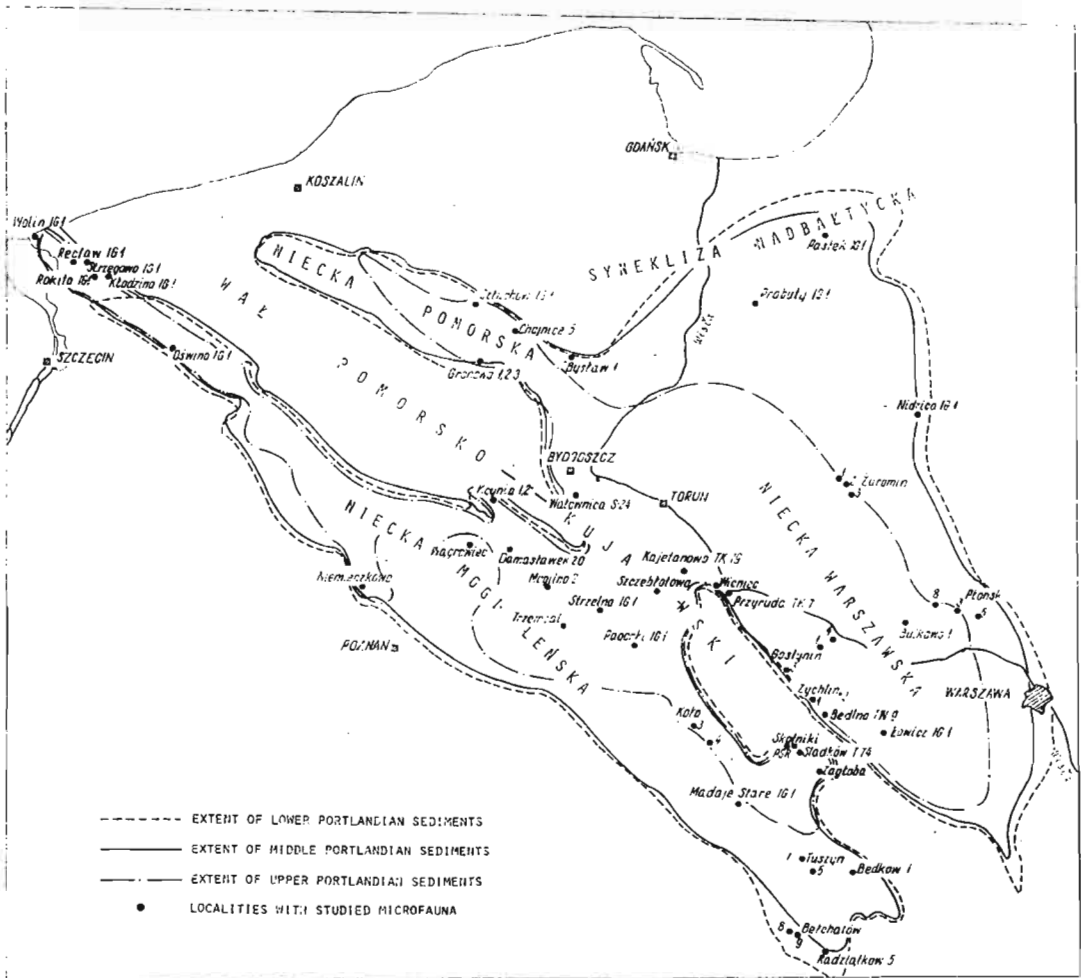


Fig. 1. Distribution of the Portlandian deposits in the Polish Lowlands (after J. Dembowska, 1973). Synekliza Nadbałtycka = Baltic syncline; Niecka Pomorska = Pomeranian basin; Wał Pomorsko-Kujawski = Pomeranian and Kujawy swells. Niecka Mogileńska = Mogilno and Łódź basins; Niecka Warszawska = Warsaw basin.

of Micropaleontology (Geological Institute) for help in preparation of microfauna and tables. Photos of foraminifers and ostracods were made by Mrs. J. Modrzejewska and Mrs. J. Oleksiak (Photographical Lab., Geological Institute).

CHARACTERISTIC OF THE POLISH LOWLANDS PORTLANDIAN AND ITS MICROFAUNA

The present extent of the Portlandian in the Polish Lowlands (Text-fig. 1) is markedly smaller than that of the Kimmeridgian. Lower Portlandian strata are known from the Pomeranian basin, parts of Baltic syncline and western Mazury-Suwałki elevation, north-western and south-

eastern parts of Pomeranian swell, Mogilno-Łódź basin, Kujawy swell and Warsaw basin (Dembowska 1965, 1973; Dąbrowska 1970; Dadlez & Dembowska, 1965). The thickness of Lower Portlandian sediments in the Polish Lowlands in the complete sequence averages from 18 m in the peripheral part of the basin to 73 m in the central part. The deepest parts of Portlandian basin of Poland, excluding the Carpathian, are characterized by siltstone-clay-marly deposits known from the Kujawy swell and northern parts of Szczecin basin. Towards the periphery of the basin, sandy-limestone-marly facies appears, found on the Pomeranian swell, Pomeranian basin and Baltic syncline (Dembowska 1965, 1973), where reduction in thickness is noted.

Middle Portlandian strata are characterized by similar extent as the Lower Portlandian and they are represented by similar siltstone marls or, in places, by marly slates and siltstone-marly limestones. A marked admixture of sandy material is found in N and NE part of the Polish Lowlands. Close to the end of the Middle Portlandian the basin shrank and became shallower. This was reflected by deposition of series of limestones with brachiopod layer in the top part. The brachiopod layer is found throughout the Polish Lowlands, except of the southern part of the Kujawy swell (Dembowska 1973). The thickness of Middle Portlandian sediments is from 24 m to 165 m.

During the Late Portlandian the basin became cut off of open marine basins and was still shrinking. This is reflected by deposition of brackish sediments — gypsum and anhydrite in the central parts, and marly-clay deposits on the periphery of the basin. Upper Portlandian strata developed in the Purbeckian facies yield no foraminifers but rich brackish ostracod fauna, serving as a basis for its zonation (Bielecka & Szejn, 1966; Marek, Bielecka & Szejn, 1969). The thickness of the not eroded Upper Portlandian sediments is from 60 m to 142 m, and the big thickness depends on the development of the evaporite facies.

During the earliest Portlandian, there was a bloom of foraminiferal fauna, especially in the central parts of the basin. Generic and specific composition of the early Portlandian assemblage appears only somewhat different from that of the Upper Kimmeridgian assemblages, as the majority of species pass the Kimmeridgian/Portlandian boundary. Somewhat later but still in the early Portlandian there appeared several new species typical of the marine deposits of the Portlandian age.

During the Middle Portlandian the ecological conditions were still favourable for the development of foraminifers. There appeared several new species the stratigraphic ranges of which are confined to the Middle Portlandian, as. e.g.: *Planularia dofleini* (Kasanzev), *Nodosaria osynkiensis* Mjatliuk, *Lenticulina ponderosa* Mjatliuk, several species of the genus *Citharina*, and others.

Lower and Middle Portlandian foraminiferal assemblages are domin-

ated by the calcareous forms, and mainly by the representatives of the family Nodosariidae. This family is represented in these deposits by numerous species of the genera *Lenticulina*, *Citharina*, *Nodosaria*, and *Marginulinopsis*, as well as some species of the genera *Planularia*, *Vaginulinopsis*, *Citharinella*, *Pseudonodosaria*, *Fronicularia* and *Saracenaria*. Contribution of other families such as Polymorphinidae (with genera *Eoguttulina*, *Guttulina* and *Tristix*), Nubeculariidae (genus *Nubecularia*), Miliolidae (genus *Palaeomiliolina*) and Involutinidae (genus *Trocholina*), as well as subfamilies Spirillininae (genus *Spirillina*), Epistomininae (genus *Epistomina*) and Ceratobulimininae (genus *Pseudolamarckina*) is subordinate. Foraminifers with agglutinated tests almost exclusively belong to the family Lituolidae, represented by the genera *Haplophragmoides*, *Ammobaculites*, *Haplophragmium*, *Everticyclammina* and *Triplasia*. Their presence is found in peripheral parts of the basin or when there is admixture of sandy material in the deposit. There are some differences in generic and specific composition of the foraminiferal assemblages throughout the Polish Lowlands (Table I, depending on changes in lithofacies or on some phenomena related to marine regression and shrinkage of the basin.

At the end of the Middle Portlandian the life conditions deteriorated due to the beginning of marine regression. No new species appeared and the extinction of the Middle Portlandian foraminiferal fauna has started. The marine basin became shallower which was reflected by deposition of limestone-sandy sediments with impoverished foraminifer assemblage. Only a few species pass the Middle/Upper Portlandian boundary and they soon disappear along with decrease in salinity of waters and a change from marine to brackish-marine, and finally brackish facies.

The change in environmental conditions primarily resulted in extinction of the representatives of families Nodosariidae, Nubeculariidae, Miliolidae and Lituolidae, and subfamilies Epistomininae and Ceratobulimininae. The representatives of subfamilies Polymorphininae and Spirillininae appeared relatively less sensitive to that change. In top parts of the Middle Portlandian, the *Virgatites pusillus* zone, only occasional representatives of *Eoguttulina liassica* (Strickland), *E. polygona* (Terquem), *Spirillina infima* (Strickland) and *Lenticulina muensteri* (Roemer) are found occasionally. These species pass the Middle/Upper Portlandian boundary and are found in the basal part of the Upper Portlandian, in ostracod zone F, but they soon disappear.

In the brackish environment of lagoon basin of the Late Portlandian all the marine foraminifers and ostracods disappeared and only brackish ostracods are found. The latter are primarily represented by some species of the genus *Cypridea*. Species of the genera *Klieana*, *Damonella*, *Fabarella*, *Darwinula*, *Rhinocypris*, *Mantelliana* and some others (see Table II) occur in subordinate numbers.

Table I

PORTLANDIAN FORAMINIFERS FROM THE BOREHOLES OF THE POLISH LOWLANDS

Locality	NW part of the Pomeranian swell (Wat Pomorski)		Kujawy swell (Wat Kujawski)		Szczecin trough (Niecka Szczecińska)		Mogilno trough (Niecka Mogileńska)		Łódź trough (Niecka Łódzka)		Warsaw trough (Niecka Warszawska)		Baltic syncline (Synekliza Nadbaltycka)		Pomeranian trough (Niecka Pomorska)	
	Wolin	Surzogowo Klodzino	Kcynia	Szczeciotowo Przyruda Zagłoba	Reclaw Rokita Oświno	Wagrowiec	Mogilno Strzelno Pagórki Trzemżal	Kolo	Miadaje Stare Tuszyn Będków Belchatów Radziątków	Gostynin	Zychlin Łowicz Bulkowo Płońsk	Nidzica Prabuty Pasłęk	Człuchów Chojnice Bysław			
<i>Haplophragmoides volgensis</i> Mjatluk	+++		+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Everticyclammina virguliana</i> (Koechlin)				+			+	+								
<i>Ammobaculites fontinensis</i> (Terquem)	+++		+	+			+								+	
<i>Ammobaculites haplophragmoides</i> Furssenko & Polenova	+++		+	+	+	+									+	
<i>Haplophragmium coprolithiforme subaequale</i> (Mjatluk)			+	+			+	+								
<i>Haplophragmium infravolgense</i> (Mjatluk)			+	+			+									
<i>Triplasia althoffi jurassica</i> (Mjatluk)	+++		+	+			+									
<i>Belorussiella wolinensis</i> sp. n.	+++															
<i>Nubecularia mazoviensis</i> Bielecka & Pożaryski				+		+				+	+					
<i>Palaeomiliolina egmontensis</i> (Lloyd)			+	+	+	+										
<i>Nodosaria cucumiformis</i> sp. n.	+++		+	+	+	+									+	
<i>Nodosaria osynkiensis</i> Mjatluk	++		+	+	+	+				+						
<i>Nodosaria pentagonalis</i> Furssenko & Polenova	+++		+	+	+	+										
<i>Nodosaria scythicus</i> Furssenko & Polenova	+++		+	+	+	+			+	+						
<i>Nodosaria striatojurenensis</i> Klähn	+++		+	+	+	+			+	+				+	+	
<i>Citharina brevis</i> (Furssenko & Polenova)	+++		+	+			+	+		+	+			+	+	
<i>Citharina catherinae</i> sp. n.	+++		+	+			+	+		+	+			+	+	
<i>Citharina culter</i> (Furssenko & Polenova)	++		+	+												
<i>Citharina cuneata</i> sp. n.	+++		+	+												
<i>Citharina densicostata</i> sp. n.	+++		+	+												
<i>Citharina kujaviensis</i> (Bielecka & Pożaryski)	+++		+	+					+	+				+		
<i>Citharina parallela</i> (Bielecka & Pożaryski)	++		+	+					+	+					+	
<i>Citharina varicostata</i> (Furssenko & Polenova)	++		+	+			+	+						+		
<i>Citharina undosicostata</i> sp. n.	+++		+	+												
<i>Citharina</i> cf. <i>virgatis</i> (Furssenko & Polenova)	++															
<i>Citharina zaglobensis</i> (Bielecka & Pożaryski)	+++		+	+	+	+	+	+		+	+			+	+	
<i>Citharinella pomeraniae</i> sp. n.	++		+													
<i>Citharinella portlandensis</i> sp. n.			+	+												
<i>Citharinella uhligi</i> (Furssenko & Polenova)	++			+					+	+						
<i>Fronicularia iberica</i> Furssenko & Polenova			+													
<i>Geinitzinita keyniensis</i> sp. n.			+													
<i>Geinitzinita wolinensis</i> sp. n.	+++		+	+											+	
<i>Lugena apiculata neocomiana</i> Bartenstein & Brand	+++		+	+		+			+	+						
<i>Lenticulina dogieli</i> Furssenko	+++		+											++	+	
<i>Lenticulina infravolgaensis</i> (Furssenko & Polenova)	+++		+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Lenticulina muensteri</i> (Roemer)	+++		+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Lenticulina ponderosa</i> Mjatluk	+++		+	+	+	+	+	+								
<i>Lenticulina vistulae elongata</i> Bielecka & Pożaryski	+++		+	+	+	+	+		+	+				+	+	
<i>Marginulina pyramidalis</i> (Koch)	++		+													
<i>Marginulinopsis buskensis</i> (Bielecka & Pożaryski)	+++		+	+											++	
<i>Marginulinopsis robusta</i> (Reuss)	+++		+	+					+	+				+		
<i>Marginulinopsis striatocostata</i> (Reuss)	+++		+	+	+	+	+	+	+	+	+			++	++	
<i>Planularia dofleini</i> (Kasanzev)	+++		+	+			+	+						+	+	
<i>Planularia multicosata</i> Kusnetzova	+++		+	+			+	+		+	+			+		
<i>Planularia poljenovae</i> Kusnetzova	+++		+	+	+	+	+	+		+	+			+	+	
<i>Pseudonodosaria costulata portlandensis</i> subsp. n.	++		+	+												
<i>Pseudonodosaria humilis</i> (Roemer)	+++		+	+		+										
<i>Pseudonodosaria multicosata klodziniensis</i> subsp. n.	+++		+	+												
<i>Pseudonodosaria tenuis</i> (Bornemann)	+++		+	+			+		+	+						
<i>Saracenaria pravoslavlevi</i> Furssenko & Polenova	+++		+	+	+	+	+	+	+	+				+++		
<i>Vaginulinopsis embaensis</i> (Furssenko & Polenova)	+++		+	+	+	+	+	+	+	+	+			+++	+++	
<i>Vaginulinopsis incisiformis</i> sp. n.	++		+	+					+	+	+			+++	+++	
<i>Eoguttulina liassica</i> (Strickland)	+++		+	+	+	+	+	+	+	+	+			+++	++	
<i>Eoguttulina polygona</i> (Terquem)	++		+	+	+	+								+		
<i>Guttulina multistriata</i> sp. n.	++		+	+												
<i>Tristix acutangulus</i> (Reuss)	+++		+	+			+									
<i>Tristix quadrangularis</i> Furssenko & Polenova	+++		+	+												
<i>Tristix temirica</i> (Dain)	+++		+	+	+	+	+	+	+	+				+	+	
<i>Spirillina infima</i> (Strickland)	+++		+	+	+	+	+	+	+	+				+	+	
<i>Trocholina</i> aff. <i>burlini</i> Gorbatchik	+				+				+	+	+			+++	+++	
<i>Trocholina solecensis</i> Bielecka & Pożaryski			+											+	+	
<i>Pseudolamarckina polonica</i> (Bielecka & Pożaryski)			+	+					+	+	+			+	+	
<i>Epistomina stelicostata</i> Bielecka & Pożaryski			+	+	+				+	+	+			+++	+++	

Table II
PURBECKIAN OSTRACODS FROM THE BOREHOLES OF THE POLISH LOWLANDS

Species	Locality		Kujawy swell (Wał Kujawski)	Szczecin trough (Niecka Szczecińska)	Mogilno trough (Niecka Mogileńska)	Łódź trough (Niecka Łódzka)	Warsaw trough (Niecka Warszawska)	Pomeranian trough (Niecka Pomorska)
	NW part of the Pomeranian swell (Wał Pomorski)	Wolin Strzegowo						
		Kcynia Wałownica Szczęblotowo Przyruda Bedlno Skotniki Zagłoba		Reclaw Oświno	Niemieckowo Domasławek Mogilno Strzelno Pagórki	Kolo	Gostynin Zychlin Łowicz Bulkowo Płońsk Żuromin	Gronowo Chojnice
<i>Mantelliana purbeckensis</i> (Forbes)	+ + +	+ +	+ +	+ +	+ +		+ +	
<i>Rhinocypris jurassica jurassica</i> (Martin)	+ +	+ + + + + +	+ + + + + +	+ +	+ + + +		+ + + + + +	+ +
<i>Damonella ellipsoidea</i> (Wolburg)	+	+ +	+ +		+ +		+ +	
<i>Damonella pygmaea</i> (Anderson)		+ + + +	+ +	+ +	+ +	+	+ + + + +	+ +
<i>Cypridea binodosa</i> Martin		+ +	+ +		+ +		+ +	
<i>Cypridea dunkeri</i> Jones	+ +	+ + + + + +	+ +	+ +	+ +	+	+ +	+ +
<i>Cypridea inversa</i> Martin		+ + + + + +	+ +	+ +	+ +		+ +	
<i>Cypridea praealta</i> sp. n.	+	+ + + + + +	+ +	+	+ + + + +		+ + + + + +	+ +
<i>Cypridea valdensis praecursor</i> Oertli	+ +	+ + + + + +	+ +		+ + + + +	+	+ + + + + +	+ +
<i>Scabriculocypris trapezoides</i> Anderson		+ + + + + +	+ +		+ + + + +		+ + + + + +	+ +
<i>Darwinula leguminella</i> (Forbes)		+ + + + + +	+ +	+			+ + + + +	
<i>Darwinula oblonga</i> (Roemer)		+ + + + + +	+ +		+ +		+ + + + +	
<i>Fabanella ansata</i> (Jones)		+ +	+ +				+ + + + +	
<i>Fabanella boloniensis</i> (Jones)	+	+ + + + + +	+ +	+	+ + + + +		+ + + + + +	+ +
<i>Theriosynoecium forbesii</i> (Jones)		+ + + + + +	+ +		+ + + + +		+ + + + + +	
<i>Dicrorhygma groenwali</i> O. B. Christensen	+	+ + + + + +	+ +	+	+ + + + +		+ + + + + +	+ +
<i>Orthonotacythere rimosa</i> Martin		+ +	+ +	+ +	+ + + + +		+ + + + + +	
<i>Procytheropteron brodiei</i> (Jones)		+ +	+ +	+ +	+ + + + +		+ + + + + +	
<i>Klieana alata</i> Martin	+ +	+ + + + + +	+ +	+ +	+ + + + +	+	+ + + + + +	+ +
<i>Klieana kujaviana</i> Bielecka & Szejn	+	+ + + + + +	+ +	+	+ + + + +		+ + + + + +	+ +
<i>Bisulcocypris verrucosa</i> (Jones)		+ +	+ +				+ + + + + +	

MICROFAUNAL ZONATION OF THE PORTLANDIAN OF THE POLISH
LOWLANDS
(Table III)

Analysis of stratigraphic ranges of foraminifers and brackish ostracods made it possible to divide the Portlandian strata of the Polish Lowlands into 10 biostratigraphic zones. Lower and Middle Portlandian strata were divided into 5 foraminiferal zones (I—V), and the Upper Portlandian strata developed in the Purbeckian facies — into 5 ostracod zones (F-B). The ostracod zone A belongs to the Berriasian (Marek, Bielecka & Szejn, 1969) and, thus, is out of scope of the present study.

The foraminiferal zone I comprises whole Lower Portlandian, i.e. ammonite zones *Subplanites klimovi*, *Subplanites* sp. and *Pectinatites* sp. It is characterized by the occurrence of Late Kimmeridgian species such as *Pseudolamarckina polonica* (Bielecka & Pożaryski), *Nubecularia mazoviensis* Bielecka & Pożaryski and *Everticyclammina virguliana* (Koechlin), which do not enter the foraminiferal zone II, and *Citharina parallela* (Bielecka & Pożaryski), known from the latter zone. In the zone I there also appear new species, which characterize the Portlandian: *Saracenaria pravoslavlevi* Furssenko & Polenova, *Citharina brevis* (Furssenko & Polenova), *C. raricostata* (Furssenko & Polenova), *Nodosaria scythicis* Furssenko & Polenova, and some others. *Haplophragmium infravolgense* (Mjatluk) was occasionally found only in this zone.

The foraminiferal zone II roughly coincides with the ammonite zone *Zaraiskites scythicus* and it is characterized by highly rich microfaunal assemblage. Here were found *Planularia dofleini* (Kasanzev), *Vaginulinopsis incisiformis* sp.n., *Nodosaria scythicis* Furssenko & Polenova, *Geinitzinita wolinensis* sp.n., as well as *Saracenaria pravoslavlevi* Furssenko & Polenova, *Citharina brevis* (Furssenko & Polenova), *C. raricostata* (Furssenko & Polenova), *C. zaglobensis* (Bielecka & Pożaryski) and some others known from the foraminiferal zone I. The species appearing for the first time in the zone II include: *Marginulinopsis robusta* (Reuss), *Citharina undosicostata* sp.n., *C. culter* (Furssenko & Polenova), *Nodosaria osynkiensis* Mjatluk and, not before the upper parts of this zone, *Lenticulina ponderosa* Mjatluk.

The foraminiferal zone III comprises the ammonite zone *Zaraiskites zaraiskensis* and sometimes the top part of the *Zaraiskites scythicus* zone and basal part of the *Virgatites pusillus* zone. It is characterized by several species of the genera *Citharina* and *Nodosaria*, represented by relatively numerous individuals. The species include: *Citharina catherinae* sp.n., *C. densicostata* sp.n., *C. cuneata* sp.n., *C. culter* (Furssenko & Polenova), as well as *Nodosaria pentagonalis* Furssenko & Polenova and *N. cucumiformis* sp.n. It is also characterized by the occurrence of *Ammobaculites haplophragmoides* Furssenko & Polenova, *Tristix quadrangularis*

Furssenko & Polenova, *Lenticulina ponderosa* Mjatliuk, *Guttulina multistriata* sp.n., *Triplasia althoffi jurassica* (Mjatliuk) and *Belorussiella wolnensis* sp.n.

The foraminiferal zone IV comprises the basal part of the ammonite zone Virgatites pusillus. It is characterized by the extinction of a large number of foraminiferal species as well as by the appearance of a few new — *Palaeomiliolina egmontensis* (Lloyd), *Trocholina* aff. *burlini* Gorbachik, *Frondicularia inderica* Furssenko & Polenova and *Geinitzinita kcyniensis* sp.n. Moreover, there are also found *Eoguttulina polygona* (Terquem) and, sometimes, *Ammobaculites haplophragmoides* Furssenko & Polenova, *Tristix quadrangularis* Furssenko & Polenova and few others.

The foraminiferal zone V comprises higher parts of the ammonite zone Virgatites pusillus and is characterized by still impoverished foraminiferal assemblage. In its basal part there are found innumerable representatives of *Lenticulina infravolgaensis* (Furssenko & Polenova), *Trocholina* aff. *burlini* Gorbachik; and in higher parts — only *Lenticulina muensteri* (Roemer), *Eoguttulina polygona* (Terquem), *E. liassica* (Strickland) and *Spirillina infima* (Strickland). The latter species in places pass the boundary and are recorded from the ostracod zone F, the basal zone of the Upper Portlandian in the Purbeckian facies.

Lower part of the ostracod zone F still yields innumerable foraminifers and marine ostracods — *Procytheropteron brodiei* (Jones), *Orthonotacythere rimosa* Martin, *Galliaecytheridea* sp., *Paracypris* sp. — and euryhaline ostracod species *Mantelliana purbeckensis* (Forbes), First oligohaline ostracods — *Klieana alata* (Martin), *Rhinocypris jurassica jurassica* (Martin), and a rare species *Theriosynoecum forbestii* (Jones) — do not occur below the top part of the zone F. The ostracod zone F is time equivalent of the Middle Munder Mergel from the areas of G.D.R. and F.R.G.

The ostracod zone E is characterized by moderately numerous ostracod assemblage, comprising: *Mantelliana purbeckensis* (Forbes), *Klieana alata* Martin, *Rhinocypris jurassica jurassica* (Martin), *BisulcoCypris verrucosa* (Jones), *Theriosynoecum forbesii* (Jones), *Cypridea inversa* Martin, *C. valdensis praecursor* Oertli, as well as *Fabanella ansata* (Jones), the stratigraphic range of which is confined to this zone. Moreover, innumerable representatives of *Scabriculocypris trapezoides* Anderson, *Damonella pygmaea* (Anderson), *Darwinula leguminella* (Forbes), *Fabanella bolonienensis* (Jones) and *Cypridea dunkeri* Jones are sometimes found in upper parts of this zone. The zone E is time equivalent of lower parts of the Upper Munder Mergel.

The ostracod zone D is characterized by somewhat more numerous ostracod assemblage. Top parts of this zone yield first representatives of *Cypridea binodosa* Martin and, sometimes, *C. praealta* sp.n., which are typical of the upper zone C. The zone D is time equivalent of upper parts of the Upper Munder Mergel.

The ostracod zone C is characterized by the richest ostracod fauna. *Cypridea praealta* sp.n., *C. binodosa* Martin, *Damonella ellipsoidea* (Wolburg) and *Dicrorygma groenwali* Christensen are typical of this zone. Moreover, almost all the species known from the zone D are present here. The zone C is time equivalent of lower parts of the Serpulite.

The ostracod zone B is characterized by somewhat impoverished ostracod assemblage. *Rhinocypris jurassica jurassica* (Martin), *Cypridea dunckeri* Jones, *C. praealta* sp.n. and *Dicrorygma groenwali* Christensen are still present but the majority of species known from the lower zones, including *Klieana alata* Martin, disappear. The species *Klieana kujaviana* Bielecka & Szejn, typical of this zone, appears here for the first time. The zone B is time equivalent of upper parts of the Serpulite.

COMPARISON OF THE UPPERMOST JURASSIC FORAMINIFERAL
ASSEMBLAGES OF THE POLISH LOWLANDS AND EUROPE
(Table V)

It appears difficult to compare the foraminiferal assemblages of the epicontinental facies of Uppermost Jurassic stage of western Europe, Polish Lowlands, Russian Platform and other areas. The difficulties are primarily related to a limited amount or even scarcity of relevant published data. Thus it is only possible to establish general similarity or differences between these assemblages.

It follows from the papers by Gordon (1962, 1965), Lloyd (1959, 1962), Guyader (1968) and Bielecka & Pożaryski (1954) that Upper Jurassic foraminifer assemblages of southern England, northern France (Normandy) and central Poland are primarily characterized by the occurrence of representatives of the family Nodosariidae. The most common genera of this family include *Lenticulina*, *Planularia*, *Marginulina*, *Nodosaria*, *Citharina*, *Vaginulina* and *Pseudonodosaria*. Arenaceous foraminifers are here primarily represented by the genera *Ammobaculites*, *Haplophragmoides* and, sometimes, *Textularia*. Other (besides Nodosariidae) common calcareous foraminifers include Polymorphinidae, locally appearing in high numbers, and Epistominidae. Warm-water forms — *Pseudocyclamina* and *Everticyclammina* — sometimes appeared under suitable ecological conditions in Oxfordian and Kimmeridgian.

Comparisons of the Portlandian foraminiferal assemblages of southern England and central Poland have shown only 4 species in common. In the Portlandian, arenaceous foraminifers and Polymorphinidae predominated in the former (Lloyd, 1959, 1962) and the representatives of Nodosariidae were still predominating in the latter region. Comparisons of the foraminiferal assemblages from Poland and France may be made only for the Oxfordian and Kimmeridgian, as there are no adequate data on the younger strata of France. It follows from the paper by Guyader (1968) that the Oxfordian and Kimmeridgian foraminiferal assemblages of north-

ern France (Normandy) and central Poland are very similar, comprising several elements in common and being characterized by the predominance of Nodosariidae.

Portlandian foraminiferal fauna of the Polish Lowlands appears to be most similar to that known from the Lower and Middle Volgian of the Russian Platform. Such conclusion may be somewhat affected by relatively high number of microfaunistic papers dealing with these areas. However, at least 34 species (and possibly 39 species) out of 64 species recognized in the Lower and Middle Portlandian of the Polish Lowlands (Table V) are known from the Lower and Middle Volgian of the Russian Platform, i.e. the species known from both regions represent over 60 percent of species identified in the Polish Lowlands. It should be noted that the number of species known from the Russian Platform increases towards the north-west, decreasing towards the south-east in the area of the Polish Lowlands. This would suggest the lack of any direct connection between the central Poland and Russian Platform basins during the Portlandian and that the migration route of the microfaunas to the epicontinental basin of Poland was indirect, from the north-west. It follows that the basin was, at least temporarily, closed on the south, south-east and south-west.

