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# FORAMINIFERA AND OSTRACODS FROM THE CARBONATE SEDIMENTS OF THE POLISH ZECHSTEIN

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**Fifty six species of foraminifera (17 new) and twenty six species of ostracods (4 new) have been described from the carbonates of the Polish Zechstein (cyclothems PZ1, PZ2, PZ3). In the regions of peri-Baltic syneclise and Podlasie depression the microfauna occurs in deposits of cyclothems PZ1, PZ2 and PZ3, while in the Koszalin—Chojnice region and at the pre-Sudetian monocline the microfauna has been found only in deposits of PZ1 cyclothem. *Geinitzina richteri — Roundyella lebaensis* zone characteristic of cyclothem PZ1 and *Lingulina minima — Dorsoobliquella pulchra* zone, characteristic of PZ2 and PZ3, have been distinguished in Poland.**

Key words: Foraminiferida, Ostracoda, biostratigraphy, taxonomic descriptions, Zechstein, Permian, Poland.
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## INTRODUCTION

The aim of this paper is to present a microfaunal spectrum of the Polish Zechstein. The material constitutes foraminifera and ostracods isolated from the rock; the microfaunistic investigations of rocks in thin sections have not been made.

The material here studied comes from bore-holes situated in the following regions (fig. 1): 1 — peri-Baltic syneclise (38 bore-holes), 2 — Podlasie depression (8 bore-holes), 3 — Koszalin—Chojnice region (7 bore-holes), and 4 — pre-Sudetian monocline (5 bore-holes). Regional distribution of the described species, made on the basis of chosen bore-holes, is presented in table 1, stratigraphic range is indicated in table 2.

The samples were taken every 1 metre. Over 4,000 samples have been examined but only less than 30 per cent of them, the undolomitized ones, provided the microfauna. The specimens are very well preserved. Ostracods occur as complete carapaces.

The most abundant and diversified microfauna comes from two regions: peri-Baltic syneclise (45 foraminiferal and 17 ostracod species) and Podla-


Fig. 1. Location of main bore-holes yielding the Zechstein microfauna in Poland.

sie depression (22 foraminiferal and 20 ostracod species). Considerably poorer in microfauna are the Koszalin—Chojnice region (4 foraminiferal and 10 ostracod species) and the pre-Sudetian monocline (8 foraminiferal and 3 ostracod species).

The previously published data concerning Zechstein microfauna of Poland may be found in: Wolańska (1959), Krömmelbein (1958), Odrzywolska-Bieniek (1961), Odrzywolska-Bieńkowa (1961), Jurkiewicz (1962, 1966), Barwicz (1966), Alexandrowicz and Barwicz (1970), Peryt and Peryt (1977), Woszczyńska (1968, 1970).

The material is housed at the Museum of the Geological Institute, Warsaw (abbreviated IG).

The study has been done in 1964—1985 at the Department of Stratigraphy, Tectonics and Palaeogeography of the Geological Institute, Warsaw.

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## MICROFAUNAL CHARACTERISTICS OF THE POLISH ZECHSTEIN

In the Polish part of the Zechstein basin, like in its other Central European parts, four sedimentary cycles have been recognized. The three lower ones (PZ1—PZ3) are of carbonate-evaporatic nature, the fourth one (PZ4) is clastic-evaporatic (Wagner *et al.* 1978).

It has been found that microfauna in Zechstein carbonates is irregularly distributed. Most frequent and diversified are foraminifera and ostracods in the Zechstein Limestone (cyclothem PZ1). Slightly less differentiated microfuna comes from the Main Dolomite (cyclothem PZ2), and the poorest one from the Platty Dolomite (cyclothem PZ3).

In the deposits of cyclothem PZ1 foraminifera dominate over ostracods, whereas in cyclothems PZ2 and PZ3 ostracods prevail and foraminifera are scarce or absent.

*PZ1 — Zechstein Limestone (Ca 1).* — The carbonate sediments of cyclothem PZ1 include limestones, dolomitic limestones as well as marly dolomites with interbeddings of algal limestones (Wagner *et al.* 1978). The richest in microfauna profile of PZ1 comes from the peri-Baltic syneclise, Białogarda IG1 bore-hole (figs. 1, 2, table 1). Twenty six species of foraminifera and 7 species of ostracods has been found here. In this bore-hole both ostracods and foraminifera are frequent; calcareous foraminiferal species dominate over agglutinated ones. Most frequent are the following foraminiferal species: *Nodosaria conicodensestriata*, *N. permiana*, *Agathammina pusilla*, *Geinitzina wagneri*, *Ammobaculites eiseli* and following ostracods: *Roundyella lebaensis*, *Healdia dahlgruni*, *Microcheilinella nuciformis*, *M. artiensis* and *Polycope perminuta*. Very scarce are tests of *Trochammina brevis*, *Siphonodosaria magnifica*, *Astacolus oblongus* and carapaces of *Cornigella permiana*.

Microfauna of PZ1 from the Podlasie depression is represented by the assemblage from the profile of Łochów IG 1 bore-hole (table 1). Twenty foraminiferal and as much as 15 ostracod species have been found here. The frequency of this fauna is high in the samples. The dominating foraminifera are *Haplophragmoides probata*, *Ammobaculites procera* and *Geinitzina richteri*, the scarce one is *Pseudotristix tscherdynzevi*. The following ostracods, characteristic of PZ1, were found: *Kirkbya permiana*, *Acratia acuta*, *Bairdiacypris jonesiana*, *Bairdia hisingeri*, *Bythocypris kroemmelbeini* as well as single carapaces of *Bairdia knuepferi* and *Cavellina permiana*.

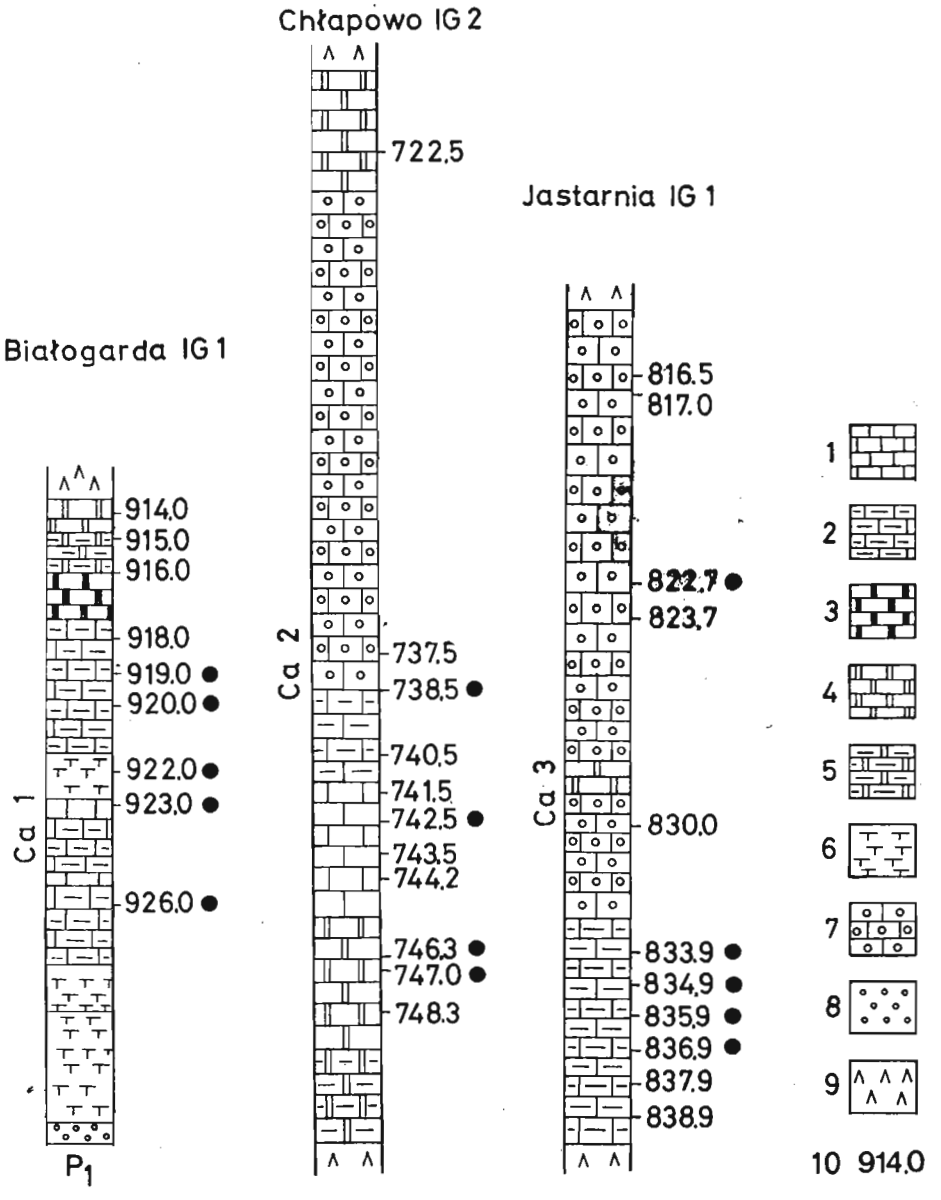


Fig. 2. Some profiles of the deposits of cyclothems PZ1, PZ2 and PZ3, bore-holes: Białogarda IG 1, Chłapowo IG 2 and Jastarnia IG 1. Explanations: 1 limestones, 2 marly limestones, 3 dolomitic limestones, 4 dolomites, 5 dolomitic marls, 6 marls, 7 oncolitic limestones, 8 conglomerates, 9 anhydrite, 10 location of samples (depth in meters); samples containing microfauna indicated by dots; $P_1$ Lower Permian.

In the remaining regions examined the PZ1 microfauna is much less diversified and less frequent (table 1).

It should be noted that in PZ1 carbonate sediments of Poland certain regional differences in microfauna distribution can be observed. In the peri-Baltic syneclise some species have been found which do not occur in

other regions, these are: among foraminifera — *Spandelina kirkbyi minuta, Nodosaria polonica, N. candida, N. striatula, N. aequalis, Geinitzina wagneri* and *Astacolus oblongus*, and an ostracod species — *Cornigella permiana*. The species found only in Podlasie depression are: among foraminifera — *Haplophragmoides probata, Ammobaculites procera, Pseudotristix tscherdynzevi, Spandelina cavernula* and *Geinitzina gigantea lithuanica*, and ostracods — *Kirkbya permiana, Bairdiacypris jonesiana* and *Bythocypris kroemmelbeini*. In the Koszalin—Chojnice region no specific microfauna has been found. The poor fauna of the pre-Sudetian monocline differs from the other ones in only one species — *Reophax belfordi* — which is unknown in the other regions of Poland.