Comparison of the Portlandian foraminiferal assemblages of the Polish Lowlands with foraminiferal faunas of Siberia, i.e., typical assemblages of the Boreal province, has shown only 10 species in common. However, these species are characterized by a fairly wide geographic distribution and are also known from the Russian Platform. Comparison of the generic compositions of the latest Jurassic foraminiferal assemblages of Poland and Siberia has shown a marked difference. The latter (Basov, 1967; Levina 1968; Ivanova 1969a, b; Dain 1972) is characterized by a marked contribution of arenaceous foraminifers of the families Saccamminidae, Ammodiscidae, Lituolidae and Textulariidae, and a relative impoverishment in the calcareous foraminifers (Nodosariidae, Spirillinidae and Ceratobuliminidae), whereas the former is dominated by the calcareous foraminifers, and mostly by the representatives of the family Nodosariidae with its numerous genera and species, and it is characterized by subordinate contribution of the families Spirillinidae and Ceratobuliminidae. Therefore, it may be assumed that the foraminiferal assemblage of Polish Lowland belonged to the Subboreal and not to the Boreal province during the Late Jurassic.

Comparison of the latest Jurassic foraminiferal faunas of Poland and those from lower Cieszyn slates of the internal Carpathians (Geroch, 1967; Bielecka & Geroch, paper presented on VI Colloque Africain de Micropaléontologie, Tunis 1974) has shown 15 species in common, i.e. that about 25 percent of species identified in the former areas are also known from the latter areas. However, these species are characterized by long stra-

tigraphical ranges (several of them are known from the Kimmeridgian) and geographical ranges. The foraminiferal assemblage of the Lower Cieszyn slates is characterized by higher contribution of *Trocholina*, and by fairly numerous *Paalzowella* and *Paleogaudryina*. These two latter are not known from the Portlandian of the Polish Lowlands. The occurrence of the two latter genera brings the foraminiferal fauna of the lower Cieszyn slates closer to those of the Klentnice Beds of Czechoslovakia (Hanzlikova, 1965) and the uppermost Jurassic stage of the Franconian Alb (Groiss, 1963, 1967a, b), suggesting the affinity of the faunas of the internal Carpathians with the Submediterranean province.

Comparison of the two latter foraminiferal assemblages with that of the Portlandian of the Polish Lowlands has shown that the latter comprises 15 species known from the Klentnice Beds and 23 species known from the Lower or Middle Tithonian of the Franconian Alb (southern Germany). Fourteen out of the 23 species known from both Polish Lowlands and Franconian Alb were also recorded from the Russian Platform.

The foraminiferal assemblage of the Polish Lowlands appears much less similar to that known from the uppermost Jurassic of the Caucasus (Hoffmann, 1967) as there are only 3 species in common. Moreover, the species may be pandemic as two of them are also known from the Portlandian of Madagascar (Éspitalié & Sigal, 1963). In the Portlandian of the Polish Lowlands there were recorded 9 species previously known from the Portlandian of Madagascar.

There is almost complete lack of Mediterranean forms in the Portlandian of the Polish Lowlands. *Everticyclammina virguliana* (Koechlin), recorded from the Lower Portlandian, is an exception; however, it appears that this species reached the area of central Poland already in the Kimmeridgian and that it persisted till the Lower Portlandian. In Switzerland, this species appears in the Kimmeridgian and enters the Portlandian. It is also known from the Kimmeridgian of northern France (Normandy) and reported from a certain stratigraphic link of the uppermost Jurassic of Somali. Up to now, it is unknown from the Franconian Alb and Klentnice Beds of Czechoslovakia.

SYSTEMATIC DESCRIPTIONS

Foraminiferida

Family **Lituolidae** de Blainville, 1825

Subfamily **Haplophragmoidinae** Maync, 1952

Genus *Haplophragmoides* Cushman, 1910

Haplophragmoides volgensis Mjatluk, 1939

(Pl. I, Figs. 1, 2)

1939. *Haplophragmoides volgensis* nov.sp.; E. V. Mjatluk, p. 42, Pl. 1, Fig. 6 a,b.

1954. *Haplophragmoides volgensis* Mjatluk; W. Bielecka & W. Pożaryski, p. 23, Pl. 2, Fig. 1a, b.

Material. — Over 50 specimens.

Dimensions (in mm):

Coll. IG, Warsaw	No. 5131/73/F	No. 5132/73/F	No. 5133/73/F
Length	0.68	0.45	0.40
Width	0.57	0.38	0.34
Thickness	0.12	0.11	0.10
Number of chambers in the last whorl	8	7	7

Remarks. — The specimens from the Portlandian of the Polish Lowlands appear somewhat larger than those from the Middle Volgian¹⁾, the Dorsoplanites panderi zone of Volga Region, USSR.

Distribution. — Poland: uppermost Kimmeridgian, Lower and Middle Portlandian; USSR: Lower and Middle Volgian; F.R.G. (Franconian Alb): Lower and Middle Tithonian.

Subfamily **Cyclammininae** Marie, 1941

Genus *Everticyclammina* Redmond, 1964²⁾

Everticyclammina virguliana (Koechlin, 1942)

(Pl. I, Figs. 3, 4)

1942. *Pseudocyclammina virguliana* sp.n.: E. Koechlin, p. 195, Pl. 6, Fig. 1-9.
pars 1954. *Ammobaculites braunsteini* Cushman et Applin; W. Bielecka et W. Pożaryski, p. 26, Pl. 2, Fig. 5b non 5a.
1968. *Everticyclammina virguliana* (Koechlin); J. Guyader, p. 113, Pl. 18, Fig. 12-14; Pl. 25, Fig. 1a-c.

Material. — A few tens of specimens generally well-preserved.

Dimensions (in mm):

Coll. IG, Warsaw	No. 5134/73/F	No. 5135/73/F	No. 5136/73/F
Length	1.96	0.84	0.70
Width	1.24	0.61	0.61
Thickness	0.60	0.31	0.33
Number of visible chambers	9	7	7
Number of chambers in coiled part	6	6	5

Supplemented description. — Test bilaterally flattened; in the last whorl of coiled part 4—6 chambers; uncoiled part consisting of 1—3 chambers; peripheral margin rounded, slightly incised; sutures depressed, somewhat arcuate. Distance from umbilicus to periphery increasing along with growth of successive chambers. Aperture slit-like, poorly marked, situated at the base of the last chamber; in older specimens it is shifted to the center of apertural face of the last chamber or is sometimes terminal.

¹⁾ Recently, Gerassimov & Mikhailov (1966) divided the former Lower Volgian into Lower and Middle Volgian.

²⁾ Assignment to the family after Redmond (1964).

Individual variability high, reflected by differences in size of test, number of chambers, and position of umbilicus varying from central to subperipheral.

Remarks. — The Polish specimens are smaller and thinner than those from Switzerland and France, and they somewhat resemble *E. excentrica* Redmond in that umbilicus does not occupy a near-central position on test, differing in larger size of test and proportionally smaller thickness of test. According to Redmond (1964, p. 408), *Pseudocyclammina virguliana* Koechlin actually belongs to the genus *Everticyclammina*.

Occurrence. — Poland: Upper Kimmeridgian and Lower Portlandian; France, England: Kimmeridgian; Switzerland: Upper Kimmeridgian, Lower Portlandian.

Subfamily *Lituolinae* de Blainville, 1825

Genus *Ammobaculites* Cushman, 1910

Ammobaculites fontinensis (Terquem, 1870)

(Pl. I, Figs. 5, 6)

1870. *Haplophragmium fontinense* Terquem; M. O. Terquem, p. 235, Pl. 24, Fig. 29, 30a, b.

1966. *Ammobaculites fontinensis* (Terquem); H. G. Lindenberg, p. 470, Pl. 51, Fig. 5-8 (*cum synonymica*).

1970. *Ammobaculites fontinensis* (Terquem); W. Fuchs, p. 72, Pl. 1, Fig. 9; Pl. 2, Fig. 1.

Material. — Over 30 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5137/73/F	No. 5138/73/F	No. 5139/73/F
Length	1.12	0.76	0.65
Width of uncoiled part	0.61	0.36	0.36
Width of coiled part	0.77	0.54	0.45
Number of chambers in uncoiled part	2	2	2
Number of chambers in coiled part	7	7	7

Remarks. — Individual variability expressed in differences in test size, number of whorls, diameter of spiral part, and number of chambers in uncoiled part. Polish specimens sometimes have a half of whorl less and thus they are smaller than the holotype.

Occurrence. — Poland: Middle and Upper Jurassic; France: Middle Jurassic; F.R.G.: Liassic — lower Upper Jurassic; Switzerland: Oxfordian; USSR (Rusian Platform): Lower and Middle Volgian; Sinai peninsula: Bathonian — Callovian.

Ammobaculites haplophragmoides Furssenke & Polenova, 1950

(Pl. I, Figs. 7a, b 8)

1950. *Ammobaculites haplophragmoides* sp.n.; A. V. Furssenke & E. N. Polenova, p. 16 Pl. 1, Fig. 2, 3.

1959. *Ammobaculites haplophragmoides* Furssenko & Polenova; T. N. Chabarova, p. 478, Pl. 2, Fig. 2a, b, w.

Material. — About 30 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5140/73/F	No. 5141a/73/F	No. 5141b/73/F
Length	0.63	0.50	0.36
Width	0.50	0.40	0.32
Thickness	0.32	0.14	0.12
Number of chambers in the last whorl	8	8	7

Supplemented description. — Test bilaterally flattened, with subcircular in outline whorls not completely overlapping one another; peripheral margin rounded, sometimes slightly incised; the last whorl consisting of 7—8 chambers; proloculus spherical; chambers subrectangular; the last chamber sometimes higher than the remaining ones. Sutures somewhat depressed. Umbilical depression equalling about 1/5 of test diameter. Aperture ovate, situated at the center of apertural face or in the proximity of dorsal margin of the last chamber in mature individuals.

Individual variability expressed in differences in test size, diameter of umbilical depression and position of the aperture.

Remarks. — Some Polish specimens display some features of the genus *Haplophragmoides* and another of *Ammobaculites* and it is difficult to decide to which genus they should be assigned. This is particularly the case when aperture is insufficiently preserved. The present author assigned the specimens to the genus *Ammobaculites* on account of the aperture located at the center of apertural face of the last chamber in mature individuals. The Polish specimens are usually larger and thicker than those known from the Russian Platform.

Occurrence. — Poland: Middle Portlandian; USSR (Russian Platform): Middle Volgian.

Genus *Haplophragmium* Reuss, 1860 emend. Lindenberg, 1967

Haplophragmium coprolithiforme subaequale (Mjatliuk, 1939)

(Pl. I, Figs. 9, 10; Pl. II, Figs. 1, 2)

1939. *Ammobaculites subaequalis* nov.sp.; E. V. Mjatliuk, p. 44, 45; Pl. 2, Fig. 19a,b, 20.
1967. *Haplophragmium coprolithiforme* Schwager Forma *subaequalis* (Mjatliuk); H. G. Lindenberg, p. 31 Pl. 2, Fig. 24-25; Pl. 3, Fig. 37-42, Text-fig. 39-55
1968. *Ammobaculites coprolithiformis* (Schwager); J. Guyader, p. 115, Pl. 18; Fig. 2-3; Pl. 25, Fig. 5a-b, Fig. 9.
1970. *Haplophragmium coprolithiforme* Schwager; B. Winter, p. 8, Pl. 1, Fig. 1-2, Text-fig. 6.

Material. — Over 30 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No 5006a,	No. 5006b,	No. 5006c ³⁾	No. 5006d ⁴⁾
Length	1.63	1.36	2.16	0.95
Width	0.54	0.47	0.63	0.41
Thickness	0.50	0.39	—	—
Proloculus diameter	—	—	0.03	0.05
Number of chambers in uncoiled part	3	3	6	3
Number of chambers in coiled part	3	3	3	3

Remarks. — Lindenberg (1967) distinguished some subspecies within *H. coprolithiforme* Schwager, one of them being *H. coprolithiforme subaequale* (Mjatliuk). The specimens described by Mjatliuk (1939) as *Ammobaculites subaequalis*, are characterized by elongated test composed of 3-chamber spiral part and 3-6-chamber uncoiled part. The chambers forming the latter part are broad and low, and the ultimate chamber is sometimes twice larger than the penultimate chamber. Sutures are weakly depressed. Aperture circular, situated on somewhat elongated top part of the last chamber. All these details may be noted on the photos given by Lindenberg (1967). It does not follow from the description of *H. coprolithiforme subaequale* (Mjatliuk), given by Lindenberg *l.c.*, that the spiral consists of more than 4 chambers. Thus the Polish specimens assigned by Bielecka and Pożaryski (1954) to *Ammobaculites infrajurensis* (Terquem) cannot be allocated in the latter subspecies. The Polish specimens differ from *H. coprolithiforme subaequale* in having spiral part consisting of 5—7 chambers and in more bilaterally flattened tests, and they should be assigned to *H. infravolgense* (Mjatliuk). In turn, the Protlandian specimens described by Bielecka & Pożaryski (1954) as *Ammobaculites coprolithiformis* (Schwager) and *A. coprolithiformis* var. *sequana* (Mohler) should be assigned to *H. coprolithiforme subaequale*.

Dain (*in* Dain & Kusnetzova, 1971) proposed a new genus, *Orbignynoides*, displaying features transitional between those of the genera *Ammobaculites* and *Labyrinthina*. It differs from the former in the internal pseudolabyrinthine structure of chamber walls, and from the latter — in having a simple aperture located on the top of the last chamber, and not a reticulate aperture located at the base of the last chamber. However, Dain did not discuss the differences between the genera *Orbignynoides* and *Haplophragmium* and assigned the species *Haplophragmium coprolithiforme* Schwager, *H. aequale* (Roemer) and *Ammobaculites subaequalis* Mjatliuk to *Orbignynoides*. The details of internal structure, described by Dain, were not found in the material studied. Therefore, taking into

^{3), 4)} Specimens studied in thin sections

account the doubts concerning the status of the genus proposed by Dain, the generic name *Haplophragmium* is accepted here.

Occurrence. — Poland: Lower Kimmeridgian, Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; France and England: Oxfordian — Kimmeridgian; Czechoslovakia: Klentnice Beds.

Haplophragmium infravolgense (Mjatliuk, 1939)

(Pl. II, Figs. 3, 4, 5)

1939. *Ammobaculites infravolgensis* nov.sp.; E. V. Mjatliuk, p. 45, Pl. 2, Fig. 17a, b, 18.
 1954. *Ammobaculites infrajurensis* (Terquem); W. Bielecka & W. Pożaryski, p. 26, Pl. 2, Fig. 4a, b, c, Text-fig. 1.
 1967. *Haplophragmium* aff. *infravolgensis* (Mjatliuk); J. Th. Groiss, p. 6, Pl. 1, Fig. 5.

Material. — Over 20 more or less compressed specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5142/73/F	No. 5143/73/F	No. 5004d ⁵⁾
Length	2.35	1.82	1.29
Width of uncoiled part	1.10	0.95	0.40
Width of coiled part	0.63	0.83	0.45
Thickness	0.54	0.45	—
Proloculus diameter	—	—	0.08
Number of chambers in uncoiled part	6	4	5
Number of chambers in coiled part	7	6	6

Remarks. — Individual variability expressed in differences in dimensions of spiral part and in its deviations from the growth axis. Within this species two generations were distinguished; however, they are difficult to separate because of the occurrence of several transitional forms.

The Polish specimens are usually somewhat larger than those reported from the Russian Platform. *Haplophragmium infravolgense* differs from *H. coprolithiforme subaequale* (Mjatliuk) in more flattened test, more numerous chambers of the spiral part (5—7 and 3—4, respectively), and in more ovate aperture.

Occurrence. — Poland: Uppermost Kimmeridgian and Lower Portlandian; USSR (Russian Platform): Middle Volgian; F.R.G. (Franconian Alb): Middle Tithonian.

Genus *Triplasia* Reuss, 1854, emend. Lindenberg, 1967

Triplasia althoffi jurassica (Mjatliuk, 1939)

(Pl. II, Figs. 6, 7, 8; Pl. III, Fig. 1)

1939. *Flabellamina* (*Frankeina*?) *jurassica* nov. sp.: E. V. Mjatliuk, p. 47, Pl. 2, Fig. 22a, b.

⁵⁾ Specimen studied in thin section.

1939. *Flabellamina rugosa* Alexander & Smith; E. V. Mjatliuk, p. 47, Pl. 1, Fig. 7.
 1939. *Frankeina elegans* nov.sp.; E. V. Mjatliuk, p. 48, Pl. 2, Fig. 26.
 1950. *Flabellamina lidiae* n.sp.; A. V. Furssenko & E. N. Polenova, p. 18, Pl. 1, Fig. 4-6.
 1954. *Frankeina kimeridensis* n.sp.; W. Bielecka & W. Pożaryski, p. 29, Pl. 3, Fig. 8a, b.
 1970. *Triplasia althoffi* (Bartenstein in Bartenstein & Brand); B. Winter, p. 9, Pl. 1, Fig. 22, text-fig. 7a-j.

Material. — Over a dozen specimens.

Dimensions of megalospheric (flat) forms (in mm):

Coll. IG Warsaw	No. 5144/73/F	No. 5145/73/F	No. 5002 ⁶⁾
Length	1.18	0.50	0.97
Width	0.67	0.36	0.67
Thickness	0.18	0.10	0.16
Proloculus diameter	0.05	0.04	0.04
Number of chambers in coiled part	5	5	4
Number of chambers in straightened part	4	2	4

Dimensions of microspheric (three-cornered) forms (in mm):

Coll. IG Warsaw	No. 5146/73/F	No. 5147/73/F ⁷⁾	No. 5008 ⁸⁾
Length	1.51	1.44	1.40
Width	0.81	0.75	0.70
Proloculus diameter	0.1	—	?
Number of chambers in coiled part	7	lacking	7?
Number of chambers in straightened part	5	5	6

Supplemented description. — Test elongated, with spiral part consisting of 3—6 (occasionally 7) triangular chambers and the uncoiled straight part consisting of 2—6 (or, sometimes, 7) chambers. The uncoiled part flat or multangular. Sutures poorly visible, sometimes somewhat depressed. Aperture circular to ovate, situated at somewhat elongated top of the last chamber. Dimorphism expressed in differences in test shape — flat or multangular.

Megalospheric form (generation A) — test flat (*Flabellamina* type), trapezoidal, with upper part somewhat elongated and lower part slightly rounded; peripheral margin rounded, sometimes slightly incised. Initial test part spirally coiled, consisting of 3—4 chambers; rectilinear part flat, consisting of 2—5 equitant chambers; the last chamber sometimes smaller

⁶⁾ Kimmeridgian specimen formerly assigned (Bielecka & Pożaryski, 1954) to *Flabellamina jurassica* (Mjatliuk).

⁷⁾ Portlandian specimen, somewhat damaged.

⁸⁾ Kimmeridgian specimen formerly assigned (Bielecka & Pożaryski, 1954) to *Frankeina kimeridensis* Bielecka & Pożaryski.

than the penultimate. Sutures flush to somewhat depressed, usually poorly visible. Aperture circular or ovate, with poorly marked neck.

Microspheric form (generation B) — test triangular (*Triplasia* type), with small, flat spiral part consisting of 4—7 chambers, and large triangular rectilinear part consisting of 1—6 (or, sometimes, 7) chambers; the rectilinear part formed of broad chambers with edges lowering downwards; the beginning of the third edge variously located; more or less distinct longitudinal depressions (furrows) marked on test sides. Sutures poorly visible, arcuate, sometimes slightly depressed. Aperture circular, situated on projected end of the last chamber, sometimes with short neck.

Individual variability expressed in differences in shape and size of tests of the two generations, the spiral/rectilinear parts ratio, number and development of chambers, development of apertural neck, and in shape of aperture.

Remarks. — Lindenberg (1967) interpreted several genera such as *Flabellammia*, *Frankeina*, *Tetraplasia*, *Flabellamminopsis* and, partly, *Rhabdogonium* as junior synonyms of the genus *Triplasia*. He evidenced the occurrence of two generations within *T. althoffi* (Bartenstein), previously treated by some authors as separate species. Moreover, he evidenced labyrinthic structure of test walls on the basis of thin section material. The specimens from the Middle Jurassic differ from those from the Upper Jurassic. Thus the latter are interpreted as a separate subspecies of *T. althoffi* and they are assigned to *T. althoffi jurassica* (Mjatliuk). This subspecies differs from the nominative subspecies, *T. althoffi althoffi*, in narrowed and less rounded spiral part, more elongated, trapezoidal overall test shape, and in lower angle of equitant chambers. Some differences are also found in the representatives of the generation B: these of *T. althoffi jurassica* differ from those belonging to the nominative subspecies in narrower upper part, the last chamber of the same width or even narrower than the spiral part smaller and less round, and in smaller number of chambers in rectilinear test part.

The Polish specimens assigned to *T. althoffi jurassica* do not differ from those described by Mjatliuk (1939) from the Volga Region. *T. althoffi jurassica* differs from *T. alexandri* and *T. goodlandensis* (megalospheric and microspheric forms of the same species, as it was suggested by Lindenberg, 1967, p. 35) in narrower spiral part, less arcuate chamber of rectilinear part, and smaller number of the chambers.

Occurrence. — *T. althoffi althoffi* is known from FRG: Bajocian-Bathonian-Callovian; France and England: Bajocian-Bathonian; and *T. althoffi jurassica* — Poland: Kimmeridgian — Middle Portlandian; USSR (Russian Platform): Middle Volgian; France: Kimmeridgian; FRG: Lower Kimmeridgian; Czechoslovakia: Klentnice Beds.

Family *Ataxophragmiidae* Schwager, 1877Subfamily *Verneulininae* Cushman, 1911Genus *Belorussiella* Akimets, 1958*Belorussiella wolinensis* sp.n.

(Pl. III, Figs. 2, 3, 4)

Holotype: No. 5148/73/F; Pl. III, Fig. 3,*Type horizon*: Middle Portlandian.*Type locality*: Wolin borehole, depth 105.5 m.*Derivation of the name*: From Wolin island.

Diagnosis. — Test elongated; initial part triserial, composed of 3—4 chambers and equalling about 1/8 of total length of test; biserial part composed of 3—7 pairs of chambers. Chambers and sutures poorly visible in the initial part, becoming better marked in the biserial part. Aperture longitudinal, coma-shaped.

Material. Approximately 30 specimens, some damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5148/73/F	No. 5149/73/F	No. 5150/73/F
Length	0.45	0.50	0.38
Width	0.18	0.20	0.18
Thickness	0.10	0.12	0.09
Initial part of test	0.05	0.09	0.05

Description. — Test elongated, with flattened sides, with somewhat sharpened lower part and becoming wider upwards. Initial part small, triserial with 3—4 chambers, somewhat deviating from growth axis and equalling 1/7—1/9 of total test length; biserial part consisting of 3—7 pairs of chambers. Chambers poorly visible, in the initial part, becoming well-marked, somewhat convex, slightly broader than high and finally higher than wide in the biserial part. Sutures poorly marked in the initial part, becoming more distinct, depressed and oblique in the biserial part. Peripheral margin rounded, slightly limbate. Aperture longitudinally coma-shaped, located medially on apertural face of the last chamber, and set perpendicularly to the suture separating the ultimate and penultimate chambers. Test surface rugose.

Individual variability concerns the degree of the triserial development of the initial part as well as the number of chambers in biserial part.

Remarks. — The specimens display some features of the genus *Spiroplectammina* and others of the genus *Belorussiella*. The initial part is developed in such a way that it is not certain whether it is triserial or of the form of anomalous small spiral. The aperture appears typical of *Belorussiella*, thus the specimens are assigned to that genus.

Belorussiella wolinensis sp.n. differs from *B. bolivinaeformis* Akimets, in triserial part markedly smaller and representing only 1/7—1/9

of total test length (whereas it equals $1/4$ — $1/5$ of total test length in *B. bolivinaeformis*), higher number of chambers of biserial part (3—7 and 2—3 pairs of chambers, respectively), whereas the size of tests is roughly the same. *Belorussiella wolinensis* sp.n. differs from *B. taurica* Gorbachik (Gorbachik, 1971) in smaller and less distinct triserial part, smaller size of the test, biserial part more strongly widening upwards and in accordingly lower chambers.

Occurrence. — Poland: Middle Portlandian, the Zaraiskites zaraiskensis Zone.

Family **Nubeculariidae** Jones, 1875

Subfamily **Nubeculariinae** Jones, 1875

Genus *Nubecularia* DeFrance, 1825

Nubecularia mazoviensis Bielecka & Pożaryski, 1954

(Pl. III, Figs. 5, 6a, b, 7a, b)

1954. *Nubecularia mazoviensis* n.sp.; W. Bielecka & W. Pożaryski, p. 31, Pl. 3, Fig. 10a, b, c.

Material. — Over 30 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5151/73/F	No. 5152/73/F	No. 5010 ⁹⁾
Length	0.31	0.27	0.24
Width	0.24	0.23	0.18
Thickness	0.18	0.17	0.09

Remarks. — The test of the holotype appears twice thinner than in the majority of representatives of this species, as this individual was attached during its life in such a way that chambers developed only on one side. The arrangement of chambers is shown in Plate III, Figs 6b and 7b. Some Portlandian specimens representing an early growth stage display a thin tubular second chamber almost completely overlapping spherical proloculus.

Occurrence. — Poland: Upper Kimmeridgian and Lower Portlandian.

Family **Miliolidae** Ehrenberg, 1835

Subfamily **Quinqueloculininae** Cushman, 1917

Genus *Palaeomiliolina* Loeblich & Tappan, 1964

Palaeomiliolina egmontensis (Lloyd, 1962)

(Pl. III, Figs. 8, 9, 10)

1962. *Quinqueloculina egmontensis* Lloyd, n.sp.; A. J. Lloyd, p. 376, Pl. 2, Fig. 7a-c.

1967. *Quinqueloculina egmontensis* Lloyd; J. Th. Groiss, p. 85, Pl. 5, Fig. 22a, b.

⁹⁾ The holotype, described by Bielecka & Pożaryski (1954) was derived from the strata of Upper Kimmeridgian (*Aulacostephanus pseudomutabilis* Zone), penetrated by borehole Zagłoba at the depth 350.0 m.

Material. — About 20 specimens, some damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5153/73/F	No. 5154a/73/F	No. 5154b/73/F
Length	0.31	0.26	0.25
Width	0.18	0.12	0.10
Thickness	0.09	0.08	0.07

Supplemented description. — Test ovate, slightly flattened, with rounded peripheral margins; external chambers, 5 in number, tubular, slightly bent on both ends, broader at the base and becoming narrower towards the aperture, equalling about a half of whorl in length; 3 chambers visible on one side, and 4 on the other. Sutures depressed, fairly distinct; the last chambers sometimes ornamented with a longitudinal rib marked close to their inner margin. Aperture circular, without tooth.

Individual variability concerns the presence or lack of ribs on surface of chambers and the transverse outline of test, varying from subtriangular to elliptical.

Remarks. — The differences between the genera *Quinqueloculina*, *Palaeomiliolina*, *Sigmoilina* and *Massilina* were recently discussed by Pazdro (1972, p. 544, 556). There are no significant differences between the Polish representatives of *Palaeomiliolina egmontensis* and the holotype. It seems that the assignment of *Quinqueloculina* sp.B of Cushman & Głazewski (1949, p. 6. Pl. 2, Figs 14—15) to *Palaeomiliolina egmontensis* by Lloyd (1962) was not justified. The latter is characterized by markedly thicker test, uniform lumen of chambers along the whole of their length, not decreasing towards the aperture, and the lack of ribs on surface of chambers. The forms assigned to *Quinqueloculina* sp.B resemble *Q. jurassica* Bielecka & Styk (1966) and were assigned to the latter species (Bielecka & Styk, 1966).

Occurrence. — Poland: Middle Portlandian; England: Portlandian, the Pavlovia pallasoides and P. rotunda Zones; FRG (Franconian Alb): upper Solnhofen beds.

Family **Nodosariidae** Ehrenberg, 1838
 Subfamily **Nodosariinae** Ehrenberg, 1838
 Genus *Nodosaria* Lamarck, 1812
Nodosaria cucumiformis sp.n.
 (Pl. III, Figs. 11, 12, 13)

Holotype: No. 5155/73/F; Pl. III, Fig. 11.

Type horizon: Middle Portlandian.

Type locality: Borehole Strzegowo, depth 193.6 m.

Derivation of the name: Lat. *cucumis* — cucumber: †st cucumber-shaped.

Diagnosis. — Test slightly bent, consisting of 6—8 chambers; proloculus spherical; second chamber of almost the same size as proloculus; subsequent chambers somewhat broader than high; the last chamber

slightly extending upwards; test ornamented with 5—6 ribs. Sutures distinct; aperture circular, terminal.

Material.— Over a dozen specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5155/73/F	No. 5156/73/F	No. 5157/73/F
Length	1.06	0.98	0.77
Width	0.30	0.29	0.29
Proloculus diameter	0.12	0.15	0.06
Number of chambers	8	7	6

Description.— Test elongated, cucumber-shaped, slightly bent narrow at the base, widening in club-like fashion upwards to become narrower at the last chamber; test consisting of 6—8 chambers; proloculus spherical (two times smaller in the case of microspheric forms); second chamber almost of the same size as proloculus; third and subsequent chambers somewhat broader than high; the last chamber gently extending upwards. Sutures straight, distinct, depressed in the middle part of test, between ribs; test surface ornamented with 5—6 longitudinal ribs, wide at the base and relatively sharp-crested, of the same height upon sutures as elsewhere; the ribs disappear somewhere at the mid height of the last chamber. Aperture circular, situated at gently elongated top part of the last chamber.

Individual variability moderate. Megalospheric forms differ from one another in number of chambers and test size. Microspheric forms are smaller, more spindle-shaped and scarcer than the megalospheric forms.

Remarks.— *N. cucumiformis* sp.n. differs from *N. paucicostata* Roemer in cucumber-like shape of test and more distinct chambers. The former differs from *N. pentagonalis* Furssenko & Polenova in somewhat more numerous and more loosely spaced ribs and in more gently elongated upper test end.

Occurrence.— Poland: Middle Portlandian (uppermost Zaraiskites scythicus and Zaraiskites zaraiskensis Zones).

Nodosaria osynkiensis Mjatliuk, 1939

(Pl. III, Figs. 14, 15)

1939. *Nodosaria osynkiensis* nov. sp.; E. V. Mjatliuk, p. 64, Pl. 2, Fig. 27, 28.

1967. *Nodosaria osynkiensis* Mjatliuk; J. Th. Groiss, p. 10, Pl. 1, Fig. 18a, b.

Material.— About 20 more or less damaged specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5158/73/F	No. 5159/73/F	No. 5160/73/F
Length	0.57	0.48	0.46
Width	0.15	0.12	0.14
Larger proloculus diameter	0.06	0.07	0.05
Smaller proloculus diameter	0.05	0.06	0.05
Number of chambers	7	6	7

Supplemented description.—Test elongated; number of chambers ranges from 5 to 10, 6—7 at the average; proloculus almost spherical to ovate, sometimes with small spine at the base; subsequent chambers sub-spherical, becoming somewhat broader during growth; the last chamber slightly elongated. Sutures straight, depressed, distinct. Aperture radial or circular, terminal, situated at somewhat elongated top part of the last chamber.

Individual variability expressed by differences in size of test, number of chambers, the presence or lack of spine at the base of proloculus, and degree of elongation of the last chamber.

Remarks.—The Polish specimens differ from the holotype in smaller size; moreover, the spine from the base of the last chamber is not always developed in the former. *Nodosaria osynkiensis* Mjatliuk differs from *N. jonesi* Reuss in larger test size, chambers more numerous and in sutures less depressed.

Occurrence.—Poland: Middle Portlandian; USSR (Volga Region); Middle Volgian; FRG (Franconian Alb): Middle Tithonian.

Nodosaria pentagonalis Furssenko & Polenova, 1950

(Pl. III. Figs. 16, 17, 18)

1950. *Nodosaria* ex.gr. *raphanus* (Linné) var. *pentagonalis* var. n.; A. V. Furssenko & E. N. Polenova, p. 74, Fig. 16.

? 1965. *Rectoglandulina* cf. *quinquecostata* Bornemann; E. Hanzlikova, p. 91, Pl. 9, Fig. 5a, b.

Material.—Over 30 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5161/73/F	No. 5162/73/F	No. 5163/73/F
Length	0.99	0.64	0.41
Width	0.32	0.25	0.18
Proloculus diameter	0.19	0.12	0.07
Number of chambers	7	5	4

Supplemented description.—Test elongated; lower end somewhat rounded, sometimes with small spine; upper end elongated; 4-7 chambers; proloculus spherical, subsequent chambers broader than high; the last chamber extending upwards. Sutures distinct, depressed only in the middle part of test surface between ribs. Ribs longitudinal, 5—6 in number, wide at the base and sharp-crested. Aperture radial or circular, situated at the elongated top part of the last chamber.

Individual variability expressed by differences in number of ribs (ranging from 5 to 6) and the presence or lack of the spine at the base of proloculus.

Remarks.—*Nodosaria pentagonalis* differs from *N. raphanus* (Linné) in test widening upwards, the last chamber more elongated upwards and not cupola-like and in smaller number of chambers and ribs.

Some Polish specimens differ from the holotype in having one rib more. *Nodosaria pentagonalis* differs from *N. striatojurensis* in less cylindrical test shape, more protruding upper end of test, and in ribs having a wider base. The former differs from *N. paucicostata* Roemer in less egg-shaped test shape, more elongated last chamber and in ribs having wider base.

Occurrence. — Poland: upper Middle Portlandian; USSR (Volga Region): Middle Volgian; Czechoslovakia: Klentnice Beds.

Nodosaria scythicis Furssenko & Polenova, 1950

(Pl. III, Figs. 19, 20)

1950. *Nodosaria tubifera* Reuss var. *scythicis* var. n.; A. V. Furssenko & E. N. Polenova, p. 77, Pl. 6, Fig. 10—12.
 1954. *Nodosaria internotata* Chapman; W. Bielecka & W. Pożaryski, p. 60, Pl. 9, Fig. 44.
 1965. *Nodosaria internotata* Chapman; E. Hanzlikova, p. 65, Pl. 9, Fig. 1a, b.
 1969. *Nodosaria scythicis* Furssenko & Polenova; A. V. Furssenko, p. 238.

Material. — About 20, generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5164/73/F	No. 5165/73/F	No. 5166/73/F
Length	0.62	0.60	0.39
Width	0.16	0.17	0.14
Larger proloculus diameter	0.08	0.09	0.07
Smaller proloculus diameter	0.07	0.08	0.05
Number of chambers	4	4	3

Supplemented description. — Test elongated, with both ends sharp-pointed; 3—5 chambers (usually 4). Proloculus ovate or cylindrical, subsequent chambers convex, somewhat elongated; the last chamber always sharply protruding. Sutures depressed, distinctly separating chambers. Test ornamented with about 16 fine ribs; some ribs first appear at the test base, whereas others — always at the base of a chamber. Aperture radial, situated at sharply protruding top part of the last chamber.

Individual variability expressed in differences in number of chambers, shape of proloculus and in the number of ribs.

Remarks. — The Polish specimens are usually smaller than the holotype. *Nodosaria scythicis* differs from *N. internotata* Chapman in ribs not broken at sutures and less cylindrical shape of chambers. The former differs from *N. sceptrum* Reuss in less numerous and more rounded chambers, the last chamber sharply protruding upwards, and in finer ribbing. It differs from *N. tubifera* Reuss in smaller number of chambers and ribs and in more depressed sutures.

Occurrence. — Poland: Lower and Middle Portlandian; USSR (Volga Region): Middle Volgian; Czechoslovakia: Klentnice Beds.

Nodosaria striatojurensis Klähn, 1923

(Pl. III, Figs. 21, 22, 23)

1923. *Nodosaria striatojurensis* n.sp.; H. Klähn, p. 457, Pl. 23, Fig. 16a, b, non Fig. 16c, d.
 1954. *Nodosaria striatojurensis* Klähn; W. Bielecka & W. Pożaryski, p. 59, Pl. 9, Fig. 43.
 ? 1965. *Nodosaria radiata* Terquem; E. Hanzlikova, p. 66, Pl. 9, Fig. 6a, b.

Material. — Over 30, usually well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5167/73/F	No. 5168/73/F	No. 5043 ¹⁰⁾
Length	1.00	0.92	0.61
Width	0.28	0.27	0.20
Proloculus diameter	0.14	0.17	0.11
Number of chambers	7	6	6

Supplemented description. — Test consisting of 2—7 (usually 6) chambers; proloculus spherical; subsequent chambers somewhat broader than high; the last chamber slightly elongated. Sutures straight, markedly depressed; test ornamented with 5—6 ribs disappearing in the mid-height of the last chamber; ribs passing over sutures without a change in height. Aperture circular, situated at slightly elongated top part of the last chamber.

Individual variability expressed in differences in number of chambers and test size.

Remarks. — *Nodosaria striatojurensis* differs from *N. obscura* Reuss in the smaller number of ribs (5—6 and 7—10, respectively), cylindrical and not egg-shaped test, depressed sutures and in the lack of spine at the test base. It differs from *N. paucicostata* Roemer in cylindrical test shape and depressed sutures, and from *N. columnaris* Franke — in the smaller number of ribs, depressed sutures and the lack of basal spine.

Occurrence. — Poland: Lower and Middle Portlandian; FRG (Alsation): Tithonian and the beds with *Giganteus*; Czechoslovakia: Klentnice Beds.

Genus *Citharina* d'Orbigny in de la Sagra, 1839, emend. Marie, 1938

Citharina brevis (Furssenko & Polenova, 1950)

(Pl. IV, Figs. 1, 2)

1950. *Vaginulina brevis* n.sp.; A. V. Furssenko & E. N. Polenowa, p. 60, Pl. 5, Fig. 3, 4.
 1954. *Vaginulina proxima* (Terquem); W. Bielecka & W. Pożaryski, p. 44, Pl. 6, Fig. 25a, b.
 ? 1965. *Citharina* ex. gr. *proxima* (Terquem); E. Hanzlikova, p. 89, Pl. 6, Fig. 21.

¹⁰⁾ Lower Portlandian specimen described by Bielecka & Pożaryski (1954).

Material. — A few tens of generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5169/73/F	No. 5170/73/F	No. 5171/73/F
Length	1.02	0.78	0.73
Width	0.54	0.44	0.47
Thickness	0.19	0.19	0.17
Proloculus diameter	0.10	0.10	0.09
Number of chambers	7	7	6

Supplemented description. — Test triangular in outline, widening upwards; lower end rounded, somewhat bent to the ventral side; dorsal margin slightly convex; ventral margin somewhat S-shaped or straight, always shorter than the dorsal margin; 6—8 chambers; proloculus spherical; second chamber subtriangular; subsequent chambers wide and low in side view. Sutures oblique, sometimes slightly arcuate. Test surface ornamented with 6—8 longitudinal ribs spreading in fan-like manner from the base of the test; shorter intercalary ribs are spaced between the main ribs; branching of ribs is sometimes noted; proloculus ornamented with 4—5 ribs, whereas the last chamber — with 10 (including intercalary ones). The ribs reach apertural face of the last chamber, bending towards the dorsal side. Two lateral and one or two medial ribs are marked on both dorsal and ventral sides; medial ribs look like keel. Apertural surface smooth, narrow and long, surrounded by the endigs of ribs. Aperture radial or circular, located close to the dorsal margin of test, on slightly elongated top part of the last chamber.

Individual variability expressed in differences in the bending of the lower end of test, width of the upper part of test, number of ribs and their fan-like pattern.

Remarks. — The Polish specimens are usually somewhat larger than the holotype and their ventral medial rib has not reached the character of keel. *Citharina brevis* differs from *C. raricostata* (Furssenko & Polenova) in wider upper part of the test, bent lower end of test, and ribs arranged in fan-like pattern.

Occurrence. — Poland: Lower and Middle Portlandian; USSR (Russian Platform): Middle Volgian; Czechoslovakia: Klentnice Beds.

Citharina catherinae sp.n.

(Pl. IV, Figs. 3, 4, 5a, b)

Holotype: No. 5172/73/F; Pl. IV, Fig. 3.

Type horizon: Middle Portlandian.

Type locality: Borehole Strzegowo, depth 204.7 m.

Derivation of the name: after my granddaughter, Catherine.

Diagnosis. — Test elongated, trapezoidal: 7—13 chambers; proloculus spherical or egg-shaped. Sutures flush, oblique, slightly arcuate. Lateral

test surface ornamented with 7—9 or, sometimes, 10 fairly sharp, distinct, parallel ribs.

Material. — Over 30, usually well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5172/73/F	No. 5173/73/F	No. 5174/73/F
Length	2.10	1.06	0.84
Width	0.56	0.30	0.36
Thickness	0.27	0.19	0.22
Larger proloculus diameter	0.08	0.15	0.05
Smaller proloculus diameter	0.05	0.14	0.03
Number of chambers	13	7	8

Description. — Test elongated, flattened, subtrapezoidal in shape, with both ends extended. Lower test end of megalospheric forms somewhat more rounded, whereas that of microspheric forms is sharp. Upper part of test somewhat broader than the lower. Dorsal margin rectilinear; ventral margin gently convex, initially oblique, then almost parallel to the dorsal one; 7—13 chambers; proloculus egg-shaped in microspheric forms, and spherical in megalospheric forms; successive chambers low and broad. Sutures flush, oblique, slightly arcuate. Lateral test surface ornamented with 7—10 longitudinal, moderately wide, fairly sharp-crested ribs; 4—5 ribs marked on proloculus, 6—7 ribs — on second chamber; successive ribs first appear on subsequent chambers close to their ventral side. Dorsal and ventral surfaces ornamented with 3—4 ribs, two outer of which represent at the same time the lateral ribs.

Apertural face flat, narrow and long, surrounded on sides by ribs set one after another. Aperture circular or radial, located close to the dorsal margin at elongated top part of the last chamber.

Individual variability expressed in differences in test size, number of chambers, elongation of the test, as well as in test length/width ratio (ranging from 2 : 1 to 1.5 : 1).

Remarks. — *Citharina catherinae* sp.n. differs from *C. rudocostata* Bartenstein & Brand in subtrapezoidal test outline, more rounded lower test end, almost parallel dorsal and ventral margins, less oblique sutures and more numerous and finer ribs.

Occurrence. — Poland: Middle Portlandian (upper parts of the Zaraiskites scythicus and *Z. zaraiskensis* Zones).

Citharina culter (Furssenko & Polenova, 1950)

(Pl. IV, Figs. 6, 7)

1950. *Vaginulina intumescens* Reuss var. *culter* var.n.; A. V. Furssenko & E. N. Polenova, p. 65, Pl. 5, Fig. 11.
1963. *Vaginulina intumescens* var. *culter* Furssenko & Polenova; J. Espitalié & J. Sigal, p. 48, Pl. 20, Fig. 14, 15.
1969. *Citharina culter* (Furssenko & Polenova); A. V. Furssenko, p. 237.

Material. — Over a dozen, usually well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5175/73/F	No. 5176/73/F	No. 5177/73/F
Length	1.96	1.93	1.20
Width	0.42	0.32	0.28
Thickness	0.20	0.17	0.17
Proloculus diameter	0.15	0.14	0.08
Number of chambers	13	12	9

Supplemented description. — Test elongated, flattened, outlined as a narrow triangle. Proloculus sometimes with a spine formed by extension of rib. Dorsal margin rectilinear; ventral margin slightly convex or almost rectilinear, always shorter than the dorsal. Chambers 8—14 in number; proloculus spherical; successive chambers low and moderate in width. Sutures flush, oblique, poorly visible. Lower test part ornamented with 3—5 ribs; later there appears a rib between the first and the second rib counting from the dorsal margin; third rib dichotomically branching; the last chamber ornamented with 8—10 ribs. The ribs turn towards the dorsal margin and surround apertural face. Dorsal surface ornamented with 3 ribs, whereas ventral — with 2 ribs. Apertural face long, weakly convex. Aperture circular, located close to the dorsal margin, on short neck.

Individual variability expressed in number of chambers and ribs.

Remarks. — Polish specimens differ from the holotype in somewhat more slender test and less convex ventral side. *Citharina culter* differs from *C. intumescens* (Reuss) in less triangular test outline, longer ventral margin, less distinct sutures, and ribs coarser, set parallel to ventral and not to dorsal margin.

Occurrence. — Poland: Middle Portlandian; USSR (Russian Platform): Middle Volgian; Madagascar: Portlandian.

Citharina cuneata sp.n.

(Pl. IV, Figs. 8, 9, 10)

Holotype: IG Warsaw, No. 5178/73/F; Pl. IV, Fig. 8.

Type horizon: Middle Portlandian.

Type locality: Borehole Strzegowo, depth 206.7 m.

Derivation of the name: Lat. *cuneatus* — sharp-pointed, wedge-like.

Diagnosis. — Test elongated, in the form of flat, slightly bent wedge; 9—12 chambers; proloculus spherical, subsequent chambers low, somewhat broader. Sutures flush, oblique. Dorsal margin almost rectilinear; ventral margin S-shaped; 6—9 thin, longitudinal, fairly sharp-crested ribs.

Material. — Over 20 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5178/73/F	No. 5179/73/F	No. 5180/73/F
Length	1.84	1.76	1.62
Width	0.50	0.50	0.56
Thickness	0.19	0.25	0.25
Proloculus diameter	0.08	0.04	0.09
Number of chambers	12	10	9

Description. — Test elongated, in the form of flat, slightly bent wedge. Both ends of test sharp-pointed; lower end of microspherical forms sharp and bent. Dorsal margin almost rectilinear, more or less bent towards the dorsal side in the lower test part; ventral margin S-shaped in lower test part, somewhat convex upwards. Chambers 9—12 in number; proloculus spherical in megalospheric forms, somewhat ovate in microspherical forms; subsequent chambers low, moderately wide. Sutures flush, oblique. Lateral test surface ornamented with 6—9 longitudinal, thin, fairly sharp-crested ribs; proloculus ornamented with 4—5 ribs; successive ribs appear usually closer to the ventral margin; dorsal side with 3 (sometimes 4) subparallel ribs; ventral side with 2—5 ribs. Ribs from lateral test surface partly enter the apertural face of the last chamber, becoming thinner and turning towards dorsal part of the test and surrounding a narrow apertural face. Aperture circular, located close to the dorsal margin on elongated top part of the last chamber.

Individual variability expressed in differences in test width and the degree of narrowness of the lower part of the test.

Remarks. — *Citharina cuneata* sp.n. differs from all the species of this genus in a specific pattern of ribs on apertural face and in wedge-like test outline. It differs from *C. trasarivotruensis* Espitalié & Sigal in less oblique sutures, smaller number of intercalary ribs, and somewhat S-shaped course of dorsal margin, and from *C. catherinae* sp.n. — in more triangular test shape, more oblique sutures, more S-shaped dorsal margin, and in finer and less parallel ribs.

Occurrence. — Poland: Middle Portlandian (upper Zaráiskites scythicus and *Z. zaráiskensis* Zones); Madagascar: Portlandian.

Citharina densicostata sp.n.

(Pl. V. Figs. 1a, b, 2a, b)

Holotype: No. 5181/73/F; Pl. V, Fig. 1a, b.

Type horizon: Middle Portlandian.

Type locality: Borehole Strzegowo, depth 198.4 m.

Derivation of the name: Lat, *densus* — dence — densely ribbed.

Diagnosis. — Test in the shape of narrow triangle; 10—17 chambers; proloculus spherical; subsequent chambers wide and low; ventral margin

following wavy course; dorsal margin initially bent, later rectilinear; sutures flush or weakly elevated, slightly arcuate. Lateral test surface ornamented with 17—20 ribs arranged in waves.

Material. — Over a dozen specimens, usually poorly preserved.

Dimensions (in mm):

Coll. IG Warsaw	No. 5181/73/F	No. 5182/73/F	No. 5183/73/F
Length	2.83	1.68	1.25
Width	0.73	0.56	0.44
Thickness	0.25	0.17	0.14
Proloculus diameter	0.14	0.12	0.10
Number of chambers	17	13	1

Description. — Test bilaterally flattened, in the form of narrow triangle. Both ends elongated; lower end somewhat rounded; dorsal margin almost rectilinear, somewhat bent ventrally in the lower test part; ventral margin gently convex, S-shaped, sometimes irregularly incised. Chambers 10—17 in number; proloculus spherical; subsequent chambers wide and low, nonuniform in width which results in wavy course of the ventral margin line. Sutures flush or weakly elevated, oblique or, sometimes, weakly arcuate. Lateral test surface ornamented with 17—20 fine, sometimes bifurcating ribs. The ribs are set almost parallel to the dorsal margin at lateral test surface in one-third of test width from the dorsal margin; between them some intercalary ribs appear. The remaining part of lateral test surface is covered by wavy ribs, markedly bending towards the ventral margin; the ribs reach the apertural face of the last chamber, bending towards the dorsal side and forming a frame of the apertural face. The latter smooth, narrow and long, situated somewhat below the endings of ribs. Aperture circular, located close to the dorsal margin at the top of the last chamber, sometimes with short neck.

Individual variability expressed in different test elongation, wavy outline of dorsal margin line, and in more or less complex pattern of ribbing of lateral test surface.

Remarks. — *Citharina densicostata* sp.n. markedly differs from other species of this genus in complex pattern of ribbing.

Occurrence. — Poland: Middle Portlandian (upper Zaraiskites scythicus and *Z. zaraiskensis* Zones).

Citharina kujaviensis (Bielecka & Pożaryski, 1954)

(Pl. V. Figs. 3, 4)

1954. *Vaginulina kujaviensis* n.sp.; W. Bielecka & W. Pożaryski, p. 46, Pl. 6, Fig. 28a, b.

Material. — Over 30 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5184/73/F	No. 5185/73/F	No. 5028 ¹¹⁾
Length	0.84	0.81	0.54
Width	0.34	0.24	0.19
Thickness	0.10	0.10	0.09
Larger proloculus diameter	0.14	0.14	0.14
Smaller proloculus diameter	0.14	0.09	0.09
Number of chambers	6	6	5

Remarks. — Specimens with 5—6 chambers (instead of 7—8) and with 8—10 ribs were found in core material of the Portlandian, Individual variability is expressed by differences in number of fine longitudinal ribs marked on different number of chambers and disappearing in various parts of test side. *Citharina kujaviensis* differs from *C. intumescens* (Reuss) in smaller size and finer ribbing, and from *C. undosicostata* sp.n. — in smaller size and number of chambers, less numerous, finer and longitudinal and not wavy ribs.

Occurrence. — Poland: Upper Kimmeridgian, Lower and Middle Portlandian; FRG (Franconian Alb): Middle Tithonian.

Citharina parallela (Bielecka & Pożaryski, 1954)

(Pl. V. Fig. 5, 6, 7)

1954. *Vaginulina zaglobensis* var. *parallela* n.sp.; n.var.; W. Bielecka & W. Pożaryski, p. 45, Pl. 6, Fig. 27.
 1967. *Vaginulina zaglobensis parallela* Bielecka & Pożaryski; J. Th. Groiss, p. 41, Pl. 4, Fig. 153.
 1968. *Vaginulina zaglobensis parallela* Bielecka & Pożaryski; J. Guyader, p. 154, Pl. 22, Fig. 4—6; Pl. 27, Fig. 6a—e.

Material. — A few tens of generally well-preserved specimens.

Dimensions (in mm):

Coil. IG Warsaw	No. 5186a/73/F	No. 5027 ¹²⁾	No. 5186b/73/F
Length	1.45	1.40	0.62
Width	0.36	0.30	0.17
Thickness	0.22	0.25	0.12
Larger proloculus diameter	0.14	0.09	0.09
Smaller proloculus diameter	—	0.06	0.07
Number of chambers	10	8	6

Supplemented description. — Test elongated, in the form of narrow triangle, somewhat bilaterally flattened; dorsal margin rectilinear; ventral margin almost rectilinear or somewhat convex; 6—9 (sometimes 10) chambers; proloculus spherical or ovate; lateral test surface ornamented with 4—6 ribs subparallel to one another and to test margins; intercalary

¹¹⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Aulacostephanus pseudomutabilis Zone, borehole Zagłoba, depth 307.5 m.

¹²⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Upper Kimmeridgian Aulacostephanus pseudomutabilis Zone, Zagłoba borehole, depth 307.5 m.

ribs were not found; the ribs enter the top part of the test, turning towards the dorsal margin and distinctly delineating a narrow, small apertural face. Sutures slightly oblique, weakly marked, sometimes depressed. Micro- and megalospheric forms differ in the size of proloculus only.

Individual variability low, marked in differences in number of chambers and ribs.

Remarks. — *Citharina parallela* differs from *C. zaglobensis* in narrower and thicker test, smaller number of chambers and ribs, the lack of intercalary ribs and markedly shorter apertural face more distinctly delineated by the ribs. It differs from *C. angustissima* (Reuss) in somewhat wider upper test part, straight and continuous ribs, less elongated last chamber and somewhat less oblique sutures.

Occurrence. — Poland: Upper Kimmeridgian, Lower and Middle Portlandian; France: Kimmeridgian; FRG (Franconian Alb): lower parts of Middle Tithonian; USSR (Russian Platform): Middle Volgian; Madagascar: Portlandian.

Citharina raricostata (Furssenko & Polenova, 1950)

(Pl. V, Figs. 8, 9a, b)

1950. *Vaginulina raricostata* n.sp.; A. V. Furssenko & E. N. Polenova, p. 56, Pl. 5, Fig. 5—8.
 1953. *Vaginulina raricostata* Furssenko & Polenova; J. Espitalié & J. Sigal, p. 48, Pl. 26, Fig. 1—3.

Material. — Over 40, generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5187a/73/F	No. 5187b/73/F	No. 5188/73/F
Length	1.45	1.37	0.87
Width	0.53	0.42	0.36
Thickness	0.28	0.20	0.17
Proloculus diameter	0.08	0.14	0.10
Number of chambers	10	8	6

Supplemented description. — Test triangular, elongated, with flattened sides. Lower part narrow, somewhat rounded, sometimes with small spine; upper part widened; dorsal margin rectilinear or almost rectilinear; ventral margin slightly convex, somewhat oblique, always shorter than the dorsal one; 6—10 chambers; proloculus spherical or slightly ovate; subsequent chambers fairly wide and low. Sutures flush, oblique. Lateral test surface ornamented with 5—8 longitudinal, fairly thick, moderately sharp-crested ribs almost parallel to dorsal margin; 1—2 intercalary ribs marked on the last chamber. Dorsal and ventral sides ornamented with 2 main and 1 or 2 shorter ribs. Apertural face narrow, slightly convex, surrounded by ribs bent dorsally. Aperture circular, situated close to dorsal margin on neck or elongated top part of the last chamber.

Individual variability expressed in test size, number of chambers and ribs, and development of apertural neck.

Remarks. — The Polish specimens are somewhat larger than the holotype. *Citharina raricostata* differs from *C. harpa* (Roemer) in more elongated test shape, smaller number of chambers, less numerous and coarser ribs, and the development of apertural neck. It differs from *C. proxima* (Terquem) in more straight dorsal margin, narrower test, less oblique sutures, and smaller number of intercalary ribs.

Occurrence. — Poland: late Lower and Middle Portlandian; USSR (Russian Platform): Middle Volgian; Madagascar: Portlandian.

Citharina undosicostata sp.n.

(Pl. V. Figs. 10,11)

Holotype: No. 5189/73/F; Pl, V, Fig. 10.

Type horizon: Middle Portlandian.

Type locality: Borehole Strzegowo, depth 194.9 m.

Derivation of the name: Lat. *undosus* — wavy, covered with wavy ribs.

Diagnosis. — Test elongated, subtriangular in outline; 6—13 chambers; proloculus ovate or almost spherical. Sutures somewhat depressed, oblique; dorsal margin almost rectilinear; ventral margin convex, unequally incised; lateral surface ornamented with 14—17 thin wavy ribs.

Material. — Over 20, partly damaged specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5189/73/F	No. 5190/73/F	No. 5191/73/F
Length	2.21	2.07	1.00
Width	0.56	0.74	0.42
Thickness	0.17	0.17	0.10
Larger proloculus diameter	0.14	0.09	0.15
Smaller proloculus diameter	0.10	0.05	0.14
Number of chambers	13	12	6

Description. — Test elongated, flattened, irregularly triangular in shape, sharpened at both ends, sometimes with lower end somewhat rounded (in the case of megalospheric forms); dorsal margin almost rectilinear; ventral margin convex, unequally incised; 6—13 chambers; proloculus ovate (microspheric forms) or almost spherical (megalospheric forms); subsequent chambers low and broad, extending downwards and even reaching initial part of the test. Sutures somewhat incised, oblique, somewhat arcuate. Lateral test surface ornamented with 14—17 fine ribs following wavy course and lowering or breaking at sutures; the ribs are more parallel to the ventral than to the dorsal margin. Proloculus ornamented with 4 ribs; the remaining ribs first appear on subsequent chambers, usually close to the ventral margin. Ventral and dorsal surfaces or-

namented with 2—3 ribs; some ribs enter lateral test surface. Apertural face of the last chamber narrow, long, somewhat convex, surrounded by ribs bent towards the dorsal side. Aperture circular, located close to the dorsal margin on elongated top part of the last chamber.

Individual variability expressed in differences in test outline, course of dorsal margin, appearance of ventral margin, number of chambers and ribs, and in arrangement of ribs.

Remarks. — Presumably a part of specimens from the Lower and Middle Volgian of Volga Region, identified by Mjatluk (1939) as *Vaginulina flabelloides* (Terquem) should be assigned to *C. undosicostata* sp.n. The specimens appear to be closer to the new species from the Portlandian of Poland than to Terquem's specimens from the Dogger of France. Similarly, the specimens described by Furssenko and Polenova (1950) as *Vaginulina* aff. *discors* Koch resemble *C. undosicostata* sp.n. in arrangement of chambers and the occurrence of fine wavy ribs and should be assigned to the latter species. Some representatives of *C. undosicostata* resemble *C. flabelloides* (Terquem) whereas others — *C. heteropleura* (Terquem), differing from the latter in less triangular test outline, more numerous chambers, and in more numerous, finer and wavy ribs. *Citharina undosicostata* sp.n. differs from *C. discors* (Koch) in more numerous, finer and wavy ribs and in the lack of marked sharp, keel-like rib on dorsal margin.