*PZ2 — Main Dolomite (Ca 2).* — The carbonate sediments of cyclothem PZ2 contain dolomites, calcareous dolomites, oncolitic and massive carbonates, and scarce marly sediments (Wagner *et al.* 1978).

The most diversified microfauna comes from Chłapowo IG 2 bore-hole (figs. 1, 2; table 1). Sixteen species of foraminifera and only 3 species of ostracods have been found here. The frequency of microfauna in the samples is high, especially that of foraminifera. The fauna contains numerous new foraminiferal species, such as: *Lingulina magna, L. minima, Pseudonodosaria limpida, Geinitzina compacta* and *G. cylindrica*. Scarce species are: *Lunucammina celsa, Pachyploia schwageri, Tristix mariusi* and *T. pomeraniae*.

The microfauna of Chłapowo IG 2 profile can be compared with that of Barciany 1 bore-hole (fig. 1, table 1) where 10 foraminiferal and 8 ostracod species have been found; the microfauna is frequent in the samples. The foraminifera are similar to those of Chłapowo IG 2. Special attention is due to ostracods *Monoceratina longissima*, the species found in Poland, in diverse regions, only in the sediments of cyclothem PZ2, not in PZ1 as it has been assumed by Krömmelbein (1958). The following ostracod species are frequent: *Dorsoobliquella pulchra, Cavellina permiana, Acratia polonica* and *Healdia zechsteiniana*.

In PZ2 carbonate sediments of the peri-Baltic syneclise 11 new species of foraminifera and 2 species of ostracods have been found (table 1). The profiles of the Podlasie depression contain very scarce microfauna, and in the Koszalin-Chojnice region and the pre-Sudetian monocline no microfauna has been found.

*PZ3 — Platty Dolomite (Ca 3).* — Carbonates of cyclothem PZ3 are represented by dolomites, microoncolitic limestones, dolomitic marls, dolomitic oncolites (Wagner *et al.* 1978).

The most diversified microfauna comes from Jastarnia IG 1 bore-hole (figs. 1, 2, table 1). In this fauna, which has a wide geographic and stratigraphic ranges, appears a new foraminiferal species, *Lunucammina olgae*. Among foraminifera relatively frequent are *Calcitronella inflata*,

*C. rotunda*, *C. extensa* as well as *Lingulina minima* and *Lunucammina olgae*. Among ostracods very frequent are *Healdia zechsteiniana*, *Dorsoobliquella pulchra*, *Bairdia knuepferi* and *Cavellina permiana*.

Apart from the peri-Baltic syneclise, no region of Poland is known to provide foraminifera of the Platty Dolomite.

Table 1

| Species \ Regions | 1 | | | | | 2 | | 3 | | | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore-holes | a Białogarda 1Gl | b Chłapowo 1G2 | | c Jastarnia 1Gl | d Barciany 1 | e Barciany 2 | f Jamno 1G 3 | g Nowa Karczma 1 | h Łochów 1Gl | i Mielnik 1Gl | j Dębe Wielkie 1 | k Bielawa Górna N 19 |
| Cyclothems | PZ1 | PZ2 | PZ3 | PZ3 | PZ2 | PZ2 | PZ1 | PZ1 | PZ1 | PZ1 | PZ2 | PZ1 |
| Zones | I | II | | II | II | II | I | I | I | I | II | I |
| *Ammodiscus bradynus* (Spandel) | ● | ● | | ● | ● | ● | | | ● | | | ● |
| *Ammodiscus roesleri* (Schmid) | ● | | | | | | | | | | | |
| *Glomospira regularis* Scherp | ● | | | | | | | | ● | | | |
| *Glomospira spiralis* Scherp | ● | | | | | | ● | ● | ● | | | |
| *Reophax belfordi* Crespin | | | | | | | | | ● | | | ● |
| *Haplophragmoides probata* Scherp | | | | | | | | | ● | | | |
| *Ammobaculites eiseli* Spandel | ● | | | | | | | | ● | | | ● |
| *Ammobaculites procera* Scherp | | | | | | | | | ● | | | |
| *Trochammina brevis* Ukharskaja | ● | | | | | | | | | | | |
| *Lunucamina hastata* Scherp | | | | | | | | | ● | ● | | |
| *Lunucammina celsa* sp. n. | ● | | | | | | | | | | | |
| *Lunucammina olgae* sp. n. | | | | ● | | | | | | | | |
| *Spandelina kirkbyi kirkbyi* (Richter) | ● | | | | | | | | ● | | | |
| *Spandelina kirkbyi minuta* Scherp | ● | | | | | | | | | | | |
| *Spandelina cavernula* Paalzow | | | | | | | | | ● | | | |
| *Geinitzina compacta* sp. n. | | ● | | | ● | | | | | | | |
| *Geinitzina cylindrica* sp. n. | | ● | | | ● | | | | | | | |
| *Geinitzina flabellata* M.-Maklay | | ● | | | | | | | | | | |
| *Geinitzina gigantea lithuanica* M. Maklay | | | | | | | | | ● | | | |
| *Geinitzina postcarbonica* Spandel | | | | | ● | | | | | | | |
| *Geinitzina richteri* M.-Maklay | ● | | | | | | ● | | ● | ● | ● | ● |
| *Geinitzina triangularis* Chap. et Howchin | | ● | | | ● | ● | | | | | ● | |
| *Geinitzina wagneri* sp. n. | ● | | | | | | | | ● | | | ● |
| *Pachyphloia schwageri* Civ. et Dessauv. | | ● | | | | | | | | | | |
| *Cyclogyra kinkelini* (Spandel) | ● | | | | | | | | ● | | | |
| *Agathammina pusilla* (Geinitz) | ● | | | | | | ● | | ● | | | ● |
| *Calcitornella extensa* Scherp | | | | ● | | | | | | | | |
| *Calcitornella inflata* (Scherp) | | | | ● | | | | | | | | |
| *Calcitornella rotunda* Scherp | | | | ● | | | | | | | | |

| | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | II | II | II | I | I | I | I | II | I |
| *Nodosaria kingi* (Jones) | ● | | | | | | | | | | |
| *Nodosaria aequalis* sp. n. | ● | | | | | | | | | | |
| *Nodosaria candida* sp. n. | ● | | | | | | | | | | |
| *Nodosaria conicodensestriata* Paalzow | ● | | | | | | | ● | | | |
| *Nodosaria lineata* sp. n. | | ● | | ● | | | | | | | |
| *Nodosaria ovalis* Schmid | ● | | | | | | | | | | |
| *Nodosaria permiana* (Spandel) | ● | | | | | ● | | ● | ● | | ● |
| *Nodosaria polonica* sp. n. | ● | | | | | | | | | | |
| *Nodosaria striatula* sp. n. | ● | | | | | | | | | | |
| *Astacolus oblongus* M.-Maklay | ● | | | | | | | | | | |
| *Dentalina farcimen* (Soldani) | ● | | | | | | | | | | ● |
| *Dentalina permiana* Jones | ● | | | | | | | ● | | | |
| *Frondicularia permiana* Woszczyńska | | | | | | | | ● | | | ● |
| *Pseudonodosaria lata* M.-Maklay | ● | | | | | | | | | | |
| *Pseudonodosaria levis* sp. n. | | ● | | | | | | | | | |
| *Pseudonodosaria limpida* sp. n. | | ● | | ● | | | | | | | |
| *Pseudotristix tscherdynzevi* M.-Maklay | | | | | | | | ● | | | |
| *Lingulina zeichsteiniana* sp. n. | | ● | | ● | | | | | | | |
| *Lingulina linguaeformis* Paalzow | | ● | | ● | | | | | | | |
| *Lingulina magna* sp. n. | | ● | | ● | | | | | | | |
| *Lingulina minima* sp. n. | | ● | ● | ● | | | | | | ● | |
| *Lingulonodosaria jurkiewiczi* M.-Maklay | ● | | | | | | | ● | | | |
| *Tristix mariusi* sp. n. | | ● | | | | | | | | | |
| *Tristix pomeraniae* sp. n. | | ● | | | | | | | | | |
| *Siphonodosaria magnifica* Scherp | ● | | | | | | | | | | |
| *Cornigella permiana* (Krömmelbein) | ● | | | | | | | | | | |
| *Cornigella* sp. n. | | | | | ● | | | | | | |
| *Kirkbya permiana* (Jones) | | | | | | | | ● | | | |
| *Roundyella lebaensis* Krömmelbein | ● | | | | | | | ● | | | |
| *Dorsoobliquella pulchra* Knüpfer | | ● | | ● | ● | | | | | ● | |
| *Bairdia plebeia* Reuss | | | | | ● | | ● | ● | ● | | |
| *Bairdia knuepferi* Ivanov | | ● | ● | ● | ● | ● | | ● | ● | | |
| *Bairdia ampla* Reuss | | ● | | ● | ● | | | | | | |
| *Bairdia hisingeri* (Münster) | | | | | | ● | | ● | ● | | |
| *Acratia acuta* (Jones) | | | | | | | | ● | | | |
| *Acratia polonica* sp. n. | | | ● | ● | ● | | | | | | |
| *Bairdiacypris jonesiana* (Kirkby) | | | | | | | | ● | | | |
| *Bythocypris kroemmelbeini* sp. n. | | | | | | | | ● | ● | | ● |
| *Fabalicypris parvus* Kotschetkova | | | | ● | | ● | | | ● | | |
| *Haworthina patria* Ivanov | ● | | | | | | ● | ● | ● | | |
| *Monoceratina longissima* Krömmelbein | | | | ● | ● | | | | | ● | |
| *Basslerella regularis* (Richter) | | | | | | ● | ● | | ● | ● | |
| *Basslerella suavis* Ivanov | | | | | | | | | ● | | |
| *Healdia dahlgrüni* Krömmelbein | | | | | | | | ● | | | ● |
| *Healdia zeichsteiniana* sp. n. | | ● | ● | ● | ● | | | | | | |
| *Pseudobythocypris eichenbergi* sp. n. | | | | | ● | | | | | | |
| *Cavellina permiana* Kotschetkova | | | ● | ● | ● | | | ● | ● | ● | |
| *Microcheilinella artiensis* Guseva | ● | | | | | ● | | ● | | | |
| *Microcheilinella nuciformis* (Jones) | ● | | | | | ● | | ● | | | |
| *Polycope perminuta* (Kellett) | ● | | | | | ● | ● | ● | ● | | ● |
| *Kelletella kotschetkovae* Ivanov | | | | | | ● | | ● | | | |

Regions: 1 — peri-Baltic syneclise, 2 — Koszalin—Chojnice region, 3 — Podlasie depression, 4 pre-Sudetian monocline. Assemblage zones: I — *Geinitzina richteri* — *Roundyella lebaensis* zone, II — *Lingulina minima* — *Dorsoobliquella pulchra* zone. Cyclothems: PZ1, PZ2, PZ3.