Occurrence. — Poland: Middle Portlandian (upper Zaraiskites scythicus and *Z. zaraiskensis* Zones); USSR (Russian Platform): Lower and Middle Volgian.

Citharina cf. *virgatis* (Furssenko & Polenova, 1950)

(Pl. V, Fig. 12)

Material. — About 10 usually somewhat damaged specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5192/73/F	No. 5193/73/F
Length	0.73	0.65
Width	0.30	0.31
Thickness	0.19	0.18
Proloculus diameter	0.14	0.10
Number of chambers	5	6

Description. — Test elongated, flattened, triangular in outline; lower test end narrow, somewhat rounded; upper end elongated; dorsal margin rectilinear or weakly convex; ventral margin slightly S-shaped; 5—8 chambers; proloculus spherical; subsequent chambers low and broad. Sutures usually distinct, slightly depressed or almost flush, somewhat oblique. Lateral test surface ornamented with 5—6 moderately thick ribs, subparallel to test margins and dichotomically bifurcating on the ulti-

mate or penultimate chamber. Dorsal side with 2 ribs; the ribs sometimes are asymmetrically shifted to the side leaving place for a third rib coming there from lateral test surface. Ventral side with 2 ribs continuing from the proloculus and third rib first appearing on the second or third chamber and reaching apertural face. Apertural face narrow, fairly wide, located somewhat below the ribs surrounding it and turning towards the dorsal side. Aperture located close to dorsal margin on the top of the last chamber.

Individual variability expressed in different number of chambers and in dichotomy of ribs.

Remarks. — Polish specimens differ from *C. virgatis* in less distinct dichotomic subdivision of ribs and in the lack of intercalary ribs.

Occurrence. — Poland: upper Middle Portlandian.

Citharina zaglobensis (Bielecka & Pożaryski, 1954)

(Pl. V, Figs. 13, 14)

1954. *Vaginulina zaglobensis* sp.n.; W. Bielecka & W. Pożaryski, p. 42, Pl. 6, Fig. 23a, b.

1968. *Vaginulina zaglobensis* Bielecka & Pożaryski; J. Guyader, p. 153, Pl. 22, Fig. 1—3; Pl. 27, Fig. 5a-e.

Material. — A few tens of generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5194/73/F	No. 5023 ¹³	No. 5195/73/F
Length	1.56	1.42	1.23
Width	0.50	0.47	0.52
Thickness	0.22	0.22	0.25
Proloculus diameter	0.08	0.14	0.14
Number of chambers	11	9	9

Supplemented description. — Chambers 6—11 in number; proloculus spherical or egg-shaped; ribs 6—8 on each lateral side; reaching apertural face and turning dorsal delineating in this way a narrow and long free space in the middle of the apertural face. Aperture located at the top of the last chamber, sometimes with the neck, close to dorsal margin.

Remarks. — *Citharina zaglobensis* differs from *C. raricostata* (Furssenko & Polenova) in more numerous and sharper-crested, parallel ribs, as well as in the occurrence of intercalary ribs.

Occurrence. — Poland: Upper Kimmeridgian, Lower and Middle Portlandian; France: Kimmeridgian; Czechoslovakia: Klentnice Beds; FRG (Franconian Alb): Middle Tithonian.

¹³ The holotype was described by Bielecka and Pożaryski (1954) from the Upper Kimmeridgian, Aulacostephanus pseudomutabilis Zone, borehole Zagłoba, depth 306.0 m.

Genus *Citharinella* Marie, 1938*Citharinella pomeraniae* sp.n.

(Pl. VI, Figs. 1, 2)

Holotype: No. 5196/73/F; Pl. VI, Fig. 1.*Type horizon*: Middle Portlandian.*Type locality*: Borehole Strzegowo, depth 206.7 m.*Derivation of the name*: from Pomerania, the name of region where it was found.

Diagnosis. — Test elongated, somewhat asymmetrical; initial part of test comprising 2—4 chambers (of the *Citharina* type), rectilinear part — 1—6 equitant chambers (of the *Fronicularia* type) bent at the angle 65° — 75° . Sutures depressed. Lateral surface ornamented with 14—20 fine ribs. Aperture radial, terminal.

Material. — About 10 usually poorly specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5196/73/F	No. 5197/73/F	No. 5198/73/F
Length	1.51	0.64	0.59
Width	0.52	0.29	0.28
Thickness	0.14	0.06	0.06
Proloculus diameter	0.14	0.04	0.04
Number of equitant chambers	6	3	2
Number of chambers of initial test part	3	5	5

Description. — Test elongated, flattened, somewhat asymmetrical; 6—9 chambers; proloculus spherical; 2—5 subsequent chambers arranged as in the genus *Citharina*; next 1—6 chambers equitant, of the *Fronicularia* type, moderately wide and low, bent at the angle of 65° — 75° . Initial part of megalospheric and microspheric forms composed of 2—4 and up to 5 chambers, respectively. Sutures depressed, poorly marked in lower test part and along the axis of upper test part. Peripheral margin somewhat rounded, incised. Lateral surface ornamented with 14—20 fine thin ribs; 5—6 ribs are marked on proloculus and up to 20 — on the last chamber; ribs subparallel, sometimes broken or decreasing in height at the sutures. A longitudinal, poorly marked depression continuing along the middle part of the test but only on one side. Aperture radial, terminal, located on somewhat elongated top part of the last chamber.

Individual variability expressed in differences in test size, number of chambers and ribs, and appearance of the depression continuing along the middle part of a side of the test.

Remarks. — *Citharinella pomeraniae* sp.n. differs from *C. exornata* Kusnetzova & Umanskaja (1970) in markedly smaller number of chambers of initial test part and in finer ribs marked also on proloculus. It differs from *C. pectinatimornata* (Espitalié & Sigal, 1963) in less rhomboidal and more elongated test shape and finer ribbing, and from *C. portlandensis* sp.n. in more elongated and narrower test, finer ribbing and in the oc-

currence of longitudinal depression continuing along the middle part of the test.

Occurrence. — Poland: Middle Portlandian (upper Zaraiskites scythicus and Z. zaraiskensis Zones).

Citharinella portlandensis sp.n.

(Pl. VI, Figs. 3, 4, 5)

Holotype: No 5199/73/F; Pl. VI, Fig. 4.

Type horizon: Middle Portlandian

Type locality: Borehole Strzegowo, depth 206.7 m.

Derivation of the name: found in the Portlandian.

Diagnosis. — Test elongated, rhomboidal in shape; 5—9 chambers; proloculus spherical; initial part consisting of 1—4 chambers; rectilinear part consisting of 1—5 equitant chambers bent at the angle of 65°—75°. Lateral test surface ornamented with 12—20 fairly thin ribs.

Material. — Over a dozen specimens, some damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5199/73/F	No. 5200/73/F	Nr. 5201/73/F
Length	1.06	1.12	0.59
Width	0.65	0.58	0.28
Thickness	0.14	0.12	0.08
Proloculus diameter	0.12	0.11	0.13
Number of equitant chambers	4	5	2
Number of chambers of initial test part	4	3	3

Description. — Test elongated, rhomboidal in shape, flattened; 5—9 chambers, 8 in the average; proloculus spherical; 1—3 subsequent chambers of the *Citharina* type; and 2—5 next — equitant broad and low, of the *Fronicularia* type, bent at the angle 65°—75° and extending far downwards one side but not enough to reach the proloculus. Sutures depressed, not always distinct, obscured by ribbing. Peripheral test margin weakly rounded, sometimes slightly incised. Lateral test margin ornamented with 12—20 thin ribs; 2—4 ribs on proloculus and up to 20 on the last chamber; some ribs are broken at the sutures, while others, somewhat wavy, continue along almost the whole length of test; sometimes 1—2 intercalary ribs appear between the primary ribs. Aperture radial, terminal, located at elongated top part of the last chamber.

Individual variability expressed in degree of elongation of the test, test shape, number of chambers in initial and remaining parts of the test, number of ribs on lateral test sides.

Remarks. — Some specimens from the Portlandian, described previously by Bielecka and Pożaryski (1954) as *Flabellinella mölleri* (Uhlig), should be assigned to *C. portlandensis* sp.n. whereas those from the Kim-

meridian (Bielecka & Pożaryski, 1954, Pl. 7, Fig. 31) — to *C. postrhomboidalis* Kusnetzova & Umanskaja. *Citharinella portlandensis* sp.n. differs from *C. postrhomboidalis* Kusnetzova & Umanskaja (1970) in somewhat narrower test, chambers bent at the lower angle (65° — 75° instead of 75° — 90°), more numerous and finer ribs and in their arrangement. The former differs from *C. rhomboideoorbicularis* Kusnetzova & Umanskaja in more slender and narrower test, in usually smaller angle at which chambers are bent (65° — 75° instead of 65° — 85°), equitant chambers extending less downwards, more numerous and finer ribs and in the occurrence of intercalary ribs.

Occurrence. — Poland: Middle Portlandian.

Citharinella uhligi (Furssenko & Polenova, 1950)

(Pl. VI, Fig. 6)

1950. *Frondicularia uhligi* sp.n.; A. V. Furssenko & E. N. Polenova, p. 67, Pl. 6, Fig. 1—6, 7?, 8?

pars 1954. *Flabellinella mölleri* (Uhlig); W. Bielecka & W. Pożaryski, p. 48, *non* Pl. 7, Fig. 31.

1968. *Flabellinella nikitini* (Uhlig); J. Guyader, p. 157, Pl. 22, Fig. 20—22.

Material. — About 10 specimens, partly damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5202/73/F	No. 5203/73/F	No. 5204/73/F
Length	1.12	0.96	0.78
Width	0.58	0.40	0.48
Thickness	0.12	0.11	0.14
Proloculus diameter	0.12	0.10	0.14
Number of equitant chambers	5	5	2
Number of chambers in initial test part	3	3	3

Description. — Test elongated, rhomboidal in outline; 5—8 chambers; proloculus spherical, 2—4 subsequent chambers arranged as in *Citharina*; next 2—5 chambers equitant, of the *Frondicularia* type, wide and low, bent at the angle 50° — 65° . Sutures depressed, distinct. Peripheral margin fairly sharp, incised, resembling keel. Lateral test surface ornamented with 16—22 fine parallel ribs; ribs breaking at the sutures or passing them with some decrease in height; the latter is typical of ribs continuing throughout several chambers; intercalary ribs appear on the last chambers; ribs 6—7 in number on proloculus, and up to 22 on the last chamber. Aperture radial, terminal, located on some elevation on elongated top part of the last chamber.

Individual variability expressed in number of chambers in initial and the remaining test parts, elongation of the test, and number of ribs.

Remarks. — The Polish specimens differ from the holotype in smaller number of equitant chambers and less sharp peripheral test margin. The

species differs from *C. teisseyrei* (Uhlig) in more elongated test, somewhat smaller angle of bend of equitant chambers, somewhat sharper test outline and proloculus ornamented with ribs. It differs from *C. nikitini* (Uhlig) in shorter and broader test, less sharp test outline, smaller number of chambers and thicker ribs. It differs from *C. portlandensis* sp.n. in somewhat thicker and less continuous ribs.

Occurrence. — Poland: Lower and basal Middle Portlandian; USSR (Russian Platform): Middle Volgian; France: Kimmeridgian; Czechoslovakia: Klentnice Beds.

Genus *Frondicularia* DeFrance in d'Orbigny, 1826
Frondicularia inderica Furssenko & Polenova, 1950
(Pl. VI, Figs. 7, 8)

1950. *Frondicularia inderica* sp.n.; A. V. Furssenko & E. N. Polenova, p. 70, Pl. 6, Fig. 12a, b.

Material. — About 6 specimens, partly damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5205/73/F	No. 5206/73/F
Length	0.50	0.39
Width	0.21	0.18
Thickness	0.10	0.08
Larger proloculus diameter	0.07	0.04
Smaller proloculus diameter	0.05	0.03
Number of chambers	6	5

Supplemented description. — Test small, spindle-shaped, with both ends sharpened, somewhat bilaterally flattened (more strongly on the peripheral margin); cross-section lenticular; 5—6 chambers; proloculus ovate, subsequent chambers equitant, bent at the angle 60° — 62° , low and moderately wide. Sutures distinct, flush or weakly depressed. Peripheral margin sharp. Aperture circular, located at elongated top part of the last chamber.

Individual variability expressed in more or less spindle-like test shape and in differences in depression of the suture separating ultimate and penultimate chambers; the ultimate chamber is sometimes higher than the penultimate.

Remarks. — The Polish specimens differ from the holotype in somewhat more elongate test and the last chamber sometimes higher than the penultimate. *Frondicularia inderica* differs from *F. lingulaeformis* Schwager in less marked depression of sutures, circular and not ovate aperture and the shape of the ultimate chamber.

Occurrence. — Poland: Middle Portlandian (Virgatites pusillus Zone); USSR (Volga Region): Middle Volgian (Virgatites virgatus Zone).

Genus *Geinitzinita* Sellier de Civrieux & Dessauvagie, 1965*Geinitzinita kcyniensis* sp.n.

(Pl. VI, Figs. 9a, b, 10)

Holotype: No. 5207/73/F; Pl. VI, Fig. 9a, b.*Type horizon*: Middle Portlandian.*Type locality*: Borehole Kcynia, depth 446.2 m.*Derivation of the name*: from the type locality.

Diagnosis. — Test elongated, flattened; 3—5 chambers; proloculus spherical, subsequent chambers equitant, bent at the angle 120° — 130° , twice wider than high; the last chamber larger than the remaining one. Longitudinal, narrow depression continuing along the middle part of the test, being somewhat accentuated at the base of every chamber. Sutures depressed.

Material. — About 10 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5207/73/F	No. 5208/73/F	No. 5209/73/F
Length	0.67	0.56	0.50
Width	0.33	0.30	0.28
Thickness	0.20	0.17	0.15
Proloculus diameter	0.17	0.17	0.14
Number of chambers	5	4	3

Description. — Test elongated, flattened, fairly thick, flat-ovate in cross-section; 3—5 chambers; proloculus spherical, large, subsequent chambers equitant, bent at the angle 120° — 130° , twice wider than high; the ultimate chamber larger than the penultimate. Sutures depressed. Relatively narrow longitudinal depression continuing along the middle part of the test, at the middle of equitant chambers, being somewhat accentuated in the form of small triangle at the base of each chamber. Aperture circular, terminal, located at cupola-like top part of the last chamber.

Individual variability expressed in differences in number of chambers and more or less depressed sutures.

Remarks. — *Geinitzinita kcyniensis* sp.n. differs from *Frondicularia franconica impressa* Lutze in less numerous and more convex equitant chambers bent at the angle 120° — 130° (instead of 110° — 120°), shape of the last chamber, which is more convex and more distinctly separated from the previous one, less depressed sutures and narrower longitudinal depression at the base of equitant chambers.

Occurrence. — Poland: Middle Portlandian (Virgatites pusillus Zone).*Geinitzinita wolinensis* sp.n.

(Pl. VI, Figs. 11, 12, 13)

Holotype: No. 5210/73/F; Pl. VI, Fig. 11.*Type horizon*: Middle Portlandian.*Type locality*: Borehole Wolin, depth 121.8 m.*Derivation of the name*: after the type locality.

Diagnosis. — Test elongated, consisting of 4—7 chambers; proloculus spherical, subsequent chambers equitant, bent at the angle of about 110°; the last chamber higher than the remaining ones. Triangular depression marked at the base of equitant chambers. Sutures distinct, depressed, sometimes covered with fine tubercles: test surface covered with very fine striae.

Material. — Over 40 specimens, some damaged.

Dimensions (in mm):

Coll. IG Warsaw	No. 5210/73/F	No. 5211/73/F	No. 5212/73/F
Length	0.60	0.56	0.39
Width	0.20	0.18	0.17
Thickness	0.10	0.09	0.08
Proloculus diameter	0.10	0.06	0.07
Number of chambers	5	6	5

Description. — Test elongated, flattened, consisting of 4—7 chambers; proloculus spherical, next chambers equitant, set at the angle about 110°, slightly wider than high; the last chamber somewhat higher and narrower than the remaining ones. Triangular depression marked at the base of equitant chambers, extending upwards almost up to the mid height of the chambers. Sutures markedly depressed, sometimes covered with small tubercles. Peripheral test margin slightly rounded, incised. Test surface covered with fine longitudinal striae, not always distinct. Aperture sub-circular, terminal, located on slightly elongated top part of the last chamber.

Individual variability expressed in test elongation, width of the last chamber, as well as distinctness of fine tubercles from surface of sutures and fine longitudinal striae from test surface.

Remarks. — *Geinitzinita wolinensis* sp.n. differ from *C. nodulosa* (Fur-senko & Polenova) in somewhat higher increase in the width of chambers, the chambers set at the angle of 110° and 130°—150°, respectively, the lack of ridge on sutures and suture surface covered with fine tubercles, depression at the base of equitant chambers less distinct and not surrounded by a ridge-like swelling and, sometimes, in fine longitudinal striation of test surface. The former differs from *G. praenodulosa* Dain in depression at the base of equitant chambers, being narrower, smaller and not surrounded by ridge-like swelling.

Occurrence. — Poland: Middle Portlandian.

Genus *Lagena* Walker & Jacob in Kanmacher, 1798

Lagena apiculata neocomiana Bartenstein & Brand, 1951

(Pl. VI, Figs. 14, 15)

1951. *Lagena apiculata neocomiana* n.subsp.; H. Bartenstein & E. Brand, p. 317, Pl. 10, Fig. 275, 276; Pl. 13, Fig. 353; Pl. 16, Fig. 44—47, 49, 51; Pl. 19, Fig. 43—45.
 1951. *Lagena* cf. *apiculata neocomiana* n.subsp.; H. Bartenstein & E. Brand, p. 317, Pl. 13, Fig. 353.

Material. — Over 40, generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5213/73/F	No. 5214/73/F	No. 5215/73/F
Length	0.31	0.25	0.22
Width	0.19	0.16	0.15

Supplemented description. — Test spherical or somewhat elongated, with lower part rounded and subapertural part sharply protruding; short spine sometimes developed at the base; aperture circular located on sharply protruding upper test end. Test surface rugose or smooth, sometimes glossy.

Individual variability expressed in differences in shape, extension of upper end, development of spine at test base, and character of test surface.

Remarks. — The Polish specimens differ from the holotype in smaller size, development of subapertural part and in generally rugose test surface. Tests spherical are much more common than the elongated ones. *Lagena apiculata neocomiana* differs from *L. hispida* Reuss in the lack of distinct apertural neck and distinct spines on test surface.

Occurrence. — Poland: Lower and Middle Portlandian; FRG: Tithonian — Valanginian.

Genus *Lenticulina* Lamarck, 1804
Lenticulina dogieli Furssenko, 1969
 (Pl. VI, Figs. 16, 17, 18)

1950. *Cristellaria* aff. *hoplites* Wiśniowski; A. V. Furssenko & E. N. Polenova, p. 35, Pl. 4, Fig. 6.
 1954. *Lenticulina minuta* (Bornemann); W. Bielecka & W. Pożaryski, p. 34, Pl. 4, Fig. 13.
 1969. *Lenticulina dogieli* sp. nov. A. V. Furssenko, p. 235.

Material. — Over 40, generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5216/73/F	No. 5217/73/F	No. 5218/73/F
Length	0.39	0.36	0.33
Width	0.22	0.21	0.20
Thickness	0.12	0.12	0.10
Proloculus diameter	0.05	0.04	0.04
Number of chambers	7	7	7

Supplemented description. — Test small, slightly elongated, with lower part rounded and upper part somewhat elongated; 5—7 chambers; proloculus spherical; subsequent chambers triangular, somewhat convex, the last chamber slightly elongated upwards, somewhat more convex than the previous ones. Sutures slightly arcuate, narrow and depressed; small umbilical depression usually distinct; dorsal margin arcuate, fairly sharp.

Aperture radial, located at the top of the last chamber, closer to the dorsal margin.

Individual variability expressed in depression of sutures and degree of bending of the dorsal margin.

Remarks. — *Lenticulina dogieli* differs from *L. hoplites* (Wiśniowski) in more ovate and thinner test, smaller proloculus, more numerous chambers, and in umbilical depression generally present. The former differs from *L. minuta* (Bornemann) in somewhat more convex test, less numerous chambers and depressed sutures.

Occurrence. — Poland: Lower and Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian.

Lenticulina infravolgaensis (Furssenko & Polenova, 1950)

(Pl. VII, Figs. 1a, b 2, 3)

1950. *Cristellaria infravolgaensis* sp.n.; A. V. Furssenko & E. N. Polenova, p. 25, Pl. 1, Fig. 11—14.
 1954. *Lenticulina subalata* (Reuss); W. Bielecka & W. Pożaryski, p. 35, Pl. 4, Fig. 14a, b.
 1967. *Lenticulina infravolgensis* (Furssenko & Polenova); J. Th. Groiss, p. 20, Pl. 2, Fig. 61.

Material. — Approximately 300, generally well-preserved specimens. Dimensions (in mm):

Coll. IG Warsa'w	No. 5219/73/F	No. 5220/73/F	No. 5221/73/F
Length	0.87	0.85	0.83
Width	0.70	0.65	0.64
Thickness	0.38	0.34	0.34
Number of chambers in the last whorl	11	12	10

Supplemented diagnosis. — Test subcircular to subovate in outline; peripheral margin sharp or with blunt keel. The last whorl comprising 8—12 triangular chambers becoming progressively broader than high; the last chamber somewhat convex. Sutures arcuate, fairly wide, elevated; suture separating the last chamber sometimes somewhat depressed; usually ovate umbo situated in the centre of test, closer to the umbilical margin. Aperture radial, located close to the dorsal margin on somewhat convex apertural face of the last chamber.

Individual variability expressed in test outline, elevation of sutures and development of umbo, as well as in the sharpness of peripheral margin.

Remarks. — The Polish specimens differ from the holotype in somewhat larger size, more circular outline. *Lenticulina infravolgaensis* differs from *L. muensteri* (Roemer) in wider and elevated sutures, sharper peripheral margin and better developed umbo. The former differs from *L. subalata* (Reuss) in smaller size, less sharp and not keel-like margin, wider sutures and less distinct umbo.

Occurrence. — Poland: Upper Kimmeridgian, Lower and Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; FRG (Franconian Alb): Middle Tithonian; Czechoslovakia: Lower Cieszyn Beds (Tithonian).

Lenticulina muensteri (Roemer, 1839)

(Pl. VII, Figs. 4a, b, 5; Pl. VIII, Fig. 2)

1839. *Robulina münsteri* Roemer; F. A. Roemer, p. 48, Pl. 20, Fig. 29; *vide* B. F. Ellis & A. R. Messina — Catalogue of Foraminifera.
 1970. *Lenticulina muensteri* (Roemer); B. Winter, p. 25, Pl. 3, Fig. 93, text-fig. 20 (*cum synonymica*).
 1975. *Lenticulina muensteri* (Roemer); B. Jendryka, p. 149, Pls 8, 9, 10, Figs 1—6; Pl. 19, Figs 1, 2.

Material. — Over 200 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5222/73/F ¹⁴	No. 5012 ¹⁵	No. 5223/73/F ¹⁶
Length	0.70	0.56	0.49
Width	0.65	0.47	0.41
Thickness	0.29	0.23	0.22
Number of chambers	13	10	9

Remarks. — The last whorl of Portlandian specimens is composed of 9—10 chambers, whereas that of the Lower Kimmeridgian — of 12—13 chambers. The specimens with smaller number of chambers in the last whorl (9) are found in the Middle Portlandian. This confirms the observation made by Winter (1970), who noted that the specimens of *L. muensteri* from the Lower Kimmeridgian of FRG have 11—13 chambers in the last whorl, i.e. 1—2 more than those from the Domerian of France; the number of chambers in the last whorl subsequently decreases to 9 in the case of Middle Tithonian forms, and even to 8 in Lower Cretaceous forms.

Occurrence. — Pandemic species known in Europe from the Liassic to Lower Cretaceous. Poland: Middle and Upper Jurassic and Lower Cretaceous.

Lenticulina ponderosa Mjatluk, 1971

(Pl. VII, Figs. 6a, b, 7; Pl. VIII, Fig. 1)

1939. *Cristellaria magna* nov. sp.; E. V. Mjatluk, p. 52, Pl. 3, Fig. 32a, b, 34a, b.
 ? 1939. *Cristellaria aquilonica* nov.sp.; E. V. Mjatluk, p. 53, Pl. 3, Fig. 35a, b.
 ? 1960. *Cristellaria aquilonica* Mjatluk; D. A. Agalarova, p. 71, Pl. 4, Fig. 2a, b; Pl. 5, Fig. 7a, b.
 1971. *Lenticulina ponderosa* Mjatluk; E. V. Mjatluk, p. 200.

¹⁴ Lower Kimmeridgian specimen.

¹⁵ Lower Portlandian specimen described by Bielecka and Pożaryski (1954).

¹⁶ Middle Portlandian specimen.

Material. — Over 30 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5224/73/F	No. 5225/73/F	No. 5226/73/F
Length	1.25	1.10	1.00
Width	0.80	0.77	0.67
Thickness	0.36	0.30	0.32
Proloculus diameter	0.07	0.06	0.05
Total number of chambers	16	15	13
Number of chambers in the last whorl	11	10	9

Supplemented description. — Test slightly elongated, flattened on sides; 13—17 chambers arranged in 1.5 whorl; external whorl formed of 9—11 chambers. Proloculus spherical, subsequent chambers triangular; the last chamber somewhat convex, sometimes smaller and not reaching the coiled part of test; the last chambers displaying certain trend to deviation from growth axis, which results in asymmetry of test. Sutures arcuate, flush or weakly elevated in initial test part becoming somewhat depressed in the final part. Central test part with small umbo. Peripheral margin sharpened along the first chambers, somewhat rounded later. Aperture radial, located on elongated top part of the last chamber, close to dorsal side, sometimes on short neck. Apertural face narrow and weakly convex.

Individual variability expressed in degree of elongation of test and the arrangement of the last two chambers in relation to the spiral part.

Remarks. — Some Polish specimens differ from the holotype in sutures somewhat elevated in initial test part and the tendency to deviation of the last 1—2 chambers from the spiral part. These features bring these specimens closer to *L. aquilonica* (Mjatliuk). The specimens described by Mjatliuk (1939) as *Cristellaria* sp. display intermediate features. Therefore it may be assumed that all these forms, *Lenticulina ponderosa*, *L. aquilonica* and *Cristellaria* sp., are conspecific.

Occurrence. — Poland: upper Middle Portlandian; USSR (Russian Platform): Middle Volgian.

Lenticulina vistulae elongata Bielecka & Pożaryski, 1954
(Pl. VIII, Figs. 3, 4a, b, 5)

1954. *Lenticulina vistulae* var. *elongata* n.sp., n. var.; W. Bielecka & W. Pożaryski, p. 36, Pl. 4, Fig. 16a, b.
1967. *Lenticulina vistulae elongata* Bielecka & Pożaryski; J. Th. Groiss, p. 23, Pl. 2, Fig. 72.

Material. — Over 80 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5227/73/F	No. 5016 ¹⁷⁾	No. 5228/73/F	No. 5229/73/F
Length	0.90	0.88	0.68	0.65
Width	0.57	0.57	0.45	0.38
Thickness	0.25	0.25	0.18	0.16
Number of chambers in the last whorl	11	10	10	10

Occurrence. — Poland: top parts of the Kimmeridgian, Lower and Middle Portlandian; FRG (Franconian Alb): lower part of Middle Tithonian; USSR (Russian Platform): ? Middle Volgian.

Genus *Marginulina* d'Orbigny, 1826 emend. Marie, 1941

Marginulina pyramidalis (Koch, 1851)

(Pl. VIII, Fig. 6)

1951. *Nodosaria pyramidalis* Koch; F. C.L. Koch, p. 173, Pl. 24 Fig. 2, *vide* E. F. Illis & A. R. Messina — Catalogue of Foraminifera.

1963. *Marginulina pyramidalis* (Koch); J. Espitalié & J. Sigal, p. 44, Pl. 18, Fig. 18, 19.

1967. *Marginulina pyramidalis* (Koch); A. V. Basov, p. 61, Pl. 3, Fig. 1—3.

1973. *Marginulina pyramidalis* (Koch); H. Bartenstein & M. Kaefer, p. 236, Pl. 6. Fig. 97 (*cum synonymica*).

Material. — A few well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5230/73/F	No. 5231/73/F	No. 5232/73/F
Length	0.87	0.78	0.62
Width	0.30	0.25	0.18
Proloculus diameter	0.05	0.08	0.10
Number of chambers	8	6	5

Supplemented description. — Test elongated, almost rectilinear, strongly narrowing towards the base. Cross-section almost circular; 6—8 chambers; proloculus small, spherical; first three chambers small, subsequent chambers larger; chambers convex, broader than high. Sutures straight, depressed; 7—8 ledge-like narrow, fairly sharp-crested ribs marked along the test; 5—6 ribs appearing in initial test part; later there appears one intercalary rib soon followed by 1—2 others; inter-rib space fairly wide; the ribs reach aperture. Aperture asymmetrically located, closer to test margin on the top of the last chamber, sometimes on small neck.

Individual variability expressed in test shape (from rectilinear to somewhat incurved), curvature and in the degree of pointing of lower test end, as well as in distinctness of particular chambers.