Table 2

Stratigraphic distribution of the examined microfaunal species in Zechstein carbonates of Poland and other European regions

| Species | Poland | | | | Other regions | |
|---|---|---|---|---|---|---|
| | Assemblage zones | I | II | | EE | WE |
| | Cyclothems | PZ1 | PZ2 | PZ3 | | |
| *Glomospira regularis* Scherp | | × × | | | | 1 |
| *Glomospira spiralis* Scherp | | × × | | | | 1 |
| *Reophax belfordi* Crespin | | × | | | | |
| *Haplophragmoides probata* Scherp | | × × → | | | 1,2 | 1 |
| *Ammobaculites eiseli* (Spandel) | | × × | | | | 1 |
| *Ammobaculites procera* Scherp | | × × | | | | 1 |
| *Trochammina brevis* Ukharskaya | | × | | | 1,2 | |
| *Spandelina cavernula* Paalzow | | × × → | | | | 1 |
| *Spandelina kirkbyi kirkbyi* (Richter) | | × × | | | | 1 |
| *Spandelina kirkbyi minuta* Scherp | | × | | | | 1 |
| *Geinitzina richteri* Miklukho-Maklay | | × × | | | 1 | 1 |
| *Geinitzina gigantea lithuanica* Miklukho-Maklay | | × | | | 1 | |
| *Geinitzina wagneri* sp.n. | | × | | | | |
| *Cyklogyra kinkelini* (Spandel) | | × × | | | 1 | 1 |
| *Agathammina miliolides* (Jones, Parker et Kirkby) | | × | | | | 1 |
| *Agathammina pusilla* (Geinitz) | | × × | | | 1 | 1 |
| *Nodosaria aequalis* sp.n. | | × | | | | |
| *Nodosaria candida* sp.n. | | × | | | | |
| *Nodosaria conicodensestriata* Paalzow | | × × | | | | 1 |
| *Nodosaria kingi* (Jones) | | × | | | | 1 |
| *Nodosaria permiana* (Spandel) | | × × | | | 1 | 1 |
| *Nodosaria polonica* sp.n. | | × | | | | |
| *Nodosaria striatula* sp.n. | | × | | | | |
| *Astacolus oblongus* Miklukho-Maklay | | × | | | 1 | |
| *Dentalina farcimen* (Soldani) | | × × | | | 1 | 1 |
| *Dentalina permiana* Jones | | × × | | | 1 | 1 |
| *Frondicularia permiana* Woszczyńska | | × | | | | |
| *Pseudonodosaria lata* Miklukho-Maklay | | × | | | 1 | |
| *Pseudotristix tscherdynzevi* Miklukho-Maklay | | × | | | 1 | |
| *Lingulonodosaria jurkiewiczi* Miklukho-Maklay | | × | | | 1 | |
| *Siphonodosaria magnifica* Scherp | | × | | | | 1 |
| *Lunucammina hastata* Scherp | | × | | | 1 | 1 |
| *Lunucammina plana* Scherp | | × | | | 1 | 1 |
| *Geinitzina triangularis* Chapman et Howchin | | × | × | | | 1 |
| *Nodosaria ovalis* Schmid | | × | | | 1 | 1 |
| *Ammodiscus bradynus* (Spandel) | | × × | × × | × | 1 | 1 |
| *Ammodiscus roesleri* (Schmid) | | × × | × × | × | | 1 |
| *Lunucammina celsa* sp.n. | | | × | | | |
| *Geinitzina compacta* sp.n. | | | × | | | |
| *Geinitzina cylindrica* sp.n. | | | × × | | | |
| *Geinitzina flabellata* Miklukho-Maklay | | | ← × | | 1 | |
| *Geinitzina postcarbonica* Spandel | | | ← × × | | | 1 |
| *Pachyphloia schwageri* Civrieux at Dessauvagie | | | × | | | |

Table 2 cd,

| Species | Poland | | | | Other regions | |
|---|---|---|---|---|---|---|
| | Assemblage zones | I | II | | EE | WE |
| | Cyclothems | PZ1 | PZ2 | PZ3 | | |
| *Nodosaria lineata* sp.n. | | | × × | | | |
| *Pseudonodosaria levis* sp.n. | | | × | | | |
| *Pseudonodosaria limpida* sp.n. | | | × | | | |
| *Lingulina zechsteiniana* sp.n. | | | × | | | |
| *Lingulina linguaeformis* Paalzow | | | ←× | | | 1 |
| *Lingulina magna* sp.n. | | | × | | | |
| *Tristix mariusi* sp.n. | | | × | | | |
| *Tristix pomeraniae* sp.n. | | | × | | | |
| *Lingulina minima* sp.n. | | | × × | × | | |
| *Calcitornella extensa* Scherp | | | ← × × | × | 1 | 1 |
| *Calcitornella inflata* Scherp | | | ← × × | × | 1 | 1 |
| *Calcitornella rotunda* Scherp | | | ← × × | × | 1 | 1 |
| *Lunucammina olgae* sp.n. | | | | × | | |
| *Cornigella permiana* (Krömmelbein) | | × | | | | |
| *Kirkbya permiana* (Jones) | | × | | | 1 | 1 |
| *Roundyella lebaensis* Krömmelbein | | × × | | | 1 | 1 |
| *Acratia acuta* (Jones) | | × | | | | 1 |
| *Bairdiacypris jonesiana* (Kirkby) | | × | | | 1 | 1 |
| *Bythocypris kroemmelbeini* sp.n. | | × | | | | |
| *Healdia dahlgrueni* Krömmelbein | | × × → | | | 2,3 | 1 |
| *Microcheilinella artiensis* Guseva | | × × | | | 1 | |
| *Microcheilinella nuciformis* (Jones) | | × × | | | 1 | 1 |
| *Polycope perminuta* (Kellett) | | × × | | | 1 | 1 |
| *Bairdia hisingeri* (Münster) | | × × | × | | 1 | 1,2 |
| *Haworthina patria* Ivanov | | × × | × × | | 1 | |
| *Basslerella regularis* (Richter) | | × | × | | 1 | 1 |
| *Kelletella kotschetkovae* Ivanov | | × | × × | | 1 | |
| *Bairdia knuepferi* Ivanov | | × | × × | × × | 1-3 | 1,2 |
| *Bairdia plebeia* Reuss | | × × | × | × | 1,2 | 1 |
| *Fabalicypris parvus* Kotschetkova | | × × | × × | × | 1 | |
| *Basslerella suavis* Ivanov | | × | × × | × | 1 | |
| *Cavellina permiana* Kotschetkova | | × | × × | × × | 1,2 | 1 |
| *Bairdia ampla* Reuss | | | ← × × | | | 1 |
| *Cornigella* sp. | | | × × | | | |
| *Monoceratina longissima* Krömmelbein | | | × × | | 2 | |
| *Healdia zechsteiniana* sp.n. | | | × × | × × | | |
| *Pseudobythocypris eichenbergi* sp.n. | | | × × | × × | | |
| *Dorsoobliquella pulchra* Knüpfer | | | ← × × | × × | 2 | 1 |
| *Acratia polonica* sp.n. | | | × × | × | | |

× × frequent
× rare
→ arrows mark the species ranges which extend beyond the limits of one cyclothem
Assemblage zones: I — *Geinitzina richteri-Roundyella lebaensis* zone, II — *Lingulina minima-Dorsoobliquella pulchra* zone.
EE — East Europe: Baltic regions of the USSR; WE — West Europe; 1, 2, 3 — occurrence in cyclothems PZ1, PZ2 or PZ3

## STRATIGRAPHIC DIFFERENTIATION OF MICROFAUNA

In Zechstein carbonates in Poland two foraminiferal-ostracod faunas have been observed (table 2) differing considerably in their specific spectrum. Basing on their specificity, two microfaunal assemblage zones may be distinguished: *Geinitzina richteri — Roundyella lebaensis* and *Lingulina minima — Dorsoobliquella pulchra* zones.

The *Geinitzina richteri — Roundyella lebaensis* zones comprises Zechstein Limestone (cyclothem PZ1). Its microfaunistic content is very diversified specifically and includes, among others, 5 new foraminiferal and 1 new ostracod species (table 2). In this zone scarcely appear some ostracod species which become frequent in the sediments of the next zone. Numerous are foraminiferal and ostracod species common in the next zone.

The *Lingulina minima — Dorsoobliquella pulchra* zone comprises the Main Dolomite and Platty Dolomite (cyclothems PZ2 and PZ3). It contains slightly less diversified microfauna (table 2). Apart from the species known from the previous zone, many new species, both of foraminifera (12) and ostracods (3), are present. In the highest part of this zone appears a new foraminiferal species (*L. olgae*), whose stratigraphical range has not been studied yet.

## SUMMARY

1. Zechstein carbonate sediments of cyclothems PZ1, PZ2 and PZ3 from Poland differ considerably in their microfauna.

i) The Zechstein Limestone (cyclothem PZ1) has a very diversified microfauna with many new species. This fauna is related to those of the Baltic region of the USSR and West Europe (table 2).

ii) The microfauna of the Main Dolomite (cyclothem PZ2) is less diversified than that of the Zechstein Limestone. In comparison with the latter one the PZ2 microfauna contains many different species of foraminifera, and many similar species of ostracods. Here, a great number of new species has been found, especially in foraminifera. This fauna is much more diversified than European faunas of the same age. It is more similar to this of the Baltic regions of USSR than to that of West European basins.

iii) The Platty Dolomite (cyclothem PZ3) contains microfauna which is much poorer than that of the previous cyclothem, only one new species of foraminifera has been found there.

2. In Polish Zechstein two microfaunistic zones have been distinguished: *Geinitzina richteri — Roundyella lebaensis* zone which comprises the sediments of cyclothem PZ1, and *Lingulina minima — Dorsoobliquella pulchra* zone which comprises cyclothems PZ2 and PZ3.

PALAEONTOLOGICAL PART

## Foraminiferida

(Systematics after Loeblich and Tappan 1964, modified)

### Family **Ammodiscidae** Reuss, 1862

### Genus *Ammodiscus* Reuss, 1862

### *Ammodiscus bradynus* (Spandel, 1898)

(pl. 2: 14—16)

1898. *Trochammina bradyna* Spandel; Ellis and Messina, Cat. of Foram.
1936. *Ammodiscus bradynus* (Spandel); Paalzow: 29, pl. 31: 5, 6.
1975. *Ammodiscus bradynus* (Spandel); Miklukho-Maklaj and Ukharskaya: 39, pl. 2: 3.

*Material.* — Over 100 well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7201/85/F | IG 7202/85/F | IG 7203/85/F |
|---|---|---|---|
| larger diameter | 0.364 | 0.336 | 0.308 |
| smaller diameter | 0.280 | 0.308 | 0.308 |
| width | 0.112 | 0.084 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2, PZ3. USSR, Baltic region — sasnavskaya svita and novoakmianskaya svita. German basin — Werrakarbonate, Stassfurtkarbonate.

### *Ammodiscus roesleri* (Schmid, 1867)

(pl. 2: 13)

1867. *Serpula rösleri* Schmid: 582, pl. 6: 46—47.
1936. *Ammodiscus rösleri* (Schmid); Paalzow: 29, pl. 3: 4.

*Material.* — About fifty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7204/85/F | 7205/85/F | 7206/85/F |
|---|---|---|---|
| larger diameter | 0.756 | 0.611 | 0.588 |
| smaller diameter | 0.700 | 0.611 | 0.560 |
| width | 0.168 | 0.140 | 0.140 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2, PZ3. German basin — Werrakarbonate, Stassfurtkarbonate.

### Genus *Glomospira* Rzehak, 1885

### *Glomospira regularis* Scherp, 1962

(pl. 1: 12)

1962. *Glomospira regularis* Scherp: 287, pl. 6: 7—9.
1968. *Glomospira regularis* Scherp; Woszczyńska: 97, pl. 1: 2.

*Material.* — About fifty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7207/85/F | IG 7208/85/F | IG 7209/85/F |
|---|---|---|---|
| larger diameter | 0.280 | 0.280 | 0.280 |
| smaller diameter | 0.224 | 0.280 | 0.252 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1. German basin — Werrakarbonate.

### *Glomospira spiralis* Scherp, 1962
(pl. 1: 13, 14)

1962. *Glomospira spiralis* Scherp: 287, pl. 6: 10—13.
1968. *Glomospira spiralis* Scherp; Woszczyńska: 96, pl. 1: 3.

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7210/85/F | IG 7211/85/F | IG 7212/85/F |
|---|---|---|---|
| smaller diameter | 0.196 | 0.168 | 0.196 |
| larger diameter | 0.168 | 0.168 | 0.168 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werrakarbonate.

## Family **Hormosinidae** Haeckel, 1894
## Genus *Reophax* Montfort, 1808
### *Reophax belfordi* Crespin, 1958
(pl. 1: 1)

1958. *Reophax belfordi* Crespin: 60, pl. 10: 8—11.

*Material.* — About twenty rather well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7216/85/F | IG 7217/85/F | IG 7218/85/F |
|---|---|---|---|
| length | 0.560 | 0.448 | 0.448 |
| width | 0.196 | 0.168 | 0.140 |
| thickness | 0.084 | 0.084 | 0.084 |

*Occurrence.* — Lower Silesia — cyclothem PZ1. Australia — Lower Zechstein.

## Family **Lituolidae** de Blainville, 1825
## Genus *Haplophragmoides* Cushman, 1910
### *Haplophragmoides probata* Scherp, 1962
(pl. 1: 9, 10)

1962. *Haplophragmoides probata* Scherp: 293, pl. 7: 21, 22.
1975. *Haplophragmoides probata* Scherp; Miklukho-Maklay and Ukharskaya: 41, pl. 2: 6—10, pl. 13: 6, 7.

*Material.* — Twenty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7219/85/F | IG 7220/85/F | IG 7221/85/F |
|---|---|---|---|
| larger diameter | 0.336 | 0.252 | 0.252 |
| smaller diameter | 0.280 | 0.252 | 0.224 |
| thickness | 0.140 | 0.140 | 0.140 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## Genus *Ammobaculites* Cushman, 1910
## *Ammobaculites eiseli* (Spandel, 1898)
(pl. 1: 4—6)

1936. *Ammobaculiites eiseli* (Spandel); Paalzow: 31, pl. 3: 13—14.
1962. *Ammobaculites eiseli* (Spandel); Scherp: 294, pl. 8: 9—11.
1966. *Ammobaculites eiseli* (Spandel); Jurkiewicz: 175, pl. 1: 14.

*Material.* — About thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7222/85/F | IG 7223/85/F | IG 7224/85/F |
|---|---|---|---|
| length | 0.840 | 0.616 | 0.560 |
| width | 0.168 | 0.196 | 0.140 |
| thickness | 0.140 | 0.168 | 0.140 |
| diameter of a planispirally coiled part | 0.224 | 0.308 | 0.280 |

*Occurrence.* — Polish Lowlands cyclothem PZ1. German basin — Werrakarbonate.

## *Ammobaculites procera* Scherp, 1962
(pl. 1: 2, 3)

1962. *Ammobaculites procera* Scherp: 294, pl. 8: 12—18.

*Material.* — Eighteen well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7225/85/F | IG 7226/85/F | IG 7227/85/F |
|---|---|---|---|
| length | 0.840 | 0.644 | 0.588 |
| width | 0.196 | 0.140 | 0.140 |
| thickness | 0.140 | 0.112 | 0.112 |
| diameter of a planispirally coiled part | 0.168 | 0.140 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werrakarbonate.

## Family **Trochamminidae** Schwager, 1877
## Genus *Trochammina* Parker et Jones, 1859
## *Trochammina brevis* Ukharskaya, 1975
(pl. 2: 8, 11)

1975. *Trochammina brevis* Ukharskaya *in* Miklukho-Maklay and Ukharskaya: 45, pl. 4: 8, pl. 13: 17.

*Material.* — Three well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7213/85/F | IG 7214/85/F | IG 7215/85/F |
|---|---|---|---|
| diameter | 0.476 | 0.532 | 0.476 |
| thickness | 0.392 | 0.420 | 0.392 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita and zhalghiriayskaya svita.

## Family **Nodosinellidae** Rhumbler, 1895

### Genus *Lunucammina* Spandel, 1898

### *Lunucammina hastata* Scherp, 1962

(pl. 3: 4)

1962. *Lunucammina hastata* Scherp: 301, pl. 9: 12, 13.
1968. *Ichtyolaria primitiva* Civrieux et Dessauvagie; Woszczyńska: 100, pl. 1: 9.
1975. *Lunucammina hastata* Scherp; Miklukho-Maklay and Ukharskaya: 73, pl. 12: 1, pl. 18: 12, 13.

*Material.* — Twenty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7228/85/F | IG 7229/85/F | IG 7230/85/F |
|---|---|---|---|
| length | 0.560 | 0.392 | 0.336 |
| width | 0.140 | 0.140 | 0.140 |
| thickness | 0.084 | 0.084 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

### *Lunucammina plana* Scherp, 1962

(pl. 3: 12, 13)

1962. *Lunucammina plana* Scherp: 301, pl. 9: 14, 15.
1968. *Ichtiolaria latilimbata* Civrieux et Dessauvagie; Woszczyńska: 100, pl. 1: 6.
1975. *Lunucammina plana* Scherp; Miklukho-Maklaj and Ukharskaya: 72, pl. 12: 2—4, pl. 18: 15, 16.

*Material.* — About fifteen tests.

Dimensions (mm):

| Specimen No. | IG 7231/85/F | IG 7232/85/F | IG 7233/85/F |
|---|---|---|---|
| length | 0.308 | 0.168 | 0.196 |
| width | 0.168 | 0.084 | 0.168 |
| thickness | 0.084 | 0.252 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

### *Lunucammina celsa* sp. n.

(pl. 3: 20)

*Holotypus*: IG 7234/85/F; pl. 3: 20.
*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).
*Locus typicus*: Chłapowo IG2, depth 746.0 m.
*Derivatio nominis*: from Latin *celsa* — high, after test shape.

*Material.* — Three complete tests and about thirty damaged ones.

Dimensions (mm):

| Specimen No. | IG 7234/85/F (holotype) | IG 7235/85/F (paratype) | IG 7236/85/F (paratype) |
|---|---|---|---|
| length | 0.588 | 0.644 | 0.644 |
| width | 0.196 | 0.196 | 0.196 |
| thickness | 0.112 | 0.140 | 0.140 |

*Diagnosis.* — Test straight, distinctly elongated, strongly compressed, with 12—13 low chambers; except the first 3—5 ones chambers are equal in size and shape. Sutures flush with the surface of the test.

*Description.* — Test uniserial, straight elongated, distinctly compressed, consisting of 12—13 chambers. Proloculus spherical, the next chambers, except the first 3—5 ones, low and almost equal in size and shape. Sutures flush with the surface of the test. Test surface smooth. Aperture terminal, fissure-like.

*Variability.* — It concerns mostly the length: width ratio of the tests.

*Remarks.* — *Lunucammina celsa* sp. n. differs from *L. hastata* Scherp in greater number of chambers and their slower growing in size as added.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Lunucammina olgae* sp. n.

(pl. 3: 2)

*Holotypus*: IG 7237/85/F; pl. 3: 2.

*Stratum typicum*: carbonate sediments of cyclothem PZ3 (Zechstein).

*Locus typicus*: Jastarnia IG1, depth 836.0 m.

*Derivatio nominis*: after the first name of Dr. Olga Styk, Polish micropaleontologist.

*Material.* — 100 tests, some broken and without proloculus.