Remarks. — *Marginulina pyramidalis* occupies an intermediate position between the genera *Dentalina*, *Marginulina* and *Nodosaria*, and its repre-

¹⁷⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Lower Portlandian, borehole Zagłoba, depth 276. 4 m.

sentatives were described under various generic and specific names by particular authors. The Polish specimens closely resemble the holotype in all its features preserved. *Marginulina pyramidalis* differs from *M. kasahstanica* in the last of any distinct spine at the base of test, less elongate and more cupola-like shape of the last chamber, the lack of any distinct neck at the top of the last chamber, and straight and not arcuate sutures, more numerous chambers, the occurrence of intercalary ribs and smaller total number of ribs (8 and 11, respectively).

Occurrence. — Poland: upper Middle Portlandian, Valanginian and Hauterivian; FRG: Valanginian and Hauterivian; USSR (Russian Platform): upper parts of Volgian, Valanginian and Hauterivian; Madagascar: Portlandian — Hauterivian.

Genus *Marginulinopsis* Silvestri, 1904

Marginulinopsis buskensis (Bielecka & Pożaryski, 1954)

(Pl. VIII, Figs. 7, 8, 9)

1954. *Marginulina buskensis* sp.n.: W. Bielecka & W. Pożaryski, p. 56, Pl. 8, Fig. 39.
 1970. *Marginulinopsis buskensis* (Bielecka & Pożaryski); B. Winter, p. 29, Pl. 4, Fig. 102 (*cum synonymica*).

Material. — Over 100 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5233/73/F	No. 5234/73/F	No. 5039 ¹⁸⁾
Length	0.60	0.58	0.45
Width	0.15	0.15	0.13
Thickness	0.14	0.12	0.10
Proloculus diameter	0.03	0.03	0.01
Number of chambers	8	8	7

Remarks. — This species comprises micro- and megalospheric forms with proloculus diameter equalling 0.01 mm and 0.03 mm, respectively.

Occurrence. — Poland: Lower Kimmeridgian — Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; FRG (Franconian Alb): Kimmeridgian and Middle Tithonian; Czechoslovakia: Klentnice Beds.

Marginulinopsis robusta (Reuss, 1863)

(Pl. VIII, Figs. 10, 11)

1863. *Marginulina robusta* m.: A. E. Reuss, p. 63, Pl. 6, Fig. 5,6.
 1951. *Lenticulina* (*Marginulinopsis*) *robusta* (Reuss); H. Bartenstein. & E. Brand, p. 289, Pl. 6, Fig. 142, 143 (*cum synonymica*),
 1965. *Marginulina robusta* Reuss; K. I. Kusnetzova; p. 82, Pl. 7, Fig. 1, 2, 4, 7.

¹⁸⁾ The holotype was described by Bielecka & Pożaryski (1954) from the Lower Kimmeridgian, borehole Zagłoba depth 456.0 m.

Material. — A few tens of usually well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5235/73/F	No. 5236/73/F	No. 5237/73/F
Length	0.64	0.58	0.50
Width	0.26	0.28	0.25
Thickness	0.22	0.25	0.22
Proloculus diameter	0.03	0.02	0.02
Number of chambers	8	8	7

Supplemented description. — Test elongated, broadly-ovate in cross-section; 6—8 chambers; initial test part composed of 3—4 (sometimes 5) chambers, and uncoiled test part — of 1—4 (usually 3) chambers; chambers somewhat broader than high; the last chamber convex. Sutures slightly depressed, almost rectilinear in initial test part, becoming slightly oblique thereafter; lateral test surface ornamented with 5—6 ribs; ribs fairly thick and sharp-crested, almost parallel to dorsal margin; in some specimens the medial ribs from dorsal side keel-like. Aperture circular, located close to dorsal margin on the top part of the last chamber.

Individual variability expressed in the mode of coiling of initial test part and in distinctness and number of chambers and ribs.

Remarks. — The Jurassic forms from Poland are smaller than those from the Cretaceous of FRG, differing in thinner ribs, more oblique sutures separating the last chambers; the former differ from those known from the Russian Platform of the USSR in being smaller and more slender. *Marginulinopsis robusta* differs from *M. striatocostata* (Reuss) in less numerous, thicker and sharper-crested ribs, broader test, test width/length ratio, and less distinct chambers.

Occurrence. — Poland: Middle Portlandian; FRG: Lower Cretaceous; USSR (Russian Platform): Lower and Middle Volgian.

Marginulinopsis striatocostata (Reuss, 1863)

(Pl. VIII, Figs. 12, 13, 14)

1863. *Marginulina striatocostata* m.; A. E. Reuss, p. 62, Pl. 6, Fig. 2.

1965. *Marginulina striatocostata* Reuss; K. I. Kusnetzova, p. 83, Pl. 7, Fig. 3a, b, 5a, b, 6.

1967. *Marginulina striatocostata* Reuss; V. A. Basov, p. 57, Pl. 2, Fig. 4—8.

Material. — About 200 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5238/73/F	No. 5239/73/F	No. 5240/73/F
Length	0.53	0.47	0.42
Width	0.17	0.17	0.19
Thickness	0.12	0.14	0.15
Proloculus diameter	0.02	0.02	0.02
Number of chambers	9	7	6

Remarks.— Because of the presence of coiled initial test part and ovate cross-section of the test this species should be assigned to the genus *Marginulinopsis*. The supplemented description is as follows: chambers 6—9 in number; 3—5 in initial test part; total number of ribs equalling 13—15; sutures straight or slightly oblique, somewhat depressed.

The Polish specimens differ from the holotype in somewhat larger size, lower and somewhat more numerous chambers and less numerous ribs. *Marginulinopsis striatocostata* differs from *M. robusta* (Reuss) in more numerous ribs, slender chambers and more depressed sutures.

Occurrence.— Poland: Upper Kimmeridgian, Lower and Middle Portlandian; FRG: Lower Cretaceous; USSR (Russian Platform): Lower and Middle Volgian.

Genus *Planularia* DeFrance in de Blainville, 1826

Planularia dofleini (Kasanzev, 1936)

(Pl. IX, Fig. 1a, b, 2, 3)

1936. *Cristellaria dofleini* nov.sp.: V. P. Kasanzev, p. 18, Pl. 2, Fig. 35—37.

1950. *Cristellaria dofleini* Kasanzev; A. V. Furssenko & E. N. Polenova, p. 30, Pl. 2, Fig. 4.

Material.— Over 20 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5241/73/F	No. 5242/73/F	No. 5243/73/F
Length	1.06	0.98	0.88
Width	0.78	0.67	0.64
Thickness	0.23	0.23	0.21
Proloculus diameter	0.05	0.05	0.04
Total number of chambers	14	13	14
Number of chambers in the last whorl	10	9	10

Supplemented description.— Test with flattened sides; 10—14 chambers arranged in 1.5 whorl; 8—10 chambers in the outer whorl; proloculus spherical, subsequent chambers triangular; the last chamber somewhat more convex and broader than the remaining chambers. Sutures weakly elevated, arcuate, converging in subumbilical test part forming a small swelling; sutures between the last 1—2 chambers depressed; dorsal test margin arcuate, somewhat sharpened; ventral margin weakly convex, incised at the contact of the last chamber and spiral part. Aperture radial, located close to dorsal margin at the top of the last chamber. Apertural face narrow, very weakly rounded.

Individual variability expressed in circular or elongate test shape and the distinctness of sutures, which may be almost flush.

Remarks.— The Polish specimens differ from the holotype in sutures somewhat more elevated in initial test part. All of them differ from the

specimen described by Furssenko and Polenova (1950) in less numerous chambers of the outer whorl (10 and 13 chambers, respectively). *Planularia dofleini* differs from *Lenticulina ponderosa* Mjatliuk in more flattened, bilaterally symmetrical test and the last chamber reaching initial test part.

Occurrence. — Poland: Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian.

Planularia multicostata Kusnetzova, 1960
(Pl. VIII, Figs. 15, 16, 17)

1960. *Planularia multicostata* sp.nov.; K. I. Kusnetzova, p. 29, Pl. 2, Fig. 9—12.

Material. — Over 30 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5244/73/F	No. 5245/73/F	No. 5246/73/F
Length	0.72	0.70	0.64
Width	0.27	0.22	0.23
Thickness	0.08	0.07	0.08
Maximum proloculus diameter	0.04	0.08	0.05
Minimum proloculus diameter	0.03	0.05	0.03
Number of chambers	10	8	9

Supplemented description. — Test elongated, narrow, flattened on sides; lower part somewhat rounded, upper part elongated and sharp-pointed; 7—10 chambers; proloculus almost spherical or ovate. The initial part forming incomplete spiral composed of 3—6 chambers; rectilinear part formed of 3—5 chambers; chambers of initial part triangular, whereas those of rectilinear part — quadrangular, low and wide, elongated upwards; the last chamber somewhat smaller than the remaining ones. Sutures narrow, flush, somewhat arcuate in initial test part, depressed and oblique thereafter; dorsal margin rectilinear, fairly sharp, bent in lower test part; ventral margin somewhat incised or almost rectilinear, somewhat sharpened on first chambers, rounded thereafter; lateral test surface ornamented with 8—11 moderately sharp, somewhat oblique, thin ribs. Aperture radial, located at the top of the last chamber, close to dorsal margin.

Individual variability expressed in number of chambers forming initial test part (equalling usually 6 and 3—4 in micro- and megalospheric forms, respectively); the ultimate chamber sometimes smaller than the penultimate.

Remarks. — The Polish specimens differ from the holotype in larger size and ribs somewhat more oblique and set less parallelly to dorsal test

margin. *Planularia multicostata* differs from all Upper Jurassic species of the genus *Planularia* in being ornamented with thin ribs.

Occurrence. — Poland: Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian.

Planularia poljenovae Kusnetzova, 1960

(Pl. IX, Figs. 4, 5, 6, 7)

1950. *Cristellaria lamellosa* sp.n.: A. V. Furssenko & E. N. Polenova, p. 42, Pl. 2, Fig. 5, 6.

1960. *Planularia poljenovae* nom.now.; K. I. Kusnetzova, p. 31, Pl. 2, Fig. 13—15.

Material. — Over 50 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5247/73/F	No. 5248/73/F	No. 5249/73/F	No. 5250/73/F
Length	0.92	0.78	0.53	0.36
Width	0.30	0.32	0.19	0.17
Thickness	0.08	0.08	0.07	0.05
Maximum proloculus diameter	0.02	0.02	0.03	0.03
Maximum proloculus diameter	—	—	0.02	0.02
Number of chambers	11	10	7	7

Supplemented description. — Test elongated, with sides flattened, becoming wider upwards; lower test part arcuate, upper part fairly sharply elongated; 7—11 chambers; proloculus spherical or ovate; coiled part consisting of 4—6 chambers, forming incomplete spiral; rectilinear part consisting of 2—5 chambers; chambers triangular, almost flat in initial test part, broad and low, somewhat convex and protruding upwards thereafter. Sutures initially flush, weakly arcuate, becoming depressed and oblique thereafter. Dorsal margin almost rectilinear, somewhat bent in lower test part, fairly sharp, sometimes keel-like; ventral margin almost rectilinear or somewhat incised. Lateral test surface smooth or covered with innumerable fine striae. Aperture located at the top of the last chamber, close to dorsal margin.

Individual variability expressed in test size and shape, of shape proloculus and number of chambers of initial test part.

Remarks. — The Polish specimens differ from the holotype (the specimen described by Furssenko and Polenova, 1950, as *Cristellaria lamellosa*) in less distinct keel and more numerous chambers not reaching the initial test part. The Polish specimens are essentially similar to those described by Kusnetzova (1960). *Planularia poljenovae* differs from *P. laminosa* (Schwager) in more elongated test, the last chambers not reaching the initial test part and proloculus shifted more to the side of test. It differs

from *P. hobdaensis* Kusnetzova in narrower test and less numerous chambers.

Occurrence. — Poland: Lower and Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian.

Genus *Pseudonodosaria* Boomgaard, 1949
Pseudonodosaria costulata portlandensis subsp.n.
 (Pl. IX, Figs. 8, 9)

Holotype: No. 5251/73/F; Pl. IX, Fig. 8.

Type horizon: Middle Portlandian.

Type locality: borehole Strzegowo, depth 209.0 m.

Derivation of the name: from the Portlandian stage.

Diagnosis. — Test elongated; 4—6 chambers; proloculus spherical; the last chamber cupola-like elongated upwards; sutures straight, almost flush, becoming more accentuated and depressed between the last 1—2 chambers; the last chambers ornamented with 9—12 longitudinal, sometimes somewhat oblique ribs.

Material. — Twenty generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5251/73/F	No. 5252/73/F	No. 5253/73/F
Length	1.02	0.73	0.45
Width	0.25	0.22	0.17
Proloculus diameter	0.10	0.12	0.08
Number of chambers	6	5	4

Description. — Test elongated, with both ends somewhat extending; 4—6 chambers; proloculus spherical, subsequent chambers broader than high; the last chamber cupola-like elongated upwards. Sutures straight, initially flush, later depressed, distinct between the last 1—2 chambers. Test surface ornamented with 9—12 ribs, somewhat oblique on the last chamber. Aperture circular or radial, terminal.

Individual variability expressed in number of ribs and their arrangement on younger test part, as well as in distinctness of sutures. Some specimens display a minute spine at the base of test.

Remarks. — *Pseudonodosaria costulata portlandensis* subsp.n. differs from *P. costulata costulata* (Terquem) in sutures less clearly depressed in initial test part and less oblique ribs (the ribs are oblique only on the last chambers of Polish specimens). The former differs from *P. multicostata kłodzinensis* subsp. n. in more differentiated last chamber, less lenticular test shape and in ribs passing sometimes oblique along the last chambers.

Occurrence. — Poland: Middle Portlandian.

Pseudonodosaria humilis (Roemer, 1841)

(Pl. IX, Figs. 10a, b, 11, 12)

1841. *Nodosaria humilis* N.; F. A. Roemer, p. 95, Pl. 15, Fig. 6, *fide* B. F. Ellis & A. R. Messina — Catalogue of Foraminifera.
 1939. *Pseudoglandulina tutkowskii* nov.sp.; E. V. Mjatliuk, p. 65, Pl. 4, Fig. 57, 58.
 1968. *Pseudonodosaria vulgata humilis* (Roemer); E. Welzel, p. 18 Pl. 1, Fig. 40 (*cum synonymica*).

Material. — Over 30 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5254/73/F	No. 5255/73/F	No. 5256/73/F
Length	0.75	0.58	0.33
Width	0.25	0.20	0.17
Proloculus diameter	0.10	0.09	0.07
Number of chambers	8	7	5

Remarks. — The Polish specimens differ from the holotype in more tubular test shape, broader lower part and narrower upper part. Lutze (1960) analysed in detail the following species of the subgenus *Pseudonodosaria* (*Rectoglandulina*): *P. vulgata* (Bornemann), *P. humilis* (Roemer) and *P. tenuis* (Bornemann), arriving at the conclusion that the presence of intermediate forms makes their distinct separation difficult. According to Welzel (1968) all the species are actually subspecies of *P. vulgata* (Bornemann).

Occurrence. — Poland: Lower and Middle Portlandian, Lower Cretaceous; FRG: Liassic — Upper Cretaceous; Madagascar: Kimmeridgian — Portlandian; Egypt (Sinai peninsula): Bathonian — Callovian and Kimmeridgian; USSR (Russian Platform): Lower and Middle Volgian.

Pseudonodosaria multicostata klodziniensis subsp.n.

(Pl. IX, Figs. 13, 14, 15)

Holotype: No. 5257/73/F; Pl. IX, Fig. 13.

Type horizon: Middle Portlandian.

Type locality: borehole Kłodzino, depth 31.30 m.

Derivation of the name: from the type locality, Kłodzino.

Diagnosis. — Test elongated, spindle-shaped; 4—7 chambers; proloculus spherical or ovate; subsequent chambers almost as wide as high; subapertural part of the last chamber sharply elongated upwards. Sutures straight, almost flush or somewhat depressed between the last chambers; 10—12 ribs.

Material. — Over a dozen generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5257/73/F	No. 5258/73/F	No. 5259/73/F
Length	1.12	0.64	0.50
Width	0.29	0.22	0.22
Proloculus diameter	0.07	0.09	0.14
Number of chambers	7	5	4

Description. — Test elongated, spindle-shaped; 4—7 chambers; proloculus spherical or slightly ovate, subsequent chambers almost as wide as high; subapertural part of the last chamber sharply protruding upwards. Sutures straight, almost flush, becoming somewhat depressed between the last chambers; 5—6 ribs appear on proloculus, 4—6 (sometimes 7) successive ribs appear on the second chamber; the last chamber ornamented with 10—12 ribs; ribs moderately high, thinning out towards the apertural face of the last chamber and reaching the aperture. Aperture circular or radial, terminal, located on elongated top part of the last chamber.

Individual variability expressed in degree of elongation of lower and upper test parts and number of chambers.

Remarks — *Pseudonodosaria multicostata klodzinensis* subsp.n. differs from *P. multicostata multicostata* (Bornemann) in test outline which is less rounded in upper part and more spindle-shaped and elongate, and in ribs reaching the apertural face, and more numerous chambers. The former differs from *P. costulata portlandensis* subsp.n. in less cupola-like and less distinctly separated last chamber, as well as in arrangement of ribs which are generally thicker.

Occurrence. — Poland: Middle Portlandian.

Pseudonodosaria tenuis (Bornemann, 1854)

(Pl. IX, Figs. 16, 17, 18)

1854. *Glandulina tenuis* m.; J. G. Bornemann, pl. 31, Pl. 2, Fig. 3, *vide* B. F. Ellis & A. R. Messina — Catalogue of Foraminifera.
 1960. *Rectoglandulina tenuis* (Bornemann); G. F. Lutze, p. 481, Pl. 29, Fig. 3 (cf text-fig. 16 (*cum synonymica*)).
 1970. *Pseudonodosaria tenuis* (Bornemann); B. Winter, p. 35, Pl. 4, Fig. 127, 128 (*cum synonymica*).

Material. — A few tens of well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5260/73/F	No. 5261/73/F	No. 5262/73/F
Length	0.45	0.44	0.36
Width	0.12	0.10	0.10
Proloculus diameter	0.08	0.07	0.06
Number of chambers	5	5	5

Remarks. — *Pseudonodosaria tenuis* (Bornemann) differs from *P. vulgata vulgata* (Bornemann) in slender and narrower test and less convex chambers.

Occurrence. — Poland: Upper Kimmeridgian, Portlandian, Lower Cretaceous; FRG: Liassic — Lower Cretaceous; France: Kimmeridgian; USSR (Russian Platform): Middle Volgian.

Genus *Saracenaria* DeFrance in de Blainville, 1824
Saracenaria pravoslavlevi Furssenko & Polenova, 1950
 (Pl. X, Figs. 1, 2a, b, 3)

1950. *Saracenaria pravoslavlevi* sp.n.; A. V. Furssenko & E. N. Polenova, p. 45, Pl. 4, Fig. 13—15.
 1954. *Saracenaria alata-angularis* Franke; W. Bielicka & W. Pożaryski, p., Pl. 8 fig. 41.
 1968. *Saracenaria pravoslavlevi* Furssenko & Polenova; J. Guyader, p. 149, Pl. 21, Fig. 10, 11; Pl. 27, Fig. 3a-e.
 1970. *Pravoslavlevia pravoslavlevi* (Furssenko & Polenova); F. S. Putrja, p. 37.

Material. — About 50 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5263/73/F	No. 5264/73/F	No. 5265/73/F
Length	1.32	1.12	0.81
Width	0.45	0.49	0.45
Thickness	0.30	0.32	0.32
Number of chambers in straightened part	6	5	3
Number of chambers in coiled part	9	8	8

Supplemented description. — Test elongated, triangular in cross-section of uncoiled part; dorsal margin somewhat arcuate to almost rectilinear; ventral margin somewhat bent or sometimes rectilinear; coiled test part consisting of 5—9 chambers and the straightened part — of 3—8 chambers; proloculus spherical, chambers triangular in the coiled part, becoming irregularly quadrangular in the uncoiled part. Sutures elevated, arcuate in initial test part, converging in the umbilical area without forming umbo, crescent-like in the uncoiled part and fairly sharply bent backwards close to dorsal margin; sutures decrease in width and height towards the dorsal margin. Sharp ledge-like keel continues along the dorsal margin, disappearing at the penultimate or ultimate chamber and forming a blunt margin in initial test part. Ventral surface of uncoiled part delineated on both sides by keels less sharp than dorsal keel. Aperture radial, located close to dorsal margin on somewhat convex apertural surface of the last chamber, sometimes with short neck.

Individual variability expressed in dimensions, and in different ratio of coiled to uncoiled test parts, course of dorsal and ventral margins, as well as in degree of elevation and course of sutures.

Remarks. — *Saracenaria pravoslavlevi* differs from *S. alata-angularis* Franke in sutures elevated on lateral test surface. The former differs from *S. gracilis* Kosireva in large size, more numerous chambers and better marked ledge-like keel from dorsal side; it differs from *S. cornucopiae* (Schwager) in thicker test, broader ventral surface, and sutures elevated on lateral test surface. Putrja (1970) proposed a new genus, *Pravoslavlevia*, with *Saracenaria pravoslavlevi* Furssenko & Polenova as the

type species. However, it seems that the features considered by Putrja as typical of that new genus are of insufficient importance for establishment of a new taxon of generic rank.

Occurrence. — Poland: Lower and Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; France; Kimmeridgian: Czechoslovakia: Klentnice Beds; Madagascar: Portlandian.

Genus *Vaginulinopsis* Silvestri, 1904

Vaginulinopsis embaensis (Furssenko & Polenova, 1950)

(Pl. X, Figs. 4, 5, 6)

1950. *Cristellaria embaensis* sp.n.; A. V. Furssenko & E. N. Polenova, p. 36, Pl. 3, Fig. 9—13.

1954. *Marginulina costata* (Batsch); W. Bielecka & W. Pożaryski, p. 53, Pl. 8, Fig. 36a, b.

1963. *Marginulinopsis embaensis* (Furssenko & Polenova); J. Espitalié, & J. Sigal, p. 42, Pl. 18, Fig. 3.

Material. — Over 200 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5266/73/F	No. 5267/73/F	No. 5268/73/F
Length	0.94	0.84	0.56
Width	0.44	0.47	0.28
Thickness	0.25	0.26	0.15
Number of chambers	11	10	8

Supplemented description. — Test elongated, flattened on sides, rounded in lower part and elongated in upper part, flat-ovate in cross-section; 5—12 chambers: 4—5 (sometimes 6) chambers in coiled part and 2—6 chambers in rectilinear part; proloculus spherical, subsequent chambers triangular and finally quadrangular, broad and low. Sutures flush, slightly oblique, arcuate, somewhat depressed between the last chambers; dorsal margin weakly arcuate, sometimes rectilinear; ventral margin rectilinear or somewhat bent. Lateral test surface ornamented with 6—8 ledge-like ribs set parallel to margins along the whole test length; in lower test part the ribs forming a loop embracing 1 or 2 longitudinal ribs; the ribs thin out or disappear reaching apertural surface of the last chamber. Aperture circular or radial, located on the top of the last chamber, close to ventral margin, sometimes on small neck.

Individual variability expressed in dimensions of uncoiled part, test width, and thickness of ribs.

Remarks. — The Polish specimens are somewhat smaller than those described by Furssenko and Polenova (1950) from the Russian Platform. The specimens misidentified by Bielecka and Pożaryski (1954) as *M. costata* (Batsch) differ from that species in coiled part, more flat-ovate cross-section of test, and more numerous ribs and chambers. and they should be assigned to *V. embaensis*.

Occurrence. — Poland: Upper Kimmeridgian, Lower and Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; Czechoslovakia: Klentnice Beds; Madagascar: Portlandian.

Vaginulinopsis incisiformis sp.n.

(Pl. X, Figs 7, 8, 9)

Holotype: No. 5269/73/F; Pl. X, Fig. 7.

Type horizon: Middle Portlandian.

Type locality: Borehole Zagłoba, depth 282.0 m.

Derivation of the name: Lat. *incisus* — with incised margins.

Diagnosis. — Test elongated, flattened on sides, flat-ovate in cross-section; chambers 8—10 in number, inflated just above sutures; proloculus ovate; sutures depressed, oblique; dorsal margin rectilinear or slightly incised; ventral margin almost parallel to dorsal.

Material. — Over a dozen well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5269/73/F	No. 5270/73/F	No. 5271/73/F
Length	1.00	0.92	0.81
Width	0.25	0.25	0.21
Thickness	0.14	0.14	0.12
Maximum proloculus diameter	0.10	0.07	0.09
Minimum proloculus diameter	0.06	0.04	0.05
Number of chambers	10	10	8

Description. — Test elongated, narrow, flattened on sides, rounded at the base and with somewhat elongated upper part; flat-ovate in cross-section; chambers 8—10 in number; 3—4 in coiled part, 4—7 in uncoiled part; proloculus ovate, 2—3 successive chambers triangular, subsequent chambers quadrangular in outline, broad and low, somewhat inflated just above the sutures. Sutures narrow, depressed, oblique; dorsal margin rectilinear, weakly incised and somewhat bent in lower test part; ventral margin weakly incised, almost parallel to the dorsal. Apertural surface narrow, somewhat convex; aperture radial, located on weakly elongated top part of the last chamber, near dorsal margin.

Individual variability expressed in location of ovate proloculus (closer to ventral margin or shifted towards the anterior; in the latter case the lower part of test is more strongly incurved and somewhat bent side-wards).

Remarks. — *Vaginulinopsis incisiformis* sp.n. is similar to *Marginulina parallela* (Reuss). However, it cannot be assigned to the genus *Marginulina* on account of the presence of spiral part; moreover, it differs from the latter species in: more numerous chambers, which are somewhat more inflated just above incised sutures, and the last chamber of its test less elongated upwards.

The new species differs from *V. planulariformis* (Kusnetzova) (= *Marginalina planulariformis*) in less distinctly bent lower test part, somewhat more numerous chambers of coiled part in chambers of uncoiled part broader and more inflated just above sutures, and in less elongated last chamber.

Occurrence. — Poland: Lower and Middle Portlandian.

Family **Polymorphinidae** d'Orbigny, 1839
 Subfamily **Polymorphininae** d'Orbigny, 1839
 Genus *Eoguttulina* Cushman & Ozawa, 1930
Eoguttulina liassica (Strickland, 1846)
 (Pl. X, Figs 10, 11)

1846. *Polymorphina liassica* Strickland; H. E. Strickland, p. 30, Text-fig. b, *vide* B. F. Ellis & A. R. Messina — Catalogue of Foraminifera.
 1968. *Eoguttulina liassica* (Strickland); J. Guyader, p. 170, Pl. 28, Fig. 18a-d.
 1970. *Eoguttulina liassica* (Strickland); B. Winter, p. 39, Pl. 4, Fig. 135 (*cum synonymica*).

Material. — Over 100 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5272/73/F	No. 5273/F	No. 5274/73/F
Length	0.41	0.36	0.36
Width	0.19	0.18	0.18
Thickness	0.15	0.14	0.13
Number of chambers	4	3	3

Remarks. — The revision of *Eoguttulina liassica* (Strickland), carried out by Llyod (1962), made it possible to distinguish two groups of specimens differing in proportion and appearance of the last chamber. The two forms are also found in the material from the Portlandian of the Polish Lowlands. *Eoguttulina liassica* differs from *E. polygona* (Terquem) in less elongated drop-shaped test, smaller number of chambers, and in the last chamber extending much further downwards. The former differs from *E. amygdalina* Loeblich & Tappan in the last chamber somewhat more inflated and extending much further downwards.

Occurrence. — France, FRG, Poland: Liassic — Portlandian.

Eoguttulina polygona (Terquem, 1864)
 (Pl. X, Figs 12, 13)

1864. *Polymorphina polygona* Terquem; O. Terquem, p. 305, Pl. 14, Fig. 16—20, 21, 35.
 1970. *Eoguttulina polygona* (Terquem); B. Winter, p. 40, Pl. 4, Fig. 137 (*cum synonymica*).

Material. — Over 40 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5275/73/F	No. 5276/73/F	No. 5277/73/F
Length	0.61	0.56	0.48
Width	0.23	0.21	0.21
Thickness	0.14	0.15	0.14
Number of chambers	7	6	6

Supplemented description. — Test elongated, with both ends extended; proloculus spherical or egg-shaped; subsequent chambers 3—7 in number, set one above another in a spiral at the angle smaller than 90° and progressively further from the base of test; the chambers longer than wide: the last chamber corresponding to a half of test length or more; test the widest somewhat below the middle of its length; sutures distinct, weakly incised. Aperture radial, situated on the top of the last chamber.

Individual variability expressed in dimensions of tests and degree of depression of sutures.

Remarks. — The Polish specimens resemble some figured as *E. polygona* by Terquem (1864, Pl. 14, Figs 16—20, 21, 35); it seems that the remaining specimens figured by this author represent other species of the genus *Eoguttulina*.

Occurrence. — Poland: Middle Portlandian; France: Liassic; FRG: Liassic — Dogger, Lower Tithonian; England: Kimmeridgian — Portlandian; Madagascar: Oxfordian; Egypt (Sinai peninsula): Bajocian, Callovian, Kimmeridgian.

Genus *Guttulina* d'Orbigny in de la Sagra, 1839

Guttulina multistriata sp.n.

(Pl. X, Figs 14, 15, 16)

Holotype: No 5178/73/F; Pl. X, Fig. 14.

Type horizon: Middle Portlandian.

Type locality: borehole Strzegowo, depth 198.4 m.

Derivation of the name: Lat. *multistriatus* — with numerous striae.

Diagnosis. — Test spindle-shaped; chambers 3—4 in number, longer than wide; surface ornamented with fine longitudinal striae and narrow grooves; sutures distinct, weakly depressed; aperture radial, located on elongated top part of the last chamber.