Dimensions (mm):

| Specimen No. | IG 7237/85/F (holotype) | IG 7238/85/F (paratype) | IG 7239/85/F (paratype) |
|---|---|---|---|
| length | 0.308 | 0.252 | 0.196 |
| width | 0.084 | 0.112 | 0.112 |
| thickness | 0.084 | 0.056 | 0.056 |

*Diagnosis.* — Test straight, distinctly compressed, narrow, distinctly elongated. Chambers, 5—9 in number, weakly inflated, slowly grow as added. Sutures incised.

*Description.* — Test uniserial, narrow, distinctly compressed and elongated. The proloculus spherical, the remaining chambers weakly inflated, of greater width than height, slowly increasing in size as added. Surface smooth. Sutures flush with the test surface, straight or slightly arcuate. Aperture terminal, fissure-like.

*Variability.* — It concerns the degree of chambers inflation and the rate of size increase of successive chambers.

*Remarks.* — *Lunucammina olgae* sp. n. differs from *L. hastata* Scherp in having narrower tests which are compressed on both sides, and not concave on one side as in *L. hastata.*

*Occurrence.* — Polish Lowlands — cyclothem PZ3.

## Genus *Spandelina* Cushman et Waters, 1928

## *Spandelina cavernula* Paalzow, 1936

(pl. 3: 3)

1936. *Spandelina cavernula* Paalzow: 35, pl. 4: 4.
1962. *Spandelina cavernula* Paalzow; Scherp: 303, pl. 10: 23, 24.
1970. *Spandelina cavernula* Paalzow; Woszczyńska: 478, pl. 1: 3.

*Material.* — Twenty damaged tests.

Dimensions (mm):

| Specimen No. | IG 7243/85/F | IG 7244/85/F | IG 7245/85/F |
|---|---|---|---|
| length of 4 chambers | 0.504 | 0.420 | 0.308 |
| width | 0.280 | 0.140 | 0.140 |
| thickness | 0.112 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werrakarbonate.

## *Spandelina kirkbyi kirkbyi* (Richter, 1861)

(pl. 2: 9, 10)

1861. *Nodosaria kirkbyi* Richter; Ellis and Messina, Cat. of Foram.
1936. *Geinitzina kirkbyi* (Richter); Paalzow: 33, pl. 4: 1.
1966. *Geinitzina kirkbyi* (Richter); Jurkiewicz: 179, pl. 2: 7, 8.
1975. *Spandelina kirkbyi* (Richter); Miklukho-Maklay and Ukharskaya: 74, pl. 12: 5, 6, pl. 18: 6, 7, 10, 11.

*Material.* — About 20 well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7240/85/F | IG 7241/85/F | IG 7242/85/F |
|---|---|---|---|
| length | 0.784 | 0.560 | 0.476 |
| width | 0.196 | 0.140 | 0.168 |
| thickness | 0.140 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## *Spandelina kirkbyi minuta* (Scherp, 1962)

(pl. 2: 4, 5)

1962. *Geinitzina kirkbyi minuta* Scherp: 300, pl. 10: 9, 10, 14, 15.
1966. *Geinitzina elongata* Jurkiewicz: 180, pl. 2: 3—6.

*Material.* — About 30 well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7246 /85/F | 7247/85/F | IG 7248/85/F |
|---|---|---|---|
| length | 0.420 | 0.364 | 0.280 |
| width | 0.112 | 0.084 | 0.084 |
| thickness | 0.056 | 0.056 | 0.056 |

Occurrence. — Polish Lowlands — cyclothem PZ1. German basin — Werrakarbonate.

## Genus *Geinitzina* Spandel, 1901
## *Geinitzina richteri* Miklukho-Maklay, 1975

(pl. 2: 6, 7)

1850. *Textularia cuneiformis* Jones; Ellis and Messina, Cat. of Foram.
1936. *Geinitzina cuneiformis* (Jones); Paalzow: 33, pl. 3: 16—24.
1975. *Geinitzina richteri* Miklukho-Maklay *in* Miklukho-Maklay and Ukharskaya: 67, pl. 10: 5, 6, pl. 17: 1—5.

*Material.* — About thirty tests.

Dimensions (mm):

| Specimen No. | IG 7249/85/F | IG 7250/85/F | IG 7251/85/F |
|---|---|---|---|
| length | 0.420 | 0.420 | 0.392 |
| width | 0.308 | 0.224 | 0.224 |
| thickness | 0.168 | 0.140 | 0.140 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita and pregolskaya svita. German basin — Werrakarbonate.

## *Geinitzina postcarbonica* Spandel, 1901

(pl. 3: 5, 6)

1901. *Geinitzina postcarbonica* Spandel; Ellis and Messina, Cat. of Foram.
1975. *Geinitzina postcarbonica* Spandel; Miklukho-Maklay and Ukharskaya: 69, pl. 10: 9, pl. 17: 10, 11.

*Material.* — About thirty tests.

Dimensions (mm):

| Specimen No. | 7252/85/F | IG 7253/85/F | IG 7254/85/F |
|---|---|---|---|
| length | 0.336 | 0.280 | 0.252 |
| width | 0.140 | 0.168 | 0.140 |
| thickness | 0.112 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ2. USSR, Baltic region — novoakmianskaya svita. North America — Lower Permian.

## *Geinitzina triangularis* Chapman et Howchin, 1905

(pl. 3: 9—11)

1905. *Geinitzina triangularis* Chapman et Howchin; Ellis and Messina, Cat. of Foram.
1968. *Geinitzina ichnousa* Civrieux et Dessauvagie; Woszczyńska: 97, pl. 1: 11.

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7255/85/F | IG 7256/85/F | IG 7257/85/F |
|---|---|---|---|
| length | 0.336 | 0.308 | 0.280 |
| width | 0.196 | 0.196 | 0.224 |
| thickness | 0.112 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## *Geinitzina gigantea lithuanica* Miklukho-Maklay, 1975

(pl. 2: 12)

1975. *Geinitzina gigantea lithuanica* Miklukho-Maklay *in* Miklukho-Maklay and Ukharskaya: 70, pl. 11: 1—3, pl. 17: 6—9.

*Material.* — Eighteen tests, some damaged.

Dimensions (mm):

| Specimen No. | IG 7258/85/F | IG 7259/85/F | IG 7260/85/F |
|---|---|---|---|
| length | 0.700 | 0.672 | 0.644 |
| width | 0.560 | 0.420 | 0.392 |
| thickness | 0.280 | 0.168 | 0.140 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita.

## *Geinitzina wagneri* sp. n.
(pl. 2: 3)

*Holotypus*: IG 7261/85/F; pl. 2: 3.
*Stratum typicum*: carbonate sediments of PZ1 (Zechstein).
*Locus typicus*: Białogarda IG 1, depth 922,0 m.
*Derivatio nominis*: after the name of Dr. Ryszard Wagner — Polish geologist.

*Material.* — Fifty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7261/85/F (holotype) | IG 7262/85/F (paratype) | IG 7263/85/F (paratype) |
|---|---|---|---|
| length | 0.420 | 0.280 | 0.252 |
| width | 0.140 | 0.140 | 0.112 |
| thickness | 0.056 | 0.056 | 0.056 |

*Diagnosis.* — Test markedly compressed, in lateral view having a form of an elongated triangle, with longitudinal median depression. Chambers, 5—9 in number, low, somewhat overlaping, distinctly enlarging as added.

*Description.* — Test uniserial and much compressed, elongated and triangular in lateral outline, with longitudinal median depression. Chambers, 5—9 in number, low and, except the spherical proloculus, weakly inflated, somewhat overlapping and rather rapidly increasing in size as added. Sutures slightly incised, straight or weakly arcuate. Aperture terminal, poorly visible.

*Variability.* — It concerns the number of chambers and resulting varying length of the test.

*Remarks.* — *Geinitzina wagneri* sp. n. reminds to some extent *G. cylindrica* sp. n. and differs from it in being more compressed and having chambers more rapidly increasing in size; chambers of *G. wagneri* are rather arcuate and overlapping whereas horizontal in *G. cylindrica*.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## *Geinitzina compacta* sp. n.
(pl. 3: 8)

*Holotypus*: IG 7264/85/F; pl. 3: 8.
*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).
*Locus typicus*: Chłapowo IG 2, depth 746.0 m.,
*Derivatio nominis*: Latin *compactus* — after compact test shape.

*Material.* — Eighty rather well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7264/85/F | IG 7265/85/F | IG 7266/85/F |
|---|---|---|---|
| length | 0.644 | 0.448 | 0.448 |
| width | 0.252 | 0.224 | 0.196 |
| thickness | 0.168 | 0.112 | 0.112 |

*Diagnosis.* — Test straight, distinctly elongated, compressed, with weak longitudinal depression, consisting of 9—13 chambers. Chambers low, somewhat arcuate,

slightly overlapping, markedly increasing in size as added in earlier portion, later of similar size.

*Description.* — Test uniserial, straight, distinctly elongated, compressed, with weak longitudinal depression. Chambers 9—13 in number. Proloculus spherical, following chambers (4—5) distinctly increasing in size, the next ones (5—6) of almost the same size. Chambers low, not inflated, slightly arcuate, tightly joining and slightly overlapping. Sutures flush with the surface of the test, somewhat bent. Aperture terminal, poorly visible.

*Remarks.* — *Geinitzina compacta* sp. n. differs from *G. flabellata* Miklukho-Maklay in more elongated and narrower test, and more numerous chambers.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Geinitzina cylindrica* sp. n.

(pl. 2. 2: 1, 2)

*Holotypus*: IG 7268/85/F; pl. 2: 2.

*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).

*Locus typicus*: Chłapowo IG2, depth 738.5 m.

*Derivatio nominis*: after the test shape.

*Material.* — Forty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7267/85/F | IG 7268/85/F | IG 7269/85/F |
|---|---|---|---|
| length | 0.280 | 0.280 | 0.280 |
| width | 0.140 | 0.140 | 0.112 |
| thickness | 0.084 | 0.084 | 0.084 |

*Diagnosis.* — Test straight, distinctly elongated and weakly compressed, with weakly developed longitudinal furrow. Chambers 6—9 in number, slightly inflated and gradually, rather slowly increasing in size. Last chamber flattened.

*Description.* — Test uniserial, straight, much elongated, rather narrow, weakly compressed with weakly developed longitudinal furrow. Chambers 6—9 in number. Proloculus spherical, the next chambers low, narrow, slightly inflated, rather slowly increasing in size especially in later portion. Last chamber flat. Sutures incised, straight. Aperture terminal, ovate.

*Variability.* — It concerns the size and shape of the tests; lateral outline of specimens may be triangular or cylindrical,

*Remarks.* — *Geinitzina cylindrica* sp. n. differs from *G. wagneri* sp. n. in less compressed and more elongated test, having moreover less developed furrow. Chambers in *G. cylindrica* are horizontal whereas arched and slightly overlapping in *G. wagneri*.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Geinitzina flabellata* Miklukho-Maklay, 1975

(pl. 3: 15)

1975. *Geinitzina flabellata* Miklukho-Maklay *in* Miklukho-Maklay and Ukharskaya: 71, pl. 11: 4—6, pl. 17: 12—14.

*Material.* — Fifteen well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7270/85/F | IG 7221/85/F | 7272/85/F |
|---|---|---|---|
| length | 0.448 | 0.420 | 0.392 |
| width | 0.280 | 0.224 | 0.224 |
| thickness | 0.112 | 0.168 | 0.140 |

*Occurrence.* — Polish Lowlands — cyclothem PZ2. USSR, Baltic region — novoakmianskaya svita.

## Genus *Pachyphloia* Lange, 1925
## *Pachyphloia schwageri* Civrieux et Dessauvagie, 1965
(pl. 4: 15)

1965. *Pachyphloia schwageri* Sellier de Civrieux et Dessauvagie: 38, pl. 5: 1, 3—7, 10—16, 19.
1968. *Pachyphloia schwageri* Civrieux et Dessauvagie; Woszczyńska: 98, pl. 1: 5.

*Material.* — Twenty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7273/85/F | IG 7274/85/F | IG 7275/85/F |
|---|---|---|---|
| length | 0.336 | 0.336 | 0.336 |
| width | 0.224 | 0.196 | 0.168 |
| thickness | 0.112 | 0.140 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ2. Turkey — Upper Permian.

## Family **Fischerinidae** Millett, 1898
## Genus *Cyclogyra* Wood, 1842
## *Cyclogyra kinkelini* (Spandel, 1898)
(pl. 1: 15)

1898. *Cornuspira kinkelini* Spandel; Ellis and Messina, Cat. of Foram.
1962. *Cornuspira kinkelini* Spandel; Scherp: 305, pl. 4: 9—12.
1975. *Cornuspira kinkelini* Spandel; Miklukho-Maklay and Ukharskaya: 49, pl. 6: 15, pl. 14: 8.

*Material.* — About thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7276/85/F | IG 7277/85/F | IG 7278/85/F |
|---|---|---|---|
| larger diameter | 0.364 | 0.252 | 0.224 |
| smaller diameter | 0.364 | 0.196 | 0.224 |
| thickness | 0.084 | 0.056 | 0.056 |

*Occurrence* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## Genus *Agathammina* Neumayer, 1887
## *Agathammina pusilla* (Geinitz, 1848)
(pl. 1: 7, 8)

1848. *Serpula pusilla* Geinitz; Ellis and Messina, Cat. of Foram.
1876. *Trochammina pusilla* (Geinitz); Brady: 78, pl. 3: 4—5.

1936. *Glomospira pusilla* (Geinitz); Paalzow: 30, pl. 3: 8.
1959. *Agathammina pusilla* (Geinitz); Wolańska: 27—48, pl. 1: 1—3, pl. 2: A—C.
1962. *Agathammina pusilla* (Geinitz); Scherp: 304, pl. 5: 1—10.
1968. *Agathammina pusilla* (Geinitz); Woszczyńska: 101, pl. 1: 7.
1975. *Agathammina pussilla* (Geinitz); Miklukho-Maklay and Ukharskaya: 50, pl. 6: 11—13, pl. 14: 9—11.

*Material.* — Fifty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7279/85/F | IG 7280/85/F | IG 7281/85/F |
|---|---|---|---|
| length | 1.736 | 0.838 | 0.756 |
| width | 1.680 | 0.980 | 0.700 |
| thickness | 0.784 | 0.476 | 0.392 |

*Remarks.* — *Agathammina pusilla* (Geinitz) from Poland has been examined in details by Wolańska (1959), Jurkiewicz (1966) and Woszczyńska (1968).

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## *Agathammina miliolides* (Jones, Parker et Kirkby, 1869)
(pl. 1: 11)

1869. *Trochammina miliolides* Jones, Parker et Kirkby; Ellis and Messina, Cat. of Foram.
1876. *Trochammina miliolides* Jones, Parker et Kirkby; Brady: 79, pl. 3: 11—15.
1936. *Glomospira miliolides* (Jones, Parker et Kirkby); Paalzow: 31, pl. 3: 12.
1962. *Agathammina miliolides* (Jones, Parker et Kirkby); Scherp: 305, pl. 5: 14.

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7282/85/F | IG 7283/85/F | IG 7284/85/F |
|---|---|---|---|
| length | 0.616 | 0.476 | 0.392 |
| width | 0.448 | 0.532 | 0.392 |
| thickness | 0.364 | 0.336 | 0.280 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werracarbonate. English basin — Lower magnesian Limestone.

## Genus *Calcitornella* Cushman et Waters, 1928
## *Calcitornella rotunda* Scherp, 1962
(pl. 4: 3)

1962. *Calcitornella rotunda* Scherp: 305, pl. 7: 11—13.
1975. *Calcitornella rotunda* Scherp; Miklukho-Maklay and Ukharskaya: 47, pl. 6: 7.

*Material.* — Twenty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7285/85/F | IG 7286/85/F | IG 7287/85/F |
|---|---|---|---|
| larger diameter | 0.252 | 0.224 | 0.168 |
| smaller diameter | 0.308 | 0.224 | 0.224 |
| thickness | 0.084 | 0.084 | 0.056 |

*Occurrence.* — Polish Lowlands — cyclothems PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## *Calcitornella inflata* Scherp, 1962
(pl. 4: 13, 14)

1962. *Calcitornella inflata* Scherp: 306, pl. 7: 14, 16—18.
1975. *Calcitornella inflata* Scherp; Miklukho-Maklay and Ukharskaya: 47, pl. 6: 1, 2.

*Material.* — Fifty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7288/85/F | IG 7289/85/F | IG 7290/85/F |
|---|---|---|---|
| larger diameter | 0.336 | 0.252 | 0.308 |
| smaller diameter | 0.280 | 0.364 | 0.196 |
| thickness | 0.140 | 0.112 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## *Calcitornella extensa* Scherp, 1962
(pl. 4: 12)

1962. *Calcitornella extensa* Scherp: 306, pl. 7: 19, 20.
1975. *Calcitornella extensa* Scherp: Miklukho-Maklay and Ukharskaya: 48, pl. 6: 5.

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7291/85/F | IG 7292/85/F | IG 7293/85/F |
|---|---|---|---|
| larger diameter | 0.308 | 0.252 | 0.252 |
| smaller diameter | 0.196 | 0.224 | 0.224 |
| thickness | 0.140 | 0.140 | 0.140 |

*Remarks.* — *Calcitornella extensa* differs from *C. rotunda* in smaller number of whorls and more elongate test.

*Occurrence.* — Polish Lowlands — cyclothem PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## Family **Nodosariidae** Ehrenberg, 1838
## Genus *Nodosaria* Lamarck, 1812
## *Nodosaria conicodensestriata* Paalzow, 1936
(pl. 4: 7, 8)

1936. *Nodosaria conico-densestriata* Paalzow: 38, pl. 4: 21—23.
1932. *Nodosaria conico-densestriata* Paalzow; Scherp: 314, pl. 12: 6a, b.
1975. *Nodosaria conicodensestriata* Paalzow; Miklukho-Maklay and Ukharskaya: 56, pl. 7: 12—13, pl. 15: 9—10.

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7294/85/F | IG 7295/85/F | IG 7296/85/F |
|---|---|---|---|
| length | 0.952 | 0.560 | 0.560 |
| width | 0.196 | 0.168 | 0.140 |
| thickness | 0.140 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita; German basin — Werrakarbonate.

## *Nodosaria polonica* sp. n.

(pl. 5: 5, 6)

*Holotypus*: IG 7297/85/F; pl. 5: 5.
*Stratum typicum*: carbonate sediments of PZ1 cyclothem (Zechstein).
*Locus typicus*: Białogarda IG 1, depth 922.0 m.
*Derivatio nominis*: Latin *polonicus* — found in Poland.

*Material.* — Thirty five tests, some damaged.

Dimensions (mm):

| Specimen No. | IG 7297/85/F (holotype) | IG 7298/85/F (paratype) | IG 7299/85/F (paratype) |
|---|---|---|---|
| length | 0.364 | 0.364 | 0.364 |
| width | 0.112 | 0.084 | 0.084 |

*Diagnosis.* — Test straight, chambers 6—8 in number, subglobular, each successive one being slightly larger from the former; last chamber elongated. Aperture terminal, rounded.

*Descrption.* — Test uniserial, straight, with 6—8 almost spherical chambers, slowly growing in size as added. Last chamber elongated. Sutures straight and slightly incised. Test surface smooth. Aperture terminal, rounded.

*Remarks.* — In comparison with *Nodosaria kingi*, *N. polonica* sp. n. has chambers more globular and more rapidly increasing in size as added.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## *Nodosaria striatula* sp. n.

(pl. 4: 9)

*Holotypus*: IG 7300/85/F; pl. 4: 9.
*Stratum typicum*: carbonate sediments of PZ1 cyclothem (Zechstein).
*Locus typicus*: Białogarda IG 1, depth 922.0 m.
*Derivatio nominis*: Latin *striatula* — after finely striated test.

*Material.* — Eleven tests.

Dimensions (mm):

| Specimen No. | IG 7300/85/F (holotype) | IG 7301/85/F (paratype) | IG 7302/85/F (paratype) |
|---|---|---|---|
| length | 0.448 | 0.448 | 0.392 |
| width | 0.112 | 0.112 | 0.112 |
| thickness | 0.056 | 0.056 | 0.028 |

*Diagnosis.* — Test straight, somewhat compressed on both sides. Chambers (8—9) slightly inflated, subequal, covered with distinct, longitudinal, densely arranged ribs.

*Description.* — Test uniserial, straight, narrow, compressed on both sides, ovate in cross-section. It consists of 8—9 chambers indistinctly growing in size as added, being weakly inflated and tightly joining each others. Proloculus small and poorly visible, spherical. Test surface covered with fine, longitudinal, densely arranged, parallel ribs. Sutures indistinct. Aperture terminal, poorly visible.