Material. — Over 20 well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5278/73/F	No. 5279/73/F	No. 5280/73/F
Length	0.40	0.38	0.36
Width	0.18	0.16	0.16
Thickness	0.13	0.12	0.13
Proloculus diameter	0.09	0.10	0.09
Number of chambers	4	4	3

Description. — Test spindle-shaped, somewhat asymmetrical, with lower part slightly rounded and upper part extended upwards; peripheral margin rounded, incised at the contact of chambers; chambers 3—4 in number, set one above another at the angle of about 144° ; proloculus ovate, subsequent chambers markedly longer than wide, inflated; the last chamber equal almost $3/4$ total test length. Test surface looking like covered with striae, with numerous fine longitudinal furrows converging towards the aperture of particular chambers; inter-furrow spaces and furrows almost of the same width; sutures distinct, weakly depressed; aperture radial, situated on elongated top part of the last chamber.

Individual variability expressed in distinctness of striation on test surface and flatness of test.

Remarks. — The specimens from Klentnice Beds of Czechoslovakia determined by Hanzlikova (1965) as *E. cf. helvetica* (Kübler & Zwingli) may represent *G. multistriata* sp.n. They display similar arrangement of chambers and striae on test surface, differing from the Polish specimens merely in smaller and shorter last chamber and ovate aperture surrounded by lip-resembling swelling. *Guttulina multicosata* sp.n. differs from *Globulina helvetica* Kübler & Zwingli (which according to the present author should be assigned to *Guttulina*), in fine furrows arranged longitudinally and not transversely in relation to the width of chambers, ovate proloculus, and more distinctly marked sutures. *Guttulina multicosata* sp.n. differs from *G. regina* (Brady, Parker & Jones) in slender test with less rounded lower part, more elongated, less inflated and less numerous chambers, and in ornamentation of test surface; the surface of test of the latter is ornamented with ribs separated by shallow, fairly wide, continuous grooves, whereas that of the former — with finer, closely spaced furrows almost of the same width as inter-furrow spaces, and the inter-furrow spaces resembling striae and not ribs.

Occurrence. — Poland: Middle Portlandian (the Zaraiskites zaraiskensis Zone); and supposedly Czechoslovakia: Klentnice Beds.

Subfamily Glandulininae Reuss, 1860

Genus *Tristix* Macfadyen, 1941 emend. Loeblich & Tappan, 1952

Tristix acutangulus (Reuss, 1863)

(Pl. X, Figs 17, 18, 19)

1863. *Rhabdogonium acutangulum* m; A. E. Reuss, p. 55, Pl. 4, Fig. 14.
 1950. *Tristix suprajurassica* (Paalzow); A. V. Furssenko & E. N. Polenova, p. 81, Pl. 8, Figs 5, 6.
 1954. *Tristix somaliensis* (Macfadyen); W. Bielecka & W. Pożaryski, p. 61, Pl. 9, Fig. 45a-c.
 1960. *Tristix acutangulus* (Reuss); G. F. Lutze, p. 476, Pl. 29, Fig. 1 (*cum synonymica*).
 1967. *Tristix suprajurassica* (Paalzow); J. Th. Groiss, p. 17, Pl. 1, Fig. 44.
 1968. *Tristix suprajurassica* (Paalzow); J. Guyader, p. 173, Pl. 23, Fig. 5; Pl. 28, Fig. 25.

Material. — A few tens of generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5281/73/F	No. 5282/73/F	No. 5283/73/F
Length	1.09	0.59	0.53
Width	0.42	0.21	0.22
Proloculus diameter	0.12	0.07	0.07
Number of chambers	7	7	6

Remarks. — The Polish specimens differ from the holotype in smaller number of chambers, not so slender test, and more arcuate sutures. *Tristix acutangulus* differs from *T. excavatus* (Reuss) in markedly less depressed lateral test surface and the upper test part less widening upwards.

Occurrence. — Poland: Oxfordian — Portlandian; FRG: Liassic — Lower Cretaceous; USSR (Russian Platform) Lower and Middle Volgian; France (Normandy): Kimmeridgian; Czechoslovakia: Klentnice Beds; Madagascar: Kimmeridgian — Portlandian.

Tristix quadrangularis Furssenko & Polenova, 1950

(Pl. XI, Figs 1, 2)

1950. *Tristix temirica* (Dain) var. *quadrangularis* var.n.; A. V. Furssenko & E. N. Polenova, p. 83, Pl. 7, Fig. 15.

Material. — Over a dozen well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5284/73/F	No. 5285/73/F	No. 5286/73/F
Length	0.87	0.56	0.44
Width	0.25	0.25	0.14
Proloculus diameter	0.15	0.15	0.09
Number of chambers	6	4	4

Supplemented description. — Test elongated, quadrangular, with lower part somewhat rounded and upper part elongated; chambers 4—6 in number; proloculus spherical; subsequent chambers quadrangular, weakly inflated, with four blunt edges extending downwards; chambers low and fairly broad; the last chamber elongated upwards; sutures depressed, sharply arcuate in the middle part of lateral test surface; aperture circular or radial, terminal, sometimes with small neck.

Individual variability expressed in the blunt edges of chambers and in development of neck.

Remarks. — The Polish specimens differ from those from Volga Region in being generally somewhat larger and in more sharply bent sutures. *Tristix quadrangularis* differs from *T. temirica* (Dain) in quadrangular and not triangular test, and lower chambers at the comparable width. It differs from Lower Cretaceous species *T. maertensi* (Reuss) in smaller

size, less numerous chambers and more rounded test edges, and from *T. strombecki* (Reuss) — in markedly more arcuate sutures.

Occurrence. — Poland: Middle Portlandian; USSR (Russian Platform): Middle Volgian.

Tristix temirica (Dain, 1934)
(Pl. XI, Figs 3, 4a, b)

1934. *Triplasia temirica* sp.n.; L. G. Dain, p. 29, Pl. 3, Fig. 25a, b, w.

1950. *Tristix temirica* (Dain); A. V. Furssenko & E. N. Polenova, p. 80, Pl. 7, Fig. 1-4.

pars 1954. *Dentalinopsis oolithica* (Terquem); W. Bielecka & W. Pożaryski, p. 65, Pl. 10, Fig. 51a, n.

pars 1954. *Dentalinopsis* aff. *subtriquetra* Reuss; W. Bielecka & W. Pożaryski, p. 66, Pl. 10, Fig. 52a, b, c.

1959. *Tristix temirica* (Dain); T. N. Chabarova, p. 496, Pl. 7, Fig. 2a, b.

Material. — A few tens of generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5287/73/F	No. 5288/73/F	No. 5289/73/F
Length	0.86	0.81	0.39
Width	0.28	0.30	0.20
Proloculus diameter	0.12	0.10	0.11
Number of chambers	6	5	3

Supplemented description. — Test triangular, narrowing on both ends, with slightly depressed lateral surface in its middle part; chambers 3—6 in number; proloculus spherical, subsequent chambers triangular; edges of chamber margins pointed downwards forming 3 keels; the keels disappearing on the last chamber; sutures depressed, bent at the angle of about 110°; aperture radial, terminal, situated on elongated part of the last chamber.

Individual variability expressed in sharpness of test margin edges, which resemble keels or are gently rounded, as well as in curvature of sutures.

Remarks. — Dain (1934) distinguished three groups within this species, all identified in the Polish material, and some transitional forms. *Tristix temirica* differs from *T. murchinsoni* (Reuss) in smaller test size, somewhat less depressed lateral test surface and more uniform increase in width of chambers. The specimens of *T. temirica* characterized by more rounded edges of test somewhat resemble the representatives of *T. wilcoxensis* (Cushman & Ponton), differing in smaller test size, less spindle-like test shape and its not incised outline.

Occurrence. — Poland: top parts of the Kimmeridgian — Middle Portlandian; USSR (Russian Platform): Lower and Middle Volgian; Madagascar: Portlandian.

Family **Spirillinidae** Reuss, 1862
 Subfamily **Spirillininae** Reuss, 1862

Genus *Spirillina* Ehrenberg, 1843

Spirillina infima (Strickland, 1846) emend. Barnard, 1952
 (Pl. XI, Fig. 5)

1846. *Orbis infimus* Strickland; H. E. Strickland, p. 30, Text-fig. a, *fide* B. F. Ellis & A. R. Messina — Catalogue of Foraminifera.
 1952. *Spirilina infima* (Strickland); emend. Barnard; T. Barnard, p. 905, Text-fig. 1—3 (*cum synonymica*).
 1954. *Spirillina orbicula* Terquem & Berthelin; W. Bielecka & W. Pożaryski, p. 67, Pl. 10, Fig. 54a, b.
 1962. *Spirillina infima* (Strickland); A. J. Lloyd, p. 374, Pl. 1, Fig. 2a, b. 3a, b (*cum synonymica*).

Material. — Over 50 generally well-preserved specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5290/73/F	No. 5291/73/F	No. 5292/73/F
Test diameter	0.30	0.27	0.22
Test thickness	0.04	0.03	0.03
Width of the last whorl	0.03	0.028	0.025
Number of whorls	6	5	5
Proloculus diameter	0.02	0.018	0.015

Remarks. — Barnard (1952) interpreted *Spirillina orbicula* Terquem & Berthelin and *S. numismalis* Terquem & Berthelin as megallo- and microspheric generations of the species *S. infima*, and *Cornuspira liassica* Terquem — as its synonym. The Polish specimens do not differ from the lectotype of *S. infima* (Barnard, 1952, Text-fig. 3).

Occurrence. — Poland: Oxfordian, Kimmeridgian, Portlandian; France: Liassic; FRG: Liassic, Dogger, Lower Malm; England: Liassic, Kimmeridgian, and Portlandian; Madagascar: Kimmeridgian — Portlandian; Czechoslovakia: Klentnice Beds.

Family **Involutinidae** Bütscheli, 1880

Genus *Trocholina* Paalzow, 1922

Trocholina aff. *burlini* Gorbachik, 1959
 (Pl. XI, Figs 6a, b, c, 7a, b c)

Material. — Over 50 specimens.

Dimensions of tests with higher cone (in mm):

Coll. IG Warsaw	No. 5293/73/F	No. 5294/73/F	No. 5295/73/F
Test diameter	0.45	0.43	0.41
Cone height	0.19	0.18	0.18
Test diameter/height ratio	2.37	2.38	2.36
Apical angle	110°	125°	125°
Number of whorls	7	7	6
Width of the last whorl	0.11	0.10	0.09
Proloculus diameter	0.018	0.023	0.023

Dimensions of tests with lower cone (in mm):

Coll. IG Warsaw	No. 5296/73/F	No. 5297/73/F	No. 5298/73/F
Test diameter	0.48	0.41	0.36
Cone height	0.16	0.12	0.11
Test diameter/height ratio	3.00	3.40	0.27
Apical angle	130°	135°	130°
Number of whorls	7	6	5
Width of the last whorl	0.11	0.10	0.09
Proloculus diameter	0.023	0.027	0.025

Description. — Test of the shape of low cone; proloculus spherical; second chamber tubular, trochospirally coiled into 5—7 (usually 6) whorls; the last whorl wider than the preceding ones; sutures marked between the whorls, somewhat depressed on dorsal side; ventral side flat or very weakly depressed, displaying only the last whorl equalling in width 1/4 to 1/5 of test diameter; umbilical margin of the last whorl displays numerous poorly marked furrows disappearing towards the peripheral margin. Central test part from ventral side infilled with test material and occupying 2/5 to 3/5 of test diameter; its surface is covered with 25—40 (sometimes 18) knobs differing in size. Aperture represented by open, flattened end of tubular second chamber.

Individual variability expressed in differences in size and shape of test (cupola-like or conical shape), test diameter/height ratio, number of whorls and knobs.

Remarks. — The Portlandian specimens display features intermediate between those of *T. solecensis* Bielecka & Pożaryski, *T. burlini* Gorbatchik and *T. molesta* Gorbatchik. Small individuals resemble *T. solecensis*, differing in somewhat larger size; the apical angle equals 125°—140° and 135°—150° in *T. aff. burlini* and *T. solecensis*, respectively; sutures from dorsal side are better marked, and ventral side is flat; the width of the last whorl occupies relatively smaller part of test diameter, and the test diameter/height ratio exceeds 3 in *T. aff. burlini* and about 2.5 in *T. solecensis*. The high individuals of *T. aff. burlini* resemble *T. molesta* Gorbatchik, differing in somewhat lower and more cupola-like test cone; apical angle equalling 110°—120° and 90°—110° and test diameter/height ratio — 2.3 or more and 1.7—2.2, in *T. aff. burlini* and *T. molesta*, respectively. Internal (umbilical) margin from ventral side of Polish specimens is covered by less distinct and less numerous furrows than that of the representatives of *T. molesta* Gorbatchik. The majority of individuals assigned to *T. aff. burlini*, i.e. those characterized by lower tests, resemble *T. burlini* Gorbatchik, differing in somewhat greater apical angle (130°—140° and 120°—130°, respectively), less distinct furrows on internal margin of the last whorl, smaller number of whorls (by 2) visible on dorsal side, and depressed sutures.

Occurrence. — *Trocholina burlini* — Poland (southern part of Carpathian Forefield): Tithonian — Lower Cretaceous; USSR (north-western Caucasus): Valanginian — Barremian; France (Jura Mts) Lower Cretaceous. *Trocholina* aff. *burlini* — Poland (Pomerania): higher parts of Middle Portlandian; Czechoslovakia: Cieszyn Beds (Tithonian).

Trocholina solecensis Bielecka & Pożaryski, 1954

(Pl. XI, Fig. 8a, b, c)

1954. *Trocholina solecensis* sp.n.; W. Bielecka & W. Pożaryski, p. 69, Pl. 11, Fig. 57a, b, c.

1965. *Trocholina* ex gr. *solecensis* Bielecka & Pożaryski; E. Hanzlikova, p. 63, Pl. 9, Fig. 11, 15a, b, 16a, b.

Material. — About 30 specimens.

Dimensions of Portlandian specimens (in mm):

Coll. IG Warsaw	No. 5299/73/F	No. 5302/73/F	No. 5303/73/F
Test diameter	0.30	0.27	0.23
Cone height	0.11	0.10	0.09
Test diameter/height ratio	2.72	2.70	2.60
Number of whorls	5	5	4

Dimensions of Kimmeridgian specimens (in mm):

Coll. IG Warsaw	No. 5056 ¹⁹⁾	No. 5202/73/F	No. 5203/73/F
Test diameter	0.34	0.27	0.25
Cone height	0.13	0.11	0.10
Test diameter/height ratio	2.60	2.50	2.50
Number of whorls	5	5	5

Remarks. — *Trocholina solecensis* differs from *T. nodulosa* Seibold in somewhat higher number of whorls visible on dorsal side, the last whorl less pronounced on ventral side, larger and more tuberculated surface of ventral side.

Occurrence. — Poland: Upper Oxfordian, Kimmeridgian, Lower Portlandian; RFG (Frankonian Alb): Tithonian; Czechoslovakia: Klentnice Beds.

Family **Ceratobuliminidae** Cushman, 1927

Subfamily **Ceratobulimininae** Cushman, 1927

Genus *Pseudolamarckina* Mjatliuk (*in* Rauser-Tshernousova & Furssenko, 1959) emend. Dain, 1967

Pseudolamarckina polonica (Bielecka & Pożaryski, 1954)

(Pl. XI, Fig. 9a, b, c)

1954. *Eponides* (*Conorbis*) *polonicus* sp.n.; W. Bielecka & W. Pożaryski, p. 70, Pl. 12, Fig. 58a, b, c.

? 1963. *Epistomina* (*Reinholdella*) „*rjasanensis*” (Uhlig) *in* Mjatliuk; J. Espitalié & J. Sigal, p. 68, Pl. 32, Fig. 4,5.

¹⁹⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Upper Kimmeridgian of borehole Zagłoba, depth 420.0 m.

Revised diagnosis. — Test trochospiral; peripheral margin sharp; dorsal side convex; ventral side weakly convex to almost flat; septal sutures somewhat arcuate or oblique on dorsal side, weakly marked, somewhat depressed between 2—3 last chambers on ventral side; chambers 15—23 in number, arranged in 2—3.5 whorls; the last whorl consisting of 7—8 chambers; aperture slit-like; interiomarginal, umbilical, with comma-like incision in the middle.

Material. — Over 300 specimens.

Dimensions of microspheric generation (in mm):

Coll. IG Warsaw	No. 5057 ²⁰⁾	No. 5304/73/F	No. 5305/73/F
Larger diameter	0.72	0.83	0.61
Smaller diameter	0.65	0.76	0.57
Test thickness	0.31	0.43	0.30
Number of whorls	3.5	3.5	2.5
Number of chambers	20	23	18
Number of chambers in the last whorl	7	8	7
Proloculus diameter	0.013	0.015	0.010

Dimensions of megalospheric generation (in mm):

Coll. IG Warsaw	No. 5306/73/F	No. 5307/73/F	No. 5308/73/F
Larger diameter	0.55	0.54	0.45
Smaller diameter	0.48	0.47	0.40
Test thickness	0.27	0.25	0.27
Number of whorls	2.5	2.5	2.25
Number of chambers	18	18	15
Number of chambers in the last whorl	8	8	7
Proloculus diameter	0.050	0.040	0.030

Revised description. — Test trochospiral, circular and somewhat incised in outline; usually dextral; dorsal side convex, ventral side weakly convex to flat. Peripheral margin fairly sharp. Dorsal side displaying 15—23 chambers arranged in 2—3.5 whorls; 7—8 chambers in the last whorl; proloculus spherical, situated at the center of top part of dorsal side; subsequent chambers irregularly quadrangular, progressively elongating; sutures fairly wide, somewhat elevated or almost flush on dorsal side; septal sutures somewhat arcuate or oblique; peripheral margin fairly sharp, somewhat incised.

Tests of microspheric generation 1.5 times larger, higher, somewhat more convex on dorsal side than those of megalospheric generation; chambers 18—23 in number, arranged in 2.5—3.5 whorls; 7—8 chambers in the last whorl; proloculus spherical, very minute.

Tests of megalospheric generation smaller and lower, with more flattened ventral side; 14—18 chambers visible on dorsal side, arranged in

²⁰⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Lower Portlandian of borehole Zagłoba, depth 276.4 m

2—2.5 whorls; 7—8 chambers in the last whorl; proloculus spherical, at least three times larger than that of microscopic forms. Chambers of the last whorl poorly visible on ventral side of tests of both generations. Septal sutures flush or weakly depressed, becoming somewhat better marked between 2—3 last chambers; center of the test infilled with weakly elevated umbo. Aperture slit-like, interiomarginal, umbilical, with comma-like incision in the middle part; subumbilical margin of wall of the last margin extended in the form of a lobe somewhat obscuring aperture; the lobes developed on earlier chambers may encroach upon umbilicus forming a small swelling.

Individual variability expressed in test size, convexity of dorsal side and flatness of ventral side, distinctness of umbo.

Remarks. — The representative of microspheric generation was selected as the holotype of this species (Bielecka & Pożaryski, 1954, Pl. 12, Fig. 58a, b, c). However, the specimen was inaccurately drawn, thus it is refigured here (Pl. XI, Fig. 2a, b, c). Taking into account the characteristic generic features displayed by this species, it is assigned now to the genus *Pseudolamarckina*. *Pseudolamarckina polonica* (Bielecka & Pożaryski) is very close to *P. liapinensis* Dain known from the Upper Kimmeridgian of Siberia; the features in common include: total number of chambers generally higher than that of other species, higher number of chambers in the last whorl (7—8 instead of 6), and sutures elevated on dorsal side. *Pseudolamarckina polonica* differs from *P. liapinensis* in relatively lower test, higher increase in whorl width, less flattened ventral side, and sharper peripheral margin. It differs from *P. voliaensis* Dain, the species described from the Lower Volgian on Siberia, in larger dimensions, more numerous chambers (more than 15) and whorls (over 2.5), more numerous chambers of the last whorl (at least 7) and sutures elevated on dorsal side, and from *P. rjasanensis* (Uhlig) — in more numerous chambers of the last whorl, more flattened ventral side with less clear septal sutures, and almost undifferentiated umbo (which is present in some representatives of the latter species).

Occurrence. — Poland: Upper Kimmeridgian and Lower Portlandian; USSR (Russian Platform): Lower Volgian; presumably Madagascar: Portlandian.

Subfamily Epistominidae Wedekind, 1937

Genus *Epistomina* Terquem, 1883 emend. Pazdro, 1969

Epistomina stellicostata Bielecka & Pożaryski, 1954

(Pl. XI. Figs 10a, b, 11a, b)

1954. *Epistomina stellicostata* n.sp.; W. Bielecka & W. Pożaryski, p. 71, 72, Pl. 12, Fig. 60a, b, c.
1968. *Epistomina stellicostata* Bielecka & Pożaryski; J. Guyader, p. 182, 183, Pl. 23, Fig. 32-34; Pl. 28, Fig. 32a-d.

Material. — About 100 specimens.

Dimensions (in mm):

Coll. IG Warsaw	No. 5059 ²¹⁾	No. 5309/73/F	No. 5310/73/F
Larger diameter	0.41	0.39	0.38
Smaller diameter	0.36	0.34	0.32
Test thickness	0.21	0.20	0.18

Remarks. — Description of this species was given by Bielecka and Pożaryski (1954). Sinistrial tests predominate in the Portlandian material, but some dextrial forms are also present.

Occurrence. — Poland: Lower Kimmeridgian — Middle Portlandian; France: Kimmeridgian.

Ostracoda

Family *Cyprididae* Baird, 1845

Genus *Mantelliana* Anderson, 1966

Mantelliana purbeckensis (Forbes, 1855)

(Pl. XII. Figs 1a, b, 2)

1885. *Cypris purbeckensis* Forbes; T. R. Jones, p. 347—348, Pl. 9, Fig. 1—6.
 1968. *Mantelliana purbeckensis* (Forbes, 1855); E. Wienholz, Pl. 1, Fig. 4a, b, 5.
 1968. *Mantelliana purbeckensis* (Forbes, 1855); O. B. Christensen, p. 20, Fig. 3, 4d (*cum synonymica*).
 1969. *Mantelliana purbeckensis* (Forbes); S. Marek, W. Bielecka & J. Sztejn, Pl. 1, Fig. 2.

Material. — A few tens of carapaces and over a dozen right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5001/73/0			No. 5003/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.06	0.65	0.54	0.90	0.46	0.48
Left valve	1.12	0.75		0.97	0.54	

Remarks. — Individual variability marked in differences in carapace shape (from semicircular to kidney-shaped) and height. *Mantelliana purbeckensis* differs from *M. mantelli* and *M. philipsina* (Jones), in more massive carapace and the lack of fringe.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian: ostracod zones F — C; England and France: Lower Purbeckian; FRG and DRG: Upper Münders Mergel, Lower Serpulite; Scania: Lower Purbeckian (Vita-bäck Beds).

²¹⁾ The holotype was described by Bielecka and Pożaryski (1954) from the Upper Kimmeridgian (the Aulacostephanus pseudomutabilis zone) of borehole Zagłoba, depth 307.5 m.

Family **Ilyocyprididae** Kaufmann, 1900
 Subfamily **Ilyocypridinae** Kaufmann, 1900
 Genus *Rhinocypris* Anderson, 1940
Rhinocypris jurassica jurassica (Martin, 1940)
 (Pl. XIII, Fig. 4a, b)

1940. *Ilyocypris jurassica jurassica* n.subsp.; G. P. R. Martin, p. 313, Pl. 4, Fig. 51—54.
 1968. *Rhinocypris jurassica* (Martin); O. B. Christensen, p. 26, Fig. 7h (*cum synonymica*).
 169. *Rhinocypris jurassica jurassica* (Martin); S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 4.

Material. — A few tens of carapaces and over a dozen right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5005/73/0			No. 5006/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.45	0.25	0.19	0.41	0.22	0.18
Left valve	0.51	0.29		0.46	0.26	

Remarks. — Individual variability expressed in differences in carapace dimensions and distinctness of sculpture. *Rhinocypris jurassica* differs from *R. jurassica spinosa* (Martin) in the lack of any distinct spines.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones F — B, A; England, France and Denmark: Lower Purbeckian; FRG and DRG: Upper Kimmeridgian — Wealdian 4.

Subfamily **Cyprideinae** Martin, 1940
 Genus *Damonella* Anderson, 1966
Damonella ellipsoidea (Wolburg, 1962)
 (Pl. XIII, Fig. 6a, b)

1962. *Bythocypris ellipsoidea* Wolburg; W. Wick & J. Wolburg, p. 223, Pl. 32b, Fig. 20, tab. 16.
 1966. *Damonella ellipsoidea* (Wolburg); F. W. Anderson, p. 442, Text-fig. 18, 20, 25, 26.
 1969. *Damonella cf. ellipsoidea* (Wolburg); S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 16.

Material. — About 20 carapaces and a few right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5007/73/0			No. 5008/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.70	0.34	0.25	0.60	0.31	0.23
Left valve	0.74	0.39		0.63	0.35	

Remarks. — Individual variability expressed in degree of elongation of carapace. *Damonella ellipsoidea* differs from *D. pygmea* (Anderson) in larger size and more elongated carapace, which is more semicircular in outline in the latter.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zone C; FRG and DRG: Serpulite — Wealdian 1; England: Purbeckian — up to the lower boundary of Wealdian.

Damonella pygmea (Anderson, 1940)

(Pl. XIII, Fig. 5a, b)

1940. *Cypris pygmea* sp.nov.; F. W. Anderson, p. 379, Pl. 19, Fig. 17.

1968. *Damonella pygmea* (Anderson); O. B. Christensen, p. 22, Fig. 4g (*cum synonymica*).

1969. *Damonella pygmea* (Anderson); S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 9.

Material. — Over 60 carapaces and a few right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5009/73/0			No. 5010/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.48	0.22	0.18	0.44	0.21	0.20
Left valve	0.50	0.25		0.46	0.24	

Remarks. — Individual variability expressed in more or less rectilinear course of ventral margin. Differences in respect to *D. ellipsoidea* (Wolburg) as above.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — C; England, France, Switzerland: Purbeckian; Denmark: Lower Purbeckian (Rabekke Formation); FRG and DRG: Serpulite.

Genus *Cypridea* Bosquet, 1852

Cypridea binodosa Martin, 1940

(Pl. XIII, Fig. 2a, b, c)

1940. *Cypridea binodosa* n.sp.; G. P. R. Martin, p. 306, Pl. 3, Fig. 40—43.

1963. *Cypridea binodosa* Martin; H. J. Oertli, p. 16, Pl. 2, Fig. 9—11.

1968. *Cypridea binodosa* Martin; E. Wienholz, Pl. 3, Fig. 20a, b, 21.

1969. *Cypridea binodosa* Martin; S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 14.

Material. — Over 20 carapaces and over a dozen right and left valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5011/73/0			No. 5012/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.20	0.84	0.72	1.13	0.77	0.63
Left valve	1.26	0.90		1.17	0.81	

Remarks. — Individual variability expressed in more or less distinct anteriodorsal angle and in distinctness of knob from posterior part of the carapace. *Cypridea binodosa* differs from *C. posticalis* Jones in markedly broader posterior part of the carapace and position of the knob.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zone C; FRG and DRG: Serpulite; France: Lower Purbeckian.

Cypridea dunkeri Jones, 1885

(Pl. XII, Figs 3, 4a, b, c)

1885. *Cypridea dunkeri* sp.nov.; T. R. Jones, p. 339, Pl. 8, Fig. 9, 10, 17.

1962. *Cypridea carinata* Martin; W. Klingler, H. Malz & G. P. R. Martin, p. 170, Pl. 27, Fig. 9, tabl. 10.

1963. *Cypridea dunkeri* Jones; H. J. Oertli, p. 15, Pl. 1, Fig. 3—8.

1968. *Cypridea dunkeri* Jones; D. Barker, p. 470, Pl. 7, Fig. 1, 2 (*cum synonymica*).

1969. *Cypridea dunkeri* Jones; S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 12.

Material. — Over 50 carapaces and over a dozen right and left valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5013/73/0			No. 5014/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.03	0.68	0.34	0.96	0.50	0.35
Left valve	0.94	0.56		0.91	0.53	

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones D — B, particularly common in the zone C; England: Purbeckian; France: Lower Purbeckian; FRG and DRG: Serpulite.

Cypridea inversa Martin, 1940

(Pl. XIII, Fig. 1a, b, c)

1940. *Cypridea inversa* n.sp.; G. P. R. Martin, p. 297, Pl. 2, Fig. 22—26; Pl. 9, Fig. 139.

1963. *Cypridea inversa* Martin; H. J. Oertli, p. 15, Pl. 1, Fig. 1—2.

1968. *Cypridea inversa* Martin; E. Wienholz, Pl. 3, Fig. 28.

1969. *Cypridea inversa* Martin; S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 6.

Material. — Over a dozen carapaces and over 50 left and right valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5015/73/0			No. 5016/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.10	0.81	0.48	1.08	0.73	0.48
Left valve	1.00	0.66		0.93	0.61	

Remarks. — Some Polish specimens differ from the holotype in somewhat higher carapace and somewhat better marked ridge-like swelling above ventral margin. *Cypridea inversa* differs from the species of this genus characterized by reticulation of carapace surface in markedly larger right valve, large rostrum and usually markedly triangular cyathus in posterior part of ventral margin.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — C; FRG and DRG: Upper Munder Mergel — Serpulite; France: Lower Purbeckian; Denmark: Lower Purbeckian (Rabekke Formation).

Cypridea praealta sp.n.