*Remarks.* — *Nodosaria striatula* is similar to *N. conicodensestriata* Paalzow, differing from it in having more densely ornamented and less inflated tests composed of more tightly joined chambers.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## *Nodosaria aequalis* sp. n.
(pl. 4: 1, 2)

*Holotypus*: IG 7303/85/F; pl. 4: 1.
*Stratum typicum*: carbonate sediments of PZ1 cyclothem (Zechstein).
*Locus typicus*: Białogarda IG 1, depth 922.0 m.
*Derivatio nominis*: Latin *aequalis* — equal, after equal surface of the test.

*Material.* — Thirty seven well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7303/85/F | IG 7304/85/F | IG 7305/85/F |
|---|---|---|---|
| length | 0.420 | 0.364 | 0.336 |
| width | 0.084 | 0.084 | 0.084 |

*Diagnosis.* — Test straight, narrow, strongly compressed, with smooth surface. Chambers (9—17) low, weakly inflated, difficult to be distinguished from each other, tightly joined. The last chamber elongated and more inflated than the penultimate one and provided with a neck. Proloculus sometimes with a short spine.

*Description.* — Test uniserial, narrow, straight, elongated, smooth, strongly compressed. In microspheric forms — between 9 and 17 chambers, in megalospheric ones — between 5 and 17 chambers. Proloculus spherical, often ended by a short spine. Other chambers low, slightly inflated, indistinctly growing in size as added, tightly joining each other. Last chamber elongated, with a neck. Sutures slightly arcuate, flush with the test surface. Aperture poorly visible.

*Variability.* — In some tests the proloculus is provided with a short spine. The last chamber may be either distinctly inflated at the apertural face or it may be provided with a neck.

*Remarks.* — *Nodosaria aequalis* sp. n. may be easily distinguished from other so far known species of the genus because of its strong compression of the test and tightly joining chambers.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## *Nodosaria candida* sp. n.
(pl. 5: 10)

*Holotypus*: IG 7306/85/F; pl. 5: 10.
*Stratum typicum*: sediments of PZ1 cyclothem (Zechstein).
*Locus typicus*: Białogarda IG1, depth 922.0 m.
*Derivatio nominis*: from Latin *candidus* — light shining.

*Material.* — Six quite well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7306/85/F | IG 7307/85/F | IG 7308/85/F |
|---|---|---|---|
| length | 0.700 | 0.588 | 0.532 |
| width | 0.140 | 0.112 | 0.112 |

*Diagnosis.* — Test straight, consisting of 7—8 distinctly inflated and elongated chambers, gradually growing as added. Last chamber with a neck and radiate aperture.

*Description.* — Test uniserial, straight, rounded in cross-section, consisting of seven to eight chambers. Proloculus spherical, other chambers slightly elongated, distinctly convex, gradually growing in size as added. The last chamber more elongated than the preceding ones, with a neck. Aperture terminal, radiate. Sutures straight, incised.

*Remarks.* — In comparison with *Nodosaria polonica* sp. n., the species has more elongated chambers, the last one provided with a neck.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## *Nodosaria lineata* sp. n.

(pl. 5: 1)

*Holotypus*: IG 7309/85/F; pl. 5: 1.

*Stratum typicum*: sediments of PZ2 cyclothem (Zechstein).

*Locus typicus*: Chłapowo IG2, depth 738.5 m.

*Derivatio nominis*: from Latin *linea* — line, from linear arrangement of chambers.

*Material.* — About hundred tests, some of them — damaged.

Dimensions (mm):

| Specimen No. | IG 7309/85/F | IG 7310/85/F | IG 7311/85/F |
|---|---|---|---|
| length | 0.560 | 0.392 | 0.336 |
| width | 0.168 | 0.112 | 0.140 |

*Diagnosis.* — Test straight, circular in cross-section, consisting of 4—6 chambers. Chambers rather low, weakly inflated, distinctly increasing in size as added, sometimes with fine longitudinal striae on the surface.

*Description.* — Test uniserial, straight, circular in cross-section, with 4—6 chambers. Proloculus spherical, other chambers barrel-like, weakly inflated, distinctly increasing in size as added, sometimes with fine longitudinal striae; last chamber more elongated than the former ones. Sutures straight, depressed. Aperture terminal, rounded.

*Remarks.* — In comparison with *Nodosaria kingi* (Jones), *N. lineata* sp. n. has more rapidly growing successive chambers.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Nodosaria kingi* (Jones, 1850)

(pl. 5: 8)

1850. *Dentalina kingi* Jones; Ellis and Messina, Cat. of Foram.
1936. *Nodosaria kingi* (Jones); Paalzow: 38, pl. 4: 20.
1966. *Nodosaria kingi* (Jones); Jurkiewicz: 117, pl. 3: 8.
1975. *Nodosaria kingi* (Jones); Miklukho-Maklay and Ukharskaya: 57, pl. 7: 16, pl. 15: 11.

*Material.* — Ten damaged tests.

Dimensions (mm):

| Specimen No. | IG 7312/85/F | IG 7313/85/F | IG 7314/85/F |
|---|---|---|---|
| length | 0.560 | 0.392 | 0.392 |
| width | 0.140 | 0.084 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## *Nodosaria permiana* (Spandel, 1898)

(pl. 4: 16, 17)

1898. *Orthoceras permiana* Spandel; Ellis and Messina, Cat. of Foram.
1936. *Spandelinoides geinitzi* (Spandel); Paalzow: 35, pl. 4: 8.

1961. *Spandelinoides geinitzi* (Spandel); Odrzywolska-Bieńkowa: 543, pl. 1: 3, 4, 5.
1962. *Spandelinoides geinitzi* (Spandel); Scherp: 315, pl. 12: 16.
1975. *Nodosaria permiana* (Spandel); Miklukho-Maklay and Ukharskaya: 51, pl. 7: 1, pl. 15: 1, 2.

*Material.* — About sixty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7318/85/F | IG 7319/85/F | IG 7320/85/F |
|---|---|---|---|
| length | 0.728 | 0.728 | 0.700 |
| width | 0.196 | 0.168 | 0.168 |
| thickness | 0.168 | 0.140 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## *Nodosaria ovalis* Schmid, 1867

(pl. 5: 11, 12)

1867. *Nodosaria ovalis* Schmid: 85, pl. 6: 50, 51.
1936. *Nodosaria ovalis* Schmid; Paalzow: 37, pl. 4: 17—19.

*Material.* — Eighteen tests, some of them damaged.

Dimensions (mm):

| Specimen No. | IG 7315/85/F | IG 7316/85/F | IG 7317/85/F |
|---|---|---|---|
| length | 0.560 | 0.476 | 0.476 |
| width | 0.140 | 0.112 | 0.112 |
| thickness | 0.112 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. German basin — Werrakarbonate.

## Genus *Astacolus* de Montfort, 1808
## *Astacolus oblongus* Miklukho-Maklay, 1975

(pl. 4: 18)

1975. *Astacolus oblongus* Miklukho-Maklay *in* Miklukho-Maklay and Ukharskaya: 80, pl. 10: 12.

*Material.* — One specimen IG 7321/85/F.

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — nowoakmianskaya svita.

## Genus *Dentalina* Risso, 1826
## *Dentalina farcimen* (Soldani, 1791)

(pl. 4: 10)

1791. *Orthoceras farcimen* Soldani; Ellis and Messina, Cat. of Foram.
1936. *Dentalina farcimen* (Soldani); Paalzow: 40, pl. 4: 30—31.
1966. *Dentalina farcimen* (*Soldani*); Jurkiewicz: 184, pl. 3: 22—25.

*Material.* — Eighteen tests.

Dimensions (mm):

| Specimen No. | IG 7322/85/F | IG 7323/85/F | IG 7324/85/F |
|---|---|---|---|
| length | 0.560 | 0.560 | 0.448 |
| width | 0.112 | 0.112 | 0.084 |
| thickness | 0.112 | 0.112 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werrakarbonate.

## *Dentalina permiana* Jones, 1850
(pl. 4: 11)

1850. *Dentalina permiana* Jones: Ellis and Messina, Cat. of Foram.
1936. *Dentalina permiana* Jones; Paalzow: 40, pl. 4: 32.
1966. *Dentalina permiana* Jones; Jurkiewicz: 184, pl. 3: 19—21.

*Material.* — Fifteen damaged tests.

Dimensions (mm):

| Specimen No. | IG 7325/85/F | IG 7326/85/F | IG 7327/85/F |
|---|---|---|---|
| length | 0.644 | 0.560 | 0.476 |
| width | 0.140 | 0.140 | 0.168 |
| thickness | 0.168 | 0.140 | 0.168 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. German basin — Werracarbonate. English basin — Lower Magnesian Limestone.

## Genus *Frondicularia* Defrance *in* d'Orbigny, 1826
## *Frondicularia permiana* Woszczyńska, 1970
(pl. 3: 19)

1970. *Frondicularia permiana* Woszczyńska: 479, pl. 1: 5.

*Material.* — Ten tests, some of them lacking proloculus.

Dimensions (mm):

| Specimen No. | IG 7328/85/F | IG 7329/85/F | IG 7330/85/F |
|---|---|---|---|
| length | 0.700 | 0.476 | 0.420 |
| width | 0.504 | 0.252 | 0.280 |
| thickness | 0.084 | 0.056 | 0.056 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## Genus *Pseudonodosaria* Boomgaart, 1949
## *Pseudonodosaria limpida* sp. n.
(pl. 5: 14—18)

*Holotypus*: IG 7334/85/F; pl. 5: 16.
*Stratum typicum*: sediments of PZ2 cyclothem (Zechstein).
*Locus typicus*: Chłapowo IG2, depth 738.5 m.
*Derivatio nominis*: from Latin *limpida* — light, transparent.

*Material.* — About two hundred well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7334/85/F | IG 7335/85/F | IG 7336/85/F |
|---|---|---|---|
| length | 0.504 | 0.448 | 0.336 |
| width | 0.252 | 0.224 | 0.168 |
| thickness | 0.196 | 0.168 | 0.140 |

*Diagnosis.* — Test straight, circular in cross-section. Chambers 4—10, generally quickly increasing in size in microspheric forms, while rather slowly growing in megalospheric forms. Chambers, except the last one, moderately inflated, low. Last chamber much inflated, sometimes somewhat elongated towards the aperture.