(Pl. XII, Figs 6a, b, 7a, b, c)

Holotype: No. 5017/73/0; Pl. XII, Fig. 7a, b, c.

Type horizon: Purbeckian facies of Upper Portlandian, ostracod zone C.

Type locality: borehole Kcynia, depth 307.6 m.

Derivation of the name: Lat. *prae* — prior; preceding the species *Cypridea alta* Wolburg.

Diagnosis. — Carapace ovate-trapezoidal; left valve larger than right; dorsal margin almost rectilinear, somewhat inclined towards the posterior; antero-dorsal angle distinct, posterodorsal angle less clear; ventral margin almost rectilinear; rostrum moderate in size, distinct.

Material. — Over 60 carapaces and a few tens of right and left valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5017/73/0			No. 5018/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.04	0.69	0.69	1.13	0.77	0.63
Left valve	1.07	0.74		1.18	0.82	

Description. — Carapace ovate-trapezoidal; left valve larger than right and embracing the latter particularly along ventral margin and in the middle of dorsal margin; dorsal margin almost rectilinear, somewhat inclined towards the posterior; anterodorsal angle distinct, posterodorsal angle less clear; anterior end broadly rounded, better than the posterior; ventral margin rectilinear; small triangular cyathus marked in posterior end of carapace; rostrum and alveola distinct; surface of carapaces covered with distinct, small pits arranged in reticulation; in dorsal view, the carapace ovate, narrowing to the ends, particularly towards the anterior.

Individual variability expressed in differences in carapace height and length; anterior end of some specimens is broader than posterior, whe-

reas other specimens are relatively lower and larger, and with less marked anterior dorsal angle; triangular cyathus from posterior part of ventral margin not always preserved.

Remarks.—*Cypridea praealta* sp.n. appears somewhat similar to *C. inaequalis* Wolburg and *C. alta* Wolburg. It differs from *C. inaequalis* Wolburg in smaller difference in size between right and left valves, carapace more inflated above ventral margin and thicker; it differs from *C. alta*, the species characterized by a high variability (expressed by Wolburg, 1959, by the distinguishment of some subspecies) in somewhat more trapezoidal shape of carapace, more rectilinear ventral margin, more distinct ridge-like swelling on dorsal margin of both valves, antero-dorsal margin usually more shifted towards the anterior, somewhat thicker carapace, and in carapace length/height ratio (equalling 1.40—1.45 and 1.28—1.26, respectively; 1.34 in the case of the holotype of the latter species).

Occurrence.—Poland: Purbeckian facies of Upper Portlandian, ostracod zone C or, occasionally, top part of the zone D—and entering the zone B.

Cypridea valdensis praecursor Oertli, 1963

(Pl. XIII, Fig. 3a, b, c)

1963. *Cypridea valdensis praecursor* n.sp.; H. J. Oertli, p. 16, Pl. 3, Fig. 13—19; Pl. 4, Fig. 20 (*cum synonymica*).
1968. *Cypridea valdensis praecursor* Oertli; O. B. Christensen, p. 20, Fig. 5a—e (*cum synonymica*).
1968. *Cypridea tumescens praecursor* Oertli; E. Wienholz, Pl. 2, Fig. 13—15.
1969. *Cypridea valdensis praecursor* Oertli; S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 10.

Material.—About 60 carapaces and a few tens of right and left valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5020/73/0			No. 5021/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.17	0.65	0.56	1.12	0.66	0.55
Left valve	1.22	0.75		1.17	0.71	

Remarks.—Individual variability expressed in distinctness of antero-dorsal angle, narrowness of posterior carapace end and distinctness of reticulation of carapace surface. *Cypridea valdensis praecursor* differs from *C. tumescens* (Anderson) in markedly less narrow posterior carapace end, smaller rostrum and alveola, more rectilinear ventral margin, and smaller difference in size of right and somewhat larger left valve.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian; ostracod zones E — C; France: Lower Purbeckian; England: Middle Purbeckian; Scania: Lower Purbeckian (Vitabäck Beds); FRG and DRG: Upper Münders Mergel and Serpulite.

Family Uncertain
Genus *Scabriculocypris* Anderson, 1940
Scabriculocypris trapezoides Anderson, 1940
(Pl. XII, Fig. 5a, b)

1940. *Scabriculocypris trapezoides* sp.nov.; D. W. Anderson, p. 377, Pl. 18, Fig. 5.
1968. *Scabriculocypris trapezoides* Anderson; O. B. Christensen, p. 38, Fig. 19i, j, 11e (cum synonymica).
1968. *Scabriculocypris trapezoides* Anderson; E. Wienholz, Pl. 2, Fig. 11a, b.
1969. *Scabriculocypris trapezoides* Anderson; S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 11.

Material. — Over 30 carapaces and a few left and right valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5022/73/0			No. 5023/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.58	0.37	0.25	0.53	0.34	0.25
Left valve	0.59	0.38		0.54	0.36	

Remarks. — *Scabriculocypris trapezoides* differs from *S. goerlichii* Klingler in smaller dimensions and more regular reticulation of carapace surface. It differs from *S. acanthoides* Anderson in more trapezoidal shape of carapace, less rounded posterior and anterior ends, and the lack of fine spines on carapace surface.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — C; England and France: Lower Purbeckian; Denmark: Lower Purbeckian (Rabekke Formation); Scania: Lower Purbeckian (Vitabäck Beds); FRG and DRG: Upper Münders Mergel, Serpulite to the Weald 2.

Family **Darwinulidae** Brady & Norman, 1889
Genus *Darwinula* Brady & Norman, 1885
Darwinula leguminella (Forbes, 1855)
(Pl. XIV, Fig. 5)

1885. *Darwinula leguminella* (Forbes); T. R. Jones, p. 346, Pl. 8, Fig. 30, 31.
1963. *Darwinula leguminella* (Forbes); O. B. Christensen, p. 21, Text-fig. 3, 4b, Pl. 2, Fig. 2a—c (cum synonymica).

1963. *Darwinula leguminella* (Forbes); H. J. Oertli, p. 20, Pl. 6, Fig. 40.

1969. *Darwinula leguminella* (Forbes); S. Marek, W. Bielecka & J. Sztejn, Pl. 1, Fig. 8.

Material. — Over 20 carapaces and a few right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5024/73/0			No. 5025/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.71	0.24	0.27	0.67	0.23	0.26
Left valve	0.74	0.28		0.70	0.27	

Remarks. — *Darwinula leguminella* (Forbes) differs from *D. oblonga* (Roemer) in almost two times smaller carapace. Anderson (1964) interpreted *D. leguminella* and *D. oblonga* as sexual dimorphs of the same species.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — B; England: Purbeckian; France: Lower Purbeckian; FRG and DRG: Serpulite — Wealdian; Denmark: Wealdian (Jydegaard Formation).

Darwinula oblonga (Roemer, 1839)

(Pl. XIV, Fig. 4a, b)

1839. *Cypris oblonga* Roemer; F. A. Roemer, p. 52, Pl. 20, Fig. 21, *vide* B. F. Ellis & A. R. Messina — Catalogue of Ostracoda.

1963. *Darwinula oblonga* (Roemer); O. B. Christensen, p. 23, Pl. 2, Fig. 5a—c, Text-fig. 4a (*cum synonymica*).

Material. — Over a dozen carapaces and a few right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5026/73/0			No. 5027/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.15	0.47	0.47	1.04	0.44	0.42
Left valve	1.19	0.52		1.08	0.49	

Remarks. — Differences in respect to *D. leguminella* as discussed above.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones C — B; FRG and DRG: Upper Kimmeridgian, Serpulite and Wealdian; England: Middle Purbeckian, Wealdian; France: Lower Purbeckian; Denmark: Wealdian (Jydegaard Formation).

Family **Cytheridae** Baird, 1850
 Genus *Fabanella* Martin, 1961
Fabanella ansata (Jones, 1835)
 (Pl. XIV, Fig. 1)

1885. *Candona ansata* sp.nov.; T. R. Jones, p. 349, Pl. 9, Fig. 9—12.
 1963. *Fabanella ansata* (Jones); H. J. Oertli, p. 22, Pl. 6, figs 43—45.
 1964. *Fabanella ansata* (Jones); F. W. Anderson, p. 155, Pl. 11, Fig. 37—40; Pl. 12, Fig. 60, 61.
 1966. *Fabanella ansata* (Jones); D. Barker, p. 472, Pl. 7, Fig. 8 (*cum synonymica*).
 1968. *Fabanella ansata* (Jones); E. Wienholz, Pl. 4, Fig. 35.

Material. — A dozen carapaces and a few right and left valves.
Dimensions (in mm):

Coll. IG Warsaw	No. 5028/73/0			No. 5029/73/p		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.10	0.61	0.59	1.00	0.53	0.41
Left valve	1.14	0.65		1.03	0.67	

Remarks. — *Fabanella ansata* differs from *F. boloniensis* (Jones) in irregular carapace outline, a distinct postero-dorsal angle, and the carapace higher in posterior part. Carapace in *F. boloniensis* is oval in outline.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zone E; England, France: Lower Purbeckian; FRG and DRG: Upper Münders Mergel.

Fabanella boloniensis (Jones, 1882)
 (Pl. XIV, Fig. 2a, b)

1882. *Cythere boloniensis* Jones; T. R. Jones, p. 615, Text-fig. A. B. *vide* B. F. Ellis & A. R. Messina — Catalogue of Ostracoda.
 1968. *Fabanella boloniensis* (Jones); O. B. Christensen, p. 27, Fig. 7c—d (*cum synonymica*).
 1968. *Fabanella polita polita* (Martin); E. Wienholz, Pl. 4, Fig. 36a, b, c.
 1969. *Fabanella boloniensis* (Jones); S. Marek, W. Bielecka & J. Szejn, Pl. 1, Fig. 7.

Material. — Over 30 carapaces and a few right and left valves.
Dimensions (in mm):

Coll. IG Warsaw	No. 5030/73/0			No. 5031/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	1.11	0.53	0.56	0.88	0.45	0.45
Left valve	1.15	0.58		0.92	0.50	

Remarks. — Differences in respect to *F. ansata* as discussed above.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — B; England and France: Lower Purbeckian; FRG and DRG: Serpulite; Denmark: Lower Portlandian — Wealdian (Rabekke — Jydegaard Formations); Scania: Lower Purbeckian (Vitabäck Beds).

Family **Limnocytheridae** Klie, 1938
 Subfamily **Limnocytherinae** Klie, 1938
 Genus *Theriosynoecum* Branson, 1933
Theriosynoecum forbesii (Jones, 1885)
 (Pl. XIV, Fig. 6a, b, c)

1885. *Metacypris forbesii* sp.nov.; T. R. Jones, p. 345, Pl. 8, Fig. 11, 13, 15, 16.
 1940. *Metacypris forbesii* Jones; G. P. R. Martin, p. 336, Pl. 6, Fig. 89—94.
 1962. „*Metacypris*” *forbesii* Jones; W. Klingler, H. Malz & G. P. R. Martin, p. 174, Pl. 27, Fig. 14, tab. 10.
 1966. *Theriosynoecum forbesii* (Jones); D. Barker, p. 480, Pl. 7, Fig. 6, Pl. 9, Fig. 11, 12 (*cum synonymica*).
 1969. *Theriosynoecum forbesii* (Jones); S. Marek, W. Bielecka & J. Sztejn, Pl. 1, Fig. 1a, b.

Material. — Over a dozen carapaces (1 complete) and a few right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5032/73/0			No. 5033/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.79	0.61	0.63			
Left valve	0.81	0.63		0.99	0.55	

Remarks. — *Theriosynoecum forbesii* (Jones) differs from *T. verrucosa* (Jones) in less ovate and more cordate outline of carapace, the lack of tubercles on lateral surface, less pronounced ornamentation and ribs better marked on ventral side of carapace.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones E — D and lower part of zone C; England and France: Lower Purbeckian; FRG and DRG: Serpulite; USA (Colorado): Upper Jurassic.

Family **Cytherideidae** Sars, 1925
 Subfamily **Cuneocytherinae** Mandelstam, 1960
 Genus *Dicrorygma* Poag, 1962
Dicrorygma (Orthorygma) groenwali Christensen, 1963
 (Pl. XIV, Fig. 11a, b)

1963. *Limnocythere?* *groenwali* sp.n.; O. B. Christensen, p. 46, Pl. 3, Fig. 1a—g.
 1968. *Dicrorygma (Orthorygma) groenwali* Bruun Christensen; O. B. Christensen, p. 30, Fig. 9j—l (*cum synonymica*).

Material. — A few tens of carapaces.

Dimensions (in mm):

Coll. IG Warsaw	No. 5034/73/0			No. 5036/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.34	0.17	0.13	0.36	0.16	0.13
Left valve	0.36	0.19		0.38	0.18	

Remarks. — The specimens from the Polish Lowlands differ from those of Denmark in generally smaller dimensions and less distinct sexual dimorphism. *Dicrorhygma groenwali* differs from *D. reticulata* Christensen in somewhat smaller carapace, somewhat stronger inclination towards the posterior, and finer reticulation. It differs from *D. brotzeni* Christensen in smaller and more trapezoidal carapace, rectilinear dorsal margin, and reticulate and not point ornamentation of the carapace surface.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones C — B; Denmark: Lower Purbeckian — Wealdian (Rabekke — Jydegaard Formations); Scania: Lower Purbeckian (Vitabäck Beds).

Family **Cytheruridae** Müller, 1894

Genus *Orthonotacythere* Alexander, 1933

Orthonotacythere rimosa Martin, 1940

(Pl. XIV, Fig. 7)

1940. *Orthonotacythere rimosa* n.sp.; G. P. R. Martin, p. 335, Pl. 6, Fig. 84—86.

1960. *Orthonotacythere interrupta* Triebel var. *reticulosa* Donze; P. Donze, p. 23, Pl. 5, Fig. 56—59.

1968. *Orthonotacythere rimosa* Martin; O. B. Christensen, p. 41, Fig. 8a, 9i, 11h—j (*cum synonymica*).

Material. — Three carapaces and over 20 right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5038/73/0			No. 5039/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.50	0.27	0.28	0.41	0.21	0.21
Left valve	0.52	0.29		0.43	0.23	

Remarks. — It seems that French specimens assigned to *O. interrupta reticulosa* Donze actually represent *O. rimosa* and that the lack of any distinct ledges may be explained by poor preservation of the specimens. *Orthonotacythere rimosa* differs from *O. favulata* Martin in less inflated

carapace and better marked reticulation. It differs from *O. diglypta* Triebel in rectilinear dorsal margin and somewhat in ornamentation, and from *O. interrupta* Triebel — in shallower and less distinct furrow.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zone F; FRG and DRG: Upper Kimmeridgian — Serpulite; England and France: Lower Purbeckian; Scania: Lower Purbeckian (Vitabäck Beds).

Genus *Procytheropteron* Ljubimova, 1955

Procytheropteron brodiei (Jones, 1894)

(Pl. XIV, Fig. 3a, b)

1894. *Cytheropteron brodiei* sp.nov.; T. R. Jones, p. 167, Pl. 9, Fig. 12.

1968. *Procytheropteron* cf. *P. brodiei* (Jones); O. B. Christensen, p. 42, Fig. 8b—e, 9d (cum synonymica).

?1968. *Cytheropterina* cf. *pura* (Schmidt); E. Wienholz, Pl. 4, Fig. 51a, b, c.

Material. — Ten carapaces and over a dozen right and left valves. Dimensions (in mm):

Coll. IG Warsaw	No. 5040/73/0			No. 5041/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.54	0.30	0.36	0.43	0.23	0.29
Left valve	0.56	0.32		0.45	0.25	

Remarks. — The specimens described by Wienholz (1968) from DRG as *Cytheropterina* cf. *pura* (Schmidt) presumably belong to *P. brodiei*; *P. brodiei* differs from *P. obesum* Ljubimova in somewhat smaller size, the mode of reticulation of carapace surface, less pronounced beak-like process from posterior part of carapace, and presence of fairly well-marked ridges on overhanging ventral margin.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zone F; England: Lower Purbeckian; Scania: Lower Purbeckian (Vitabäck Beds); DRG: Gigas-Schichten.

Family **Progonocyteridae** Sylvester-Bradley, 1948

Subfamily **Protocyterinae** Ljubimova, 1955

Genus *Klieana* Martin, 1940

Klieana alata Martin, 1940

(Pl. XIV, Fig. 9a, b, c)

1940. *Klieana alata* n.g., n.sp.; G. P. R. Martin, p. 323, Pl. 5, Fig. 67—73, ?Fig. 64—66; Pl. 2, Fig. 158—161.

1968. *Klieana alata* Martin; O. B. Christensen, p. 32, Fig. 10d—e (cum synonymica).

1968. *Klieana alata* Martin; E. Wienholz, Pl. 4, Fig. 43a, b, 44a, b.

1969. *Klieana alata* Martin; S. Marek, W. Bielecka & J. Szejn, p. 1, Fig. 3.

Material. — A few hundred of carapaces and right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5042/73/0			No. 5044/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.62	0.36	0.42	0.66	0.35	0.32
Left valve	0.66	0.40		0.72	0.38	

Remarks. — *Klieana alata* somewhat differs from *K. calyptroides* (Andersen) in outline of carapace in dorsal view (trapezoidal in the case of females and ovate — in males) and better developed wing-like processes on lateral carapace surface close to ventral side (represented in the case of the latter species by somewhat better marked ventral ridges).

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod zones F — C; FRG and DRG: Upper Mündler Mergel; Serpulite, Wealdian 1; England and France: Lower Purbeckian; Denmark: Lower Purbeckian (Rabekke Formation); Scania: Lower Purbeckian (Vitabäck Beds).

Klieana kujaviana Bielecka & Szejn, 1966

(Pl. XIV, Fig. 8a, b, c)

1966. *Klieana kujaviana* nov.sp.; W. Bielecka & J. Szejn, p. 110, Pl. 1, Fig. 2a—c, 3a—c, 4a—c.

Material. — About 80 carapaces and over 200 right and left valves.

Dimensions (in mm):

Coll. IG Warsaw	No. 5047/73/0			No. 5049/73/0		
	Length	Height	Width of carapace	Length	Height	Width of carapace
Right valve	0.46	0.27	0.32	0.52	0.27	0.26
Left valve	0.50	0.30		0.56	0.29	

Remarks. — *Klieana kujaviana* differs from *K. alata* Martin in finer carapace and reticulation of lateral surface; female individuals have no distinct wing-like process and have 1—2 small nodes on ridge occurring close to ventral margin and, sometimes, with third node in medioposterior part of carapace. It differs from *K. calyptroides* (Andersen) in less inflated and finer carapace, finer reticulation consisting of circular (and not hexagonal) pits, and development of posteroventral and medio-posterior nodes.

Occurrence. — Poland: Purbeckian facies of Upper Portlandian, ostracod Zone B; Scania: Lower Purbeckian (Vitabäck Beds).

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November, 1973

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WANDA BIELECKA

OTWORNICE I BRAKICZNE MAŁŻORACZKI Z PORTLANDU NIŻU POLSKI

Streszczenie

W pracy podano wyniki badań dotyczące otwornic dolnego i środkowego port-
landu oraz małżoraczków górnego portlandu facji purbeckiej Niżu Polski. Materiały
do badań mikropaleontologicznych pochodziły z wału kujawskiego, niecki warszaw-
skiej, syneklizy nadbałtyckiej, niecki łódzkiej, niecki mogileńskiej oraz z Pomorza
(NW-części wału pomorskiego, niecka pomorska i N część niecki szczecińskiej).
Ogółem opisano 63 gatunki otwornic (w tym 12 nowych gatunków i 2 nowe podga-
tunki) oraz 21 gatunków małżoraczków (w tym 1 nowy) (Text-fig. 1, tabela I, II).

W osadach dolnego i środkowego portlandu w zespole otwornic dominują for-
my o skorupkach wapiennych — głównie przedstawiciele rodziny Nodosariidae. Pod-
rzędnie występują otwornice z rodziny Polymorphinidae, Nubeculariidae, Miliolidae,
Involutinidae, a także z podrodziny Spirillininae i Epistomininae. Otwornice o sko-
rupkach aglutynujących niemal wyłącznie należą do rodziny Lituolidae.

Analizując pionowe zasięgi występowania gatunków otwornic i małżoraczków
wydzielono 10 poziomów biostratygraficznych; 5 poziomów otwornicowych od I do
V oraz 5 poziomów małżoraczkowych od F do B (te ostatnie wyróżnione uprzednio
w niektórych rejonach Polski przez W. Bielecką i J. Szejn w 1966 r.) (tabela III).

Poziom I obejmuje w całości osady dolnego portlandu, tzn. poziomy Subplanites klimowi, Subplanites sp.sp. i Pectinatites sp.sp. Charakteryzuje się on obecnością gatunków górnokimerydzkich, a przede wszystkim gatunków — *Pseudolamarckina polonica* (Bielecka & Pożaryski), *Nubecularia mazoviensis* Bielecka & Pożaryski i *Everticyclammina virguliana* (Koechlin), a które nie przechodzą do poziomu II. W poziomie I pojawiają się także nowe gatunki portlandzkie. Są to: *Saracenaria pravoslavlevi* Furssenko & Polenova, *Citharina brevis* (Furssenko & Polenova), *C. raricostata* (Furssenko & Polenova), *Nodosaria scythicis* Furssenko & Polenova i kilka innych.

Poziom II odpowiada w przybliżeniu poziomowi Zaráiskites scythicus i zawiera bardzo obfitą mikrofaunę. Charakteryzują go — *Planularia dofleini* (Kasanzev), *Vaginulinopsis incisiformis* sp.n., *Nodosaria scythicis* Furssenko & Polenova, *Geinitzinita wolinensis* sp.n., *Margulinopsis robusta* (Reuss), *Citharina undosicostata* sp.n., *Citharina culter* (Furssenko & Polenova), *Nodosaria osynkiensis* Mjatluk oraz w wyższych partiach tego poziomu — *Lenticulina ponderosa* Mjatluk.

Poziom III przypada na poziom Zaráiskites zaráiskensis, zachodząc na stropową część poziomu Z. scythicus oraz na spągową poziomu Virgatites pusillus. Występują tu stosunkowo liczne otwornice, przede wszystkim *Citharina catherinae* sp.n., *C. densicostata* sp.n., *C. cuneata* sp.n., *C. culter* (Furssenko & Polenova), *Nodosaria pentagonalis* Furssenko & Polenova, *N. cucumiformis* sp.n., a także *Ammobaculites haplophragmoides* Furssenko & Polenova, *Tristix quadrangularis* Furssenko & Polenova, *Guttulina multistriata* sp.n., *Triplasia althoffi jurassica* (Mjatluk) i *Belorussiella wolinensis* sp.n.

Poziom IV obejmuje niższą część poziomu Virgatites pusillus i charakteryzuje się wymieraniem otwornic. Spotyka się tu niekiedy kilka nowych gatunków — *Palaeomiliolina egmontensis* (Lloyd), *Trocholina* aff. *burlini* Gorbatchik, *Frondicularia nderica* Furssenko & Polenova i *Geinitzinita kcyniensis* sp.n.

Poziom V przypada na wyższą część poziomu Virgatites pusillus i zawiera jeszcze uboższy zespół otwornic. W spągowej partii spotyka się nieliczne *Lenticulina muensteri* (Roemer), *L. infravolgaensis* (Furssenko & Polenova), *Trocholina* aff. *burlini* Gorbatchik, *Eoguttulina polygona* (Terquem), *E. liassica* (Strickland) i *Spirillina infima* (Strickland). Poziom małżoraczkowy F w niższych swych partiach zawiera nieliczne otwornice — *Lenticulina muensteri* (Roemer), *Eoguttulina liassica* (Strickland) i *Spirillina infima* (Strickland) oraz morskie małżoraczki — *Procytheropteron brodiei* (Jones), *Orthonotacythere rimosa* Martin, *Galliaecytheridea* sp., *Paracypris* sp. oraz euryhalinowy gatunek *Mantelliana purbeckensis* (Forbes). W stropowej części poziomu F pojawiają się pierwsze oligohalinowe małżoraczki — *Klieana alata* (Martin), *Rhinocypris jurassica jurassica* (Martin). Poziom F odpowiada wiekowo środkowym margłom z Münder NRD.

Poziom E charakteryzuje się obecnością *Mantelliana purbeckensis* (Forbes), *Klieana alata* Martin, *Rhinocypris jurassica jurassica* (Martin), *Theriosynoecum forbesii* (Jones), *Cypridea inversa* Martin, *C. valdensis praecursor* Oertli, oraz wyłączny dla tego poziomu gatunek — *Fabanella ansata* (Jones). Poziom E wiekowo odpowiada niższym partiom górnych margli z Münder.

Poziom D zawiera nieco liczniejszy zespół małżoraczków. Występują prawie wszystkie gatunki znane uprzednio z poziomu E, za wyjątkiem *Fabarella ansata* (Jones). Częściej spotykane są *Cypridea dunkeri* Jones i *Scabriculocypris trapezoides* Anderson. W stropowych partiach niekiedy pojawiają się *Cypridea binodosa* Martin i *C. praealta* sp.n. Poziom D wiekowo odpowiada wyższym partiom górnych margli z Münder.

Poziom C jest najbardziej reprezentowany fauną małżoraczkową. Między innymi charakteryzują go *Cypridea praealta* sp.n., *C. binodosa* Martin, *Damonella ellipsoidea* (Wolburg) oraz *Dicrorhygma greoenwali* Christensen. Poziom C wiekowo odpowiada niższym partiom serpulitu.

Poziom B zawiera znacznie uboższy zespół małżoraczków. Większość uprzednio notowanych gatunków ustępuje, brak jest *Klieana alata* Martin. Pojawia się natomiast nowy gatunek *Klieana kujaviana* Bielecka & Szejn, charakteryzujący ten poziom. Występują tu jeszcze *Cypridea dunkeri* Jones, *C. praealta* sp.n., *Dicrorhygma groenwali* Christensen, a także *Rhinocypris jurassica jurassica* (Martin). Poziom B odpowiada wiekowo wyższym partiom serpulitu Niemiec (NRD). Porównując zespół otwornic portlandu Polski z innymi krajami (tabela 5) obserwuje się największe podobieństwo z zespołem otwornic dolnego i środkowego piętra wożańskiego Platformy Rosyjskiej, z którą z pośród 63 gatunków wyróżnionych w Polsce co najmniej 34 gatunki są wspólne, (a prawdopodobnie i dalsze 5). Znacznie mniejsze podobieństwo występuje z Europą zachodnią.

Najwięcej wspólnych gatunków stwierdzono z południową częścią RFN (ponad 20 gatunków), oraz z Czechosłowacją (około 15 gatunków). Z Anglią są 4 gatunki wspólne. Z obszaru pozaeuropejskiego, 9 gatunków jest wspólnych z Madagaskarem.

ВАНДА БЕЛЕЦКА

ФОРАМИНИФЕРЫ И ОСТРАКОДЫ ПОРТЛАНДСКОГО ЯРУСА ПОЛЬСКОЙ НИЗМЕННОСТИ

Резюме

В работе представлены итоги изучения ниже- и среднепортландских фораминифер и верхнепортландских остракод пурбекской фации Польской низменности. Материал для микропаленологических анализов был собран на площади Куявского вала, Варшавской мульды, Балтийской синеклизы, Лодзинской муль-

ды, Могильновской мульды и Поморья (северо-западная часть Поморского вала, Поморская мульда и северная часть Щецинской мульды). Описание охватывает 63 вида фораминифер (в том числе 12 новых видов и 2 новых подвида) и 21 вид остракод (в том числе 1 новый вид) (фиг. 1, таблица I, II).

В сообществе фораминифер нижнего и среднего портланда преобладают формы с известковыми раковинками, главным образом представители семейства *Nodosariidae*. В подчиненном количестве наблюдаются фораминиферы, принадлежащие к *Polymorphinidae*, *Nubeculariidae*, *Miliolidae*, *Involutinidae*, а также к подсемействам *Spirillininae* и *Epistomininae*. Фораминиферы с агглютинированными раковинами почти полностью принадлежат к семейству *Lituolidae*.

На основании анализа вертикальных интервалов распространения фораминифер и остракод определено 10 биостратиграфических горизонтов — 5 фораминиферовых, с обозначениями от I до V и 5 остракодовых, с обозначениями от F до B. Последние горизонты были выделены ранее в некоторых регионах Польши В. Белецкой и Я. Штейн (1966 г.) (таблица III).

Горизонт I охватывает полностью нижнепортландские отложения, т. е. зоны *Subplanites klimovi*, *Subplanites* sp. sp. и *Pectinatites* sp. sp. Он характеризуется присутствием верхнекемериджских видов, главным образом *Pseudolamarckina polonica* (Bielecka & Pożaryski), *Nubecularia mazoviensis* Bielecka & Pożaryski, *Everticyclammina virguliana* (Koechlin), которые не переходят в горизонт II. Кроме того в горизонте I появляются новые портландские виды: *Saracenaria pravoslavlevi* Furssenko & Polenova, *Citharina brevis* (Furssenko & Polenova), *C. raricostata* (Furssenko & Polenova), *Nodosaria scythicus* Furssenko & Polenova и др.

Горизонт II соответствует приблизительно зоне *Zaraiskites scythicus* и содержит обильную микрофауну. Он характеризуется *Planularia dofleini* (Kasanzev), *Vaginulinopsis incisiformis* sp. n., *Nodosaria scythicus* Furssenko & Polenova, *Geinitzinita wolinensis* sp. n., *Marginulinopsis robusta* (Reuss), *Citharina undosicostata* sp. n., *Citharina culter* (Furssenko & Polenova), *Nodosaria osynkiensis* Mjatluk и в верхних интервалах этого горизонта *Lenticulina ponderosa* Mjatluk.

Горизонт III охватывает зону *Zaraiskites zaraiskensis* и кровельный интервал зоны *Z. scythicus*, а также подошвенный интервал зоны *Virgatites pusillus*. В этом горизонте представлены довольно многочисленные фораминиферы, прежде всего *Citharina catherinae* sp. n., *C. densicostata* sp. n., *C. cuneata* sp. n., *C. culter* (Furssenko & Polenova), *Nodosaria pentagonalis* Furssenko & Polenova, *N. cucumiformis* sp. n., а также *Ammobaculites haplophragmoides* Furssenko & Polenova, *Tristix quadrangularis* Furssenko & Polenova, *Guttulina multistriata* sp. n., *Triplasia althoffi jurassica* (Mjatluk), *Belorussiella wolinensis* sp. n.

Горизонт IV охватывает нижний интервал зоны *Virgatites pusillus* и характеризуется отмиранием фораминифер. Местами можно наблюдать несколько новых видов: *Palaeomiliolina egmontensis* (Lloyd), *Trocholina* aff. *burlini* Gorbatchik, *Fron-dicularia inderica* Furssenko & Polenova, *Geinitzinita kcyniensis* sp. n.

Горизонт V совпадает с верхним интервалом зоны *Virgatites pusillus* и содержит еще более бедное сообщество фораминифер. В нижнем интервале наблю-

даются редкие *Lenticulina muensteri* (Roemer), *L. infravolgaensis* (Furssenko & Polenova), *Trocholina* aff. *burlini* Gorbachik, *Eoguttulina polygona* (Terquem), *E. liassica* (Strickland), *Spirillina infima* (Strickland).

Остракодовый горизонт F в нижнем интервале содержит редкие фораминиферы *Lenticulina muensteri* (Roemer), *Eoguttulina liassica* (Strickland) и *Spirillina infima* (Strickland), а также морские остракоды *Procytheropteron brodiei* (Jones), *Orthonotacythere rimosa* Martin, *Galliaecytheridae* sp., *Paracypris* sp. и эвригалинный вид *Mantelliana purbeckensis* (Forbes). В верхнем интервале горизонта F появляются первые олигогалинные остракоды: *Klieana alata* (Martin), *Rhinocypris jurassica jurassica* (Martin). Горизонт F является возрастным эквивалентом средних мергелей из Мюндер в ГДР.

Горизонт E характеризуется распространением *Mantelliana purbeckensis* (Forbes), *Klieana alata* Martin, *Rhinocypris jurassica jurassica* (Martin), *Theriosynoecum forbesii* (Jones), *Cypridea inversa* Martin, *C. valdensis praecursor* Oertli и руководящим по этому горизонту видом *Fabanella ansata* (Jones). Горизонт E представляет возрастную эквивалент нижнего интервала верхних мергелей из Мюндер.

Горизонт D содержит более богатое сообщество остракод, в котором представлены почти все виды, встречающиеся в горизонте E, за исключением *Fabanella ansata* (Jones). Чаще наблюдаются *Cypridea dunkeri* Jones и *Scabriculocypris trapezoides* Anderson. В кровельном интервале местами появляются *Cypridea binodosa* Martin и *C. praealta* sp. n. Горизонт D по своему возрасту соответствует верхним интервалам верхних мергелей из Мюндер.

Горизонт C охарактеризован самой обильной остракодовой фауной, в числе которой представлены: *Cypridea praealta* sp. n., *C. binodosa* Martin, *Damonella ellipsoidea* (Wolburg) и *Dicrorogma groenwali* Christensen. Горизонт C эквивалентен нижним интервалам серпулита.

Горизонт B включает обедненное сообщество остракод. Исчезают в большинстве ранее известные виды, отсутствует *Klieana alata* Martin. В то же время появляется новый вид *Klieana kujaviana* Bielecka & Szejn, характеризующий этот горизонт. Кроме того, здесь наблюдаются еще *Cypridea dunkeri* Jones, *C. praealta* sp. n., *Dicrorogma groenwali* Christensen, а также *Rhinocypris jurassica jurassica* (Martin). Горизонт B представляет возрастную эквивалент верхних интервалов серпулита в ГДР.

При сопоставлении комплекса портландских фораминифер на территории Польши с соответствующими данными по другим странам (таблица 5) выявляется самое близкое сходство с фораминиферами нижнего и среднего подъярусов волжского яруса Русской платформы, в числе которых 34 вида (вероятно и 5 других видов) общие с видами на территории Польши, представленными в количестве 63. Значительно меньшее сходство проявляется при сравнении с Западной Европой. Больше всего общих видов отмечено с южной частью ФРГ (свыше 20 видов) и с Чехословакией (15 видов). С территорией Англии 4 общих вида. На внеевропейской территории 9 общих видов наблюдается на Мадагаскаре.

EXPLANATION OF PLATES
(LV — left valve, RV — right valve)

Plate I

Haplophragmoides volgensis Mjatl.

- Fig. 1. lateral view — 75×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5131/73/F.
Fig. 2. lateral view — 75×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5133/73/F.

Everticyclammia virguliana (Koech)

- Fig. 3. lateral view — 3×, borehole Zagłoba, depth 260.0 m, Coll. IG. 5134/73/F.
Fig. 4. lateral view — 65×, borehole Zagłoba, depth 268.0 m, Coll. IG. 5136/73/F.

Ammobaculites fontinensis (Terq.)

- Fig. 5. lateral view — 50×, borehole Strzegowo, depth 204.0 m, Coll. IG. 5137/73/F.
Fig. 6. lateral view — 60×, borehole Strzegowo, depth 204.0 m, Coll. IG. 5138/73/F.

Ammobaculites haplophragmoides Furssenko & Polenova

- Fig. 7. a lateral view — 65×, b edge view — 65×, borehole Strzegowo, depth 193.0 m, Coll. IG. 5140/73/F.
Fig. 8. lateral view — 65×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5141a/73/F.

Haplophragmium coprolithiforme subaequale (Mjatl.)

- Fig. 9. lateral view — 50×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5006a.
Fig. 10. lateral view — 50×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5006b.

Plate II

Haplophragmium coprolithiforme subaequale (Mjatl.)

- Fig. 1. thin section — 50×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5006c.
Fig. 2. thin section — 50×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5006d.

Haplophragmium infravolgense (Mjatl.)

- Fig. 3. lateral view — 25×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5142/73/F.
Fig. 4. lateral view — 40×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5143/73/F.
Fig. 5. thin section — 50×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5004d.

Triplasia althoffi jurassica (Mjatl.)

- Fig. 6. macrospherical form, lateral view — 100×, borehole Wolin, depth 109.4 m, Coll. IG. 5145/73/F.
Fig. 7. microspherical form, lateral view — 50×, borehole Zagłoba, depth 178.0 m, Coll. IG. 5147/73/F.
Fig. 8. microspherical form, lateral view — 55×, borehole Kcynia, depth 484.4 m, Coll. IG. 5146/73/F.

Plate III

Triplasia althoffi jurassica (Mjatl.)

- Fig. 1. macrospherical form, lateral view — 65×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5144/73/F.

Belorussiella wolinensis sp. n.

- Fig. 2. lateral view — 70×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5149/73/F.
 Fig. 3. holotype — lateral view — 65×, borehole Wolin, depth 105.5 m, Coll. IG. 5148/73/F.
 Fig. 4. lateral view — 70×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5150/73/F.

Nubecularia mazoviensis Biel. & Poż.

- Fig. 5. lateral view — 90×, borehole Zagłoba, depth 162.1 m, Coll. IG. 5151/73/F.
 Fig. 6. a lateral view — 90×, b from the attachment side, borehole Zagłoba, depth 162.1 m, Coll. IG. 5142/73/F.
 Fig. 7. a lateral view — 90×, b from the attachment side, borehole Zagłoba, depth 359.0 m, Coll. IG. 5010.

Palaeomiliolina egmontensis (Lloyd)

- Fig. 8. lateral view — 75×, Coll. IG. 5153/73/F.
 Fig. 9. lateral view — 75×, Coll. IG. 5154a/73/F.
 Fig. 10. lateral view — 75×, borehole Kcynia, depth 214.5 m, Coll. IG. 5154b.

Nodosaria cucumiformis sp.n.

- Fig. 11. holotype, lateral view — 60×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5155/73/F.
 Fig. 12. lateral view — 60×, borehole Strzegowo, depth 93.6 m, Coll. IG. 5156/73/F.
 Fig. 13. lateral view — 60×, borehole Wolin, depth 121.8 m, Coll. IG. 5157/73/F.

Nodosaria osynkiensis Mjatl.

- Fig. 14. lateral view — 100×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5158/73/F.
 Fig. 15. lateral view — 100×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5160/73/F.

Nodosaria pentagonalis Furs. & Polen.

- Fig. 16. lateral view — 60×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5161/73/F.
 Fig. 17. lateral view — 65×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5162/73/F.
 Fig. 18. lateral view — 55×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5163/73/F.

Nodosaria scythicis Furs. & Polen.

- Fig. 19. lateral view — 70×, borehole Wolin, depth 109.0 m, Coll. IG. 5164/73/F.
 Fig. 20. lateral view — 55×, borehole Zagłoba, depth 298.0 m.

Nodosaria striatojurensis Klähn

- Fig. 21. lateral view — 70×, borehole Zagłoba, depth 298.0 m, Coll. IG. 5043.
 Fig. 22. lateral view — 60×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5168/73/F.
 Fig. 23. lateral view — 60×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5167/73/F.

Plate IV

Citharina brevis (Furs. & Polen.)

- Fig. 1. lateral view — 60×, borehole Strzegowo, depth 202.2 m, Coll. IG. 5170/73/F.
 Fig. 2. lateral view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5171/73/F.

Citharina catherinae sp.n.

- Fig. 3. holotype — microspherical form, lateral view — 50×, borehole Strzegowo, depth 204.7 m, Coll. IG. 5172/73/F.
 Fig. 4. macrospherical form — 70×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5173/73/F.
 Fig. 5. a microspherical form — 50×, b specimen in toluen — 50×, borehole Strzegowo, depth 204.7 m, Coll. IG. 5174/73/F.

Citharina culter (Furs. & Polen.)

- Fig. 6. lateral view — 50×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5175/73/F.
 Fig. 7. lateral view — 70×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5177/73/F.

Citharina cuneata sp.n.

- Fig. 8. holotype, macrospherical form, lateral view — 55×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5178/73/F.
 Fig. 9. microspherical form, lateral view — 45×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5179/73/F.
 Fig. 10. lateral view, macrospherical form — 55×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5180/73/F.

Plate V

Citharina densicostata sp.n.

- Fig. 1. a holotype, lateral view, b specimen in toluene — 30×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5181/73/F.
 Fig. 2. a lateral view, b specimen in toluene — 40×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5182/73/F.

Citharina kujaviensis (Biel. & Poż.)

- Fig. 3. lateral view — 45×, borehole Strzegowo, depth 202.2 m, Coll. IG. 5184/73/F.
 Fig. 4. lateral view — 45×, borehole Strzegowo, depth 202.2 m, Coll. IG. 5185/73/F.

Citharina parallela (Biel. & Poż.)

- Fig. 5. lateral view — 50×, borehole Strzegowo, depth 201.7 m, Coll. IG. 5186a/73/F.
 Fig. 6. holotype, lateral view — 40×, borehole Zagłoba, depth 265.0 m, Coll. IG. 5027.
 Fig. 7. lateral view — 50×, borehole Strzegowo, depth 204.7 m, Coll. IG. 5186/73/F.

Citharina raricostata (Furs. & Polen.)

- Fig. 8. lateral view — 45×, borehole Strzegowo, depth 204.7 m, Coll. IG. 5187a/73/F.
 Fig. 9. a lateral view — 45×, b specimen in toluene — 45×, borehole Strzegowo, depth 193.6 m, Coll. IG. 5188/73/F.

Citharina undosicostata sp.n.

- Fig. 10. holotype, lateral view — 30×, borehole Strzegowo, depth 194.9 m, Coll. IG. 5189/73/F.
 Fig. 11. lateral view — 30×, borehole Strzegowo, depth 202.2 m, Coll. IG. 5190/73/F.

Citharina cf. *virgatis* (Furs. & Pol.)

- Fig. 12. lateral view — 40×, borehole Kłodzino, depth 260.0 m, Coll. IG. 5192/73/F.

Citharina zaglobensis (Biel. & Poż.)

- Fig. 13. lateral view — 50×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5194/73/F.
 Fig. 14. lateral view — 50×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5195/73/F.

Plate VI

Citharinella pomeraniae sp.n.

- Fig. 1. holotype, lateral view — 65×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5196/73/F.
 Fig. 2. lateral view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5198/73/F.

Citharinella portlandensis sp.n.

- Fig. 3. lateral view — 70×, borehole Strzegowo, depth 198.0 m, Coll. IG. 5200/73/F.
 Fig. 4. holotype, lateral view — 70×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5199/73/F.
 Fig. 5. lateral view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5201/73/F.

Citharinella uhligi (Furs. & Polen.)

- Fig. 6. lateral view — 75×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5202/73/F.

Frondicularia inderica Furs. & Polen.

- Fig. 7. lateral view — 70×, borehole Kcynia, depth 446.2 m, Coll. IG. 5205/73/F.
 Fig. 8. lateral view — 70×, borehole Kcynia, depth 446.2 m, Coll. IG. 5206/73/F.

Geinitzinita kcyniensis sp.n.

- Fig. 9. a holotype, lateral view — 70×; b edge view — 70×, borehole Kcynia, depth 448.2 m, Coll. IG. 5207/73/F.
 Fig. 10. lateral view — 70×, borehole Kcynia, depth 448.2 m, Coll. IG. 5209/73/F.

Geinitzinita wolinensis sp.n.

- Fig. 11. holotype, lateral view — 65×, borehole Wolin, depth 121.8 m, Coll. IG. 5210/73/F.
 Fig. 12. lateral view — 50×, borehole Strzegowo, depth 206.0 m, Coll. IG. 5211/73/F.
 Fig. 13. lateral view — 50×, borehole Strzegowo, depth 206.0 m, Coll. IG. 5212/73/F.

Lagena apiculata neocomiana Bart. & Brand.

- Fig. 14. lateral view — 60×, borehole Strzegowo, depth 198.0 m, Coll. IG. 5213/73/F.
 Fig. 15. lateral view — 70×, borehole Strzegowo, depth 198.0 m, Coll. IG. 5214/73/F.

Lenticulina dogieli Furs.

- Fig. 16. lateral view — 60×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5216/73/F.
 Fig. 17. lateral view — 60×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5217/73/F.
 Fig. 18. lateral view — 70×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5218/73/F.

Plate VII

Lenticulina infravolgaensis (Furs. & Polen.)

- Fig. 1. a lateral view — 70×; b edge view, borehole Zagłoba, depth 158.0 m, Coll. IG. 5219/73/F.
 Fig. 2. lateral view — 65×, borehole Wolin, depth 103.0 m, Coll. IG. 5221/73/F.
 Fig. 3. lateral view — 65×, borehole Zagłoba, depth 162.1 m, Coll. IG. 5220/73/F.

Lenticulina muensteri (Roemer)

Fig. 4. lateral view — 70×, borehole Zagłoba, depth 482.0 m, Coll. IG. 5222/73/F.

Fig. 5. lateral view — 90×, borehole Zagłoba, depth 162.1 m, Coll. IG. 5223/73/F.

Lenticulina ponderosa Mjatl.

Fig. 6. a lateral view — 60×; b edge view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 225/73/F.

Fig. 7. lateral view — 65×, borehole Strzegowo, depth 198.4 m, Coll. IG. 2224/73/F.

Plate VIII

Lenticulina ponderosa Mjatl.

Fig. 1. lateral view — 65×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5226/73/F.

Lenticulina muensteri (Roemer)

Fig. 2. lateral view — 90×, borehole Zagłoba, depth 162.1 m, Coll. IG. 5012/73/F.

Lenticulina vistulae elongata Bielecka & Pożaryski

Fig. 3. a lateral view — 65×; b edge view — 65×, borehole Zagłoba, depth 167.8 m, Coll. IG. 5227/73/F.

Fig. 4. a lateral view — 70×; b edge view, borehole Zagłoba, depth 167.8 m, Coll. IG. 5228/73/F.

Fig. 5. lateral view — 65×, borehole Zagłoba, depth 167.8 m, Coll. IG. 5228/73/F.

Marginulina pyramidalis (Koch.)

Fig. 6. lateral view — 60×, borehole Wolin, depth 121.8 m, Coll. IG. 5230/73/F.

Marginulinopsis buskensis (Bielecka & Pożaryski)

Fig. 7. holotype, lateral view — 85×, borehole Zagłoba, depth 456.0 m, Coll. IG. 5039/73/F.

Fig. 8. lateral view — 65×, borehole Strzegowo, depth 209.0 m, Coll. IG. 5233/73/F.

Fig. 9. lateral view — 60×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5234/73/F.

Marginulinopsis robusta (Reuss)

Fig. 10. lateral view — 65×, borehole Wolin, depth 105.0 m, Coll. IG. 5235/73/F.

Fig. 11. lateral view — 70×, borehole Strzegowo, depth 201.0 m, Coll. IG. 5237/73/F.

Marginulinopsis striatocostata (Reuss)

Fig. 12. lateral view — 65×, borehole Zagłoba, depth 298.0 m, Coll. IG. 5239/73/F.

Fig. 13. lateral view — 65×, borehole Zagłoba, depth 298.0 m, Coll. IG. 5240/73/F.

Fig. 14. specimen in toluen — 75×, borehole Zagłoba, depth 298.0 m, Coll. IG. 5238/73/F.

Planularia multcostata Kusnetzova

Fig. 15. lateral view — 60×, borehole Strzegowo, depth 204.1 m, Coll. IG. 5244/73/F.

Fig. 16. lateral view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5245/73/F.

Fig. 17. lateral view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5246/73/F.

Plate IX

Planularia dofleini (Kasanzev)

- Fig. 1. a lateral view — 70×; b edge view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5241/73/F.
 Fig. 2. lateral view — 70×, borehole Wolin, depth 121.8 m, Coll. IG. 5242/73/F.
 Fig. 3. lateral view — borehole Strzegowo, depth 315.0 m, Coll. IG. 5243/73/F.

Planularia poljenovae Kusnetzova

- Fig. 4. lateral view — 65×, borehole Strzegowo, depth 204.10 m, Coll. IG. 5247/73/F.
 Fig. 5. lateral view — 65×, borehole Strzegowo, depth 204.10 m, Coll. IG. 5248/73/F.
 Fig. 6. lateral view — 65×, borehole Strzegowo, depth 204.0 m, Coll. IG. 5249/73/F.
 Fig. 7. lateral view — 65×, borehole Strzegowo, depth 204.1 m, Coll. IG. 5250/73/F.

Pseudonodosaria costulata (Terquem) portlandensis subsp.n.

- Fig. 8. holotype, lateral view — 60×, borehole Strzegowo, depth 209.0 m, Coll. IG. 5251/73/F.
 Fig. 9. lateral view — 60×, borehole Strzegowo, depth 209.0 m, Coll. IG. 5252/73/F.

Pseudonodosaria humilis (Bornemann)

- Fig. 10. a lateral view — 70×; b specimen in toluene — 70×, borehole Wolin, depth 121.8 m, Coll. IG. 5254/73/F.
 Fig. 11. lateral view — 80×, borehole Zagłoba, depth 241.0 m, Coll. IG. 5255/73/F.
 Fig. 12. lateral view — 60×, borehole Zagłoba, depth 241.0 m, Coll. IG. 5256/73/F.

Pseudonodosaria multicostata (Bornemann) klodzinensis subsp.n.

- Fig. 13. holotype, lateral view — 60×, borehole Kłodzino, depth 31.70 m, Coll. IG. 5257/73/F.
 Fig. 14. lateral view — 70×, borehole Kcynia, depth 293.3 m, Coll. IG. 5258/73/F.
 Fig. 15. lateral view — 60×, borehole Zagłoba, depth 250.0 m, Coll. IG. 5259/73/F.

Pseudonodosaria tenuis (Bornemann)

- Fig. 16. lateral view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5260/73/F.
 Fig. 17. lateral view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5261/73/F.
 Fig. 18. lateral view — 70×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5262/73/F.

Plate X

Saracenaria pravoslavlevi Furssenko & Polenova

- Fig. 1. lateral view — 60×, borehole Strzegowo, depth 202.9 m, Coll. IG. 5263/73/F.
 Fig. 2. a lateral view — 50×; b edge view — 50×, borehole Zagłoba, depth 265.0 m, Coll. IG. 5264/73/F.
 Fig. 3. lateral view — 70×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5263/73/F.

Vaginulinopsis embaensis (Furssenko & Polenova)

- Fig. 4. lateral view — 70×, borehole Zagłoba, depth 278.10 m, Coll. IG. 5266/73/F.
 Fig. 5. lateral view — 70×, borehole Strzegowo, depth 202.9 m, Coll. IG. 5267/73/F.
 Fig. 6. lateral view — 70×, borehole Zagłoba, depth 298.0 m, Coll. IG. 5268/73/F.

Vaginulinopsis incisiformis sp.n.

Fig. 7. holotype, lateral view — 65×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5269/73/F.

Fig. 8. lateral view — 65×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5270/73/F.

Fig. 9. lateral view — 65×, borehole Zagłoba, depth 282.0 m, Coll. IG. 5271/73/F.

Eoguttulina liassica (Strickland)

Fig. 10. lateral view — 65×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5272/73/F.

Fig. 11. lateral view — 65×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5273/73/F.

Eoguttulina polygona (Terquem)

Fig. 12. lateral view — 60×, borehole Strzegowo, depth 274.0 m, Coll. IG. 5276/73/F.

Fig. 13. lateral view — 60×, borehole Strzegowo, depth 206.7 m, Coll. IG. 5277/73/F.

Guttulina multistriata sp.n.

Fig. 14. holotype, lateral view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5278/73/F.

Fig. 15. lateral view — 60×, borehole Kcynia, depth 214.1 m, Coll. IG. 5279/73/F.

Fig. 16. lateral view — 60×, borehole Strzegowo, depth 198.4 m, Coll. IG. 5280/73/F.

Tristix acutangulus (Reuss)

Fig. 17. lateral view — 60×, borehole Zagłoba, depth 250.0 m, Coll. IG. 5281/73/F.

Fig. 18. lateral view — 60×, borehole Zagłoba, depth 276.0 m, Coll. IG. 5282/73/F.

Fig. 19. lateral view — 60×, borehole Zagłoba, depth 185.0 m, Coll. IG. 5283/73/F.

Plate XI

Tristix quadrangularis Furssenko & Polenova

Fig. 1. lateral view — 60×, borehole Strzegowo, depth 204.1 m, Coll. IG. 5284/73/F.

Fig. 2. lateral view — 70×, borehole Zagłoba, depth 276.4 m, Coll. IG. 5286/73/F.

Tristix temirica (Dain)

Fig. 3. lateral view — 65×, borehole Wolin, depth 103.0 m, Coll. IG. 5287/73/F.

Fig. 4. a lateral view — 70×; b specimen in toluene — 70×, borehole Strzegowo, depth 192.8 m, Coll. IG. 5288/73/F.

Spirillina infima (Strickland)

Fig. 5. lateral view — 70×, borehole Zagłoba, depth 162.0 m, Coll. IG. 5291/73/F.

Trocholina aff. *burlini* Gorbachik

Fig. 6. a dorsal view — 75×; b ventral view — 75×; c edge view — 75×, borehole Strzegowo, depth 175.0 m, Coll. IG. 5293/73/F.

Fig. 7. a dorsal view — 90×; b ventral view — 90×; c edge view — 90×, borehole Strzegowo, depth 185.05 m, Coll. IG. 5297/73/F.

Trocholina solecensis Bielecka & Pożaryski

Fig. 8. a dorsal view — 100×; b ventral view — 100×; c edge view — 100×, borehole Paślęk, depth Coll. IG. 5299/73/F.

Pseudolamarckina polonica (Bielecka & Pożaryski)

Fig. 9. a holotype, dorsal view — 50×; b ventral view — 50×; c edge view — 50×, borehole Zagłoba, depth 276.4 m, Coll. IG. 5057/73/F.

Epistomina stelicostata (Bielecka & Pożaryski)

Fig. 10. *a* holotype, dorsal view — 80×; *b* ventral view — 80×, borehole Zagłoba, depth 307.5 m, Coll. IG. 5059.

Fig. 11. *a* dorsal view — 60×; *b* ventral view — 60×, borehole Zagłoba, depth 276.4 m, Coll. IG. 5310/73/F.

Plate XII

Mantelliana purbeckensis (Forbes)

Fig. 1. *a* ♀ lateral view LV — 50×; *b* dorsal view — 50×, borehole Pagórki, depth 1313.3 m, Coll. IG. 5001/73/O.

Fig. 2. lateral view RV — 50×, borehole Strzegowo, depth 165.8 m, Coll. IG. 5003/73/O.

Cypridea dunkeri Jones

Fig. 3. lateral view RV — 50×, borehole Strzegowo, depth 163.0 m, Coll. IG. 5013/73/O.

Fig. 4. *a* lateral view LV — 50×; *b* lateral view RV — 50×; *c* dorsal view, 50×, borehole Strzegowo, depth 163.0 m, Coll. IG. 5014/73/O.

Scabriculocypris trapezoides Anderson

Fig. 5. *a* lateral view LV — 70×; *b* lateral view RV — 70×, borehole Pagórki, depth 1315.8 m, Coll. IG. 5022/73/O.

Cypridea praealta sp.n.

Fig. 6. *a* lateral view LV — 40×; *b* lateral view RV — 40×, borehole Kcynia, depth 309.1 m, Coll. IG. 5018/73/O.

Fig. 7. *a* holotype, lateral view LV — 50×; *b* lateral view RV — 50×; *c* dorsal view — 50×, borehole Kcynia, depth 309.1 m, Coll. IG. 5017/73/O.

Plate XIII

Cypridea inversa Martin

Fig. 1. *a* lateral view RV — 50×; *b* lateral view LV — 50×; *c* dorsal view — 50×, borehole Pagórki, depth 1332.9 m, Coll. IG. 5016/73/O.

Cypridea binodosa Martin

Fig. 2. *a* lateral view RV — 50×; *b* lateral view LV — 50×; *c* dorsal view — 50×, borehole Kcynia, depth 314.6 m, Coll. IG. 5011/73/C.

Cypridea valdensis praecursor Oertli

Fig. 3. *a* lateral view LV — 50×; *b* lateral view RV — 50×; *c* dorsal view — 50×, borehole Kcynia, depth 316.1 m, Coll. IG. 5020/73/O.

Rhinocypris jurassica jurassica (Martin)

Fig. 4. *a* lateral view LV — 75×; *b* dorsal view — 75×, borehole Kcynia, depth 307.6 m, Coll. IG. 5005/73/O.

Damonella pygmea (Anderson)

Fig. 5. *a* lateral view RV — 75×; *b* dorsal view — 75×; borehole Kcynia, depth 317.6 m, Coll. IG. 5010/73/O.

Damonella ellipsoidea (Wolburg)

Fig. 6. *a* lateral view LV—70×; *b* dorsal view—70×, borehole Kcynia, depth 307.1 m, Coll. IG. 5007/73/O.

Plate XIV

Fabanella ansata (Jones)

Fig. 1. lateral view RV—50×, borehole Bulkowo, depth 1206.5 m, Coll. IG. 5028/73/O.

Fabanella boloniensis (Jones)

Fig. 2. *a* lateral view LV—50×; *b* dorsal view—50×, borehole Pagórki, depth 1287.0 m, Coll. IG. 5030/73/O.

Procytheropteron brodiei (Jones)

Fig. 3. *a* lateral view LV—80×; *b* dorsal view—80×, borehole Strzegowo, depth 167.5 m, Coll. IG. 5040/73/O.

Darwinula oblonga (Roemer)

Fig. 4. *a* lateral view LV—50×; *b* dorsal view—50×, borehole Kcynia, depth 314.1 m, Coll. IG. 5026/73/O.

Darwinula leguminella (Forbes)

Fig. 5. lateral view RV—50×, borehole Kcynia, depth 312.1 m, Coll. IG. 5024/73/O.

Theriosynoecum forbesii (Jones)

Fig. 6. *a* lateral view LV—50×; *b* dorsal view—50×; *c* ventral view—50×, borehole Zagłoba, depth 78.0 m, Coll. IG. 5032/73/O.

Orthonotacythere rimosa (Martin)

Fig. 7. lateral view RV—75×, borehole Strzegowo, depth 166.7 m, Coll. IG. 5038/73/O.

Klieana kujaviana Bielecka & Sztejn

Fig. 8. ♀ *a* lateral view LR—75×; *b* ventral view—75×; *c* dorsal view—75×, borehole Kcynia, depth 300.6 m, Coll. IG. 5046/73/O.

Klieana alata Martin

Fig. 9. ♀ *a* lateral view RV—50×; *b* dorsal view—50×; *c* ventral view—50×, borehole Strzegowo, depth 165.8 m, Coll. IG. 5043/73/O.

Fig. 10. ♂ lateral view LR—60×, borehole Strzegowo, depth 165.8 m, Coll. IG. 5044/73/O.

Dicrorygma groenwali Christensen

Fig. 11. *a* lateral view RL—70×; *b* dorsal view—70×, borehole Szczebłotowo, depth 165.8 m, Coll. IG. 5034/73/O.