*Description.* — Test uniserial, straight, circular in cross-section, in general distinctly elongated, with 4—10 chambers. Proloculus of differentiated size. In microspheric forms it is followed by chambers rather rapidly increasing in size; in megalospheric forms generally each successive chamber only slightly differs from the former one. Chambers low, moderately inflated. Last chamber much inflated, sometimes somewhat elongated towards the aperture. Sutures straight, weakly depressed. Aperture terminal, ovate.

*Variability.* — It concerns mostly the size and shape of the tests and number of chambers.

*Remarks.* — In comparison with similar *Pseudonodosaria levis* sp. n., the species under consideration has more inflated and more discriminating chambers. In comparison with *P. lata* Miklukho-Maklay it has less numerous chambers, which moreover grow more rapidly, especially in microspheric forms.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Pseudonodosaria levis* sp. n.

(pl. 5: 2)

*Holotypus*: IG 7337/85/F; pl. 5: 2.

*Stratum typicum*: carbonate sediments of the cyclothem PZ2 (Zechstein).

*Locus typicus*: Chłapowo bore-hole IG2, depth 746.0 m.

*Derivatio nominis*: Latin *levis* — after the smooth test surface.

*Material.* — Seventeen tests, some of them damaged.

Dimensions (mm):

| Specimen No: | IG 7337/85/F | IG 7338/85/F | IG 7339/85/F |
|---|---|---|---|
| length | 0.504 | 0.504 | 0.420 |
| width | 0.224 | 0.196 | 0.196 |

*Diagnosis.* — Test straight distinctly elongated, circular in cross-section. Chambers, 5—8 in number, low, rather rapidly increasing in size as added, very closely joining each other, not inflated.

*Description.* — Test uniserial, straight, much elongated, circular in cross-section, with 5—8 chambers. Proloculus rarely distinct, spherical, remaining chambers low, tightly joining each others, rather rapidly increasing in size as added, not inflated. Sutures flush with the surface of the test, weakly marked. Aperture terminal, circular. Test surface smooth.

*Remarks.* — Compare remarks concerning *Pseudonodosaria limpida* sp. n.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Pseudonodosaria lata* Miklukho-Maklay, 1972

(pl. 5: 13)

1975. *Pseudonodosaria lata* Miklukho-Maklay; Miklukho-Maklay and Ukharskaya: 57, pl. 7: 16, pl. 15: 11 (here synonymy).

*Material.* — Thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7331/85/F | IG 7332/85/F | IG 7333/85/F |
|---|---|---|---|
| length | 0.364 | 0.364 | 0.336 |
| width | 0.140 | 0.140 | 0.140 |
| thickness | 0.140 | 0.140 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita.

## Genus *Pseudotristix* Miklukho-Maklay, 1960
## *Pseudotristix tcherdynzevi* Miklukho-Maklay, 1960
(pl. 3: 18)

1965. *Tristix ?tcherdynzevi* Miklukho-Maklay; Sellier de Civrieux and Dessauvagie: 42, pl. 23: 2 (here synonymy).
1970. *Spandelinoides sparcicostata* Paalzow; Woszczyńska: 479, pl. 1: 1.
1975. *Pseudotristix tcherdynzevi* Miklukho-Maklay; Miklukho-Maklay and Ukharskaya: 74, pl. 10: 13, pl. 14: 4.

*Material.* — Four well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7340/85/F | IG 7341/85/F |
|---|---|---|
| length | 0.420 | 0.364 |
| width | 0.196 | 0.196 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita, Turkey — Upper Permian.

## Genus *Lingulina* d'Orbigny, 1826
## *Lingulina linguaeformis* Paalzow, 1936
(pl. 3: 21)

1936. *Lingulina linguaeformis* Paalzow: 41, 5: 1—2.
1966. *Lingulina linguaeformis* Paalzow; Jurkiewicz: 182, pl. 3: 29.

*Material.* — Twenty tests.

Dimensions (mm):

| Specimen No. | IG 7342/85/F | IG 7343/85/F | IG 7344/85/F |
|---|---|---|---|
| length | 0.420 | 0.420 | 0.308 |
| width | 0.224 | 0.392 | 0.168 |
| thickness | 0.140 | 0.112 | 0.112 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. German basin — Werra-karbonate.

## *Lingulina magna* sp. n.
(pl. 3: 7)

*Holotypus*: IG 7345/85/F; pl. 3: 7.
*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).
*Locus typicus*: Chłapowo bore-hole IG2, depth 746.0 m.
*Derivatio nominis*: Latin *magnus* — numerous, frequent — a species being an important component of microfaunistic assemblages.

*Material.* — About a hundred well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7345/85/F | IG 7346/85/F | IG 7347/85/F |
|---|---|---|---|
| length | 0.728 | 0.700 | 0.392 |
| width | 0.308 | 0.280 | 0.224 |
| thickness | 0.224 | 0.196 | 0.168 |

*Diagnosis.* — Test large, straight, elongated, slightly compressed on both sides. Chambers, 4—7 in number, low, distinctly enlarging as added, tightly attaching to each other. Last chamber flatly convex.

*Description.* — Test uniserial, straight, slightly compressed on both sides, with 4—7 chambers. Chambers low, distinctly enlarging as added, closely attaching to each other, smooth. Last chamber flatly convex. Proloculus generally distinct, spherical. Sutures weakly arcuate or straight, indistinctly depressed. Aperture terminal, in the form of a narrow, transverse fissure.

*Remarks.* — *Lingulina magna* sp. n. differs from *L. linguaeformis* Paalzow in less compressed test, as well as in lower and less inflated chambers.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Lingulina minima* sp. n.

(pl. 4: 4—6)

*Holotypus*: IG 7348/85/F; pl. 4: 5.

*Stratum typicum*: carbonate sediments of cyclothem PZ3 (Zechstein).

*Locus typicus*: Chłapowo IG2, depth 705.0 m.

*Derivatio nominis*: after small dimensions of the test.

*Material.* — About thirty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7348/85/F | IG 7349/85/F | IG 7350/85/F |
|---|---|---|---|
| length | 0.224 | 0.224 | 0.224 |
| width | 0.112 | 0.112 | 0.084 |

*Diagnosis.* — Test straight, weakly compressed on both sides, consisting of 4—6 chamber. Chambers distinctly inflated, rather slowly growing as added. Last chamber elongated toward the aperture or flattened. Sutures straight or arcuate, incised.

*Description.* — Test uniserial, straight, weakly compressed on both sides, with 4—6 chambers. Proloculus distinct, spherical, the remaining chambers semispherical, moderately convex and rather slowly growing as added. Last chamber, generally, elongated towards the aperture, sometimes flattened, usually more inflated than the former chambers. Sutures straight or arcuate, incised. Aperture terminal, shaped as a narrow fissure.

*Remarks.* — *Lingulina minima* sp. n. differs from *L. magna* sp. n. in smaller size and smaller number of chambers, which are moreover more inflated and less rapidly increasing in size as added.

*Occurrence.* — Polish Lowlands — cyclothems PZ2 and PZ3.

## *Lingulina zechsteiniana* sp. n.

(pl. 3: 1)

*Holotypus*: IG 7351/85/F; pl. 3: 1.

*Locus typicus*: Chłapowo IG2, depth 738.5 m.

*Derivatio nominis*: after Zechstein.

*Material.* — About forty well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7351/85/F | IG 7352/85/F | IG 7353/85/F |
|---|---|---|---|
| length | 0.672 | 0.504 | 0.420 |
| width | 0.196 | 0.168 | 0.196 |
| thickness | 0.140 | 0.140 | 0.168 |

*Diagnosis.* — Test straight, somewhat compressed. Chambers, 4—6, low, with the width twice their height, slightly overlapping, tightly joining each other, slowly increasing in size as added.

*Description.* — Test uniserial, straight, slightly compressed. Chambers 4—6 in number, slightly convex, low, a little overlapping one another, with width almost twice their height. Each successive chamber larger from the former one. Sutures slightly arcuate and deepened. Aperture terminal, shaped as a narrow fissure.

*Remarks.* — In comparison with the most similar species, *Lingulina minima* sp. n., *L. zechsteiniana* sp. n. has less inflated chambers which are, generally, more horizontal.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## Genus *Lingulonodosaria* Silvestri, 1903
## *Lingulonodosaria jurkiewiczi* Miklukho-Maklay, 1975
(pl. 5: 3, 4, 7)

1975. *Lingulonodosaria jurkiewiczi* Miklukho-Maklay *in* Miklukho-Maklay and Ukharskaya: 63, pl. 9: 1, 3; pl. 16: 5—9.

*Material.* — Twenty tests.

Dimensions (mm):

| Specimen No. | IG 7354/85/F | IG 7355/85/F | IG 7356/85/F |
|---|---|---|---|
| length | 0.420 | 0.336 | 0.224 |
| width | 0.112 | 0.112 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1; USSR, Baltic region — novoakmianskaya svita.

## Family **Glandulinidae** Reuss, 1860
## Genus *Tristix* Macfadyen, 1941
## *Tristix pomeraniae* sp. n.
(pl. 3: 16, 17)

*Holotypus*: IG 7357/85/F; pl. 3: 16.

*Stratum typicum*: sediments of cyclothem PZ2.

*Locus typicus*: bore-hole Chłapowo IG2, depth 746.0 m.

*Derivatio nominis*: after the Latin name of the region of occurrence, Pomerania.

*Material.* — Twenty one well-preserved tests.

Dimensions (mm):

| Specimen No. | IG 7357/85/F | IG 7358/85/F | IG 7359/85/F |
|---|---|---|---|
| length | 0.532 | 0.420 | 0.392 |
| width | 0.196 | 0.196 | 0.196 |

*Diagnosis.* — Test triangular in cross-section, with rounded angles and concave sides, slightly widening towards the aperture. Chambers 9—12, weakly overlapping. Last chamber flattened.

*Description.* — Test uniserial, slightly widening towards the aperture, triangular in cross-section, with rounded angles and concave sides. Chambers, 9—12 in number, low, weakly overlapping. Last chamber flattened. Proloculus globular, distinct. Sutures almost flush with the test surface, weakly arcuate. Aperture terminal, circular.

*Variability.* — It concerns the number of chambers, as well as the length : width ratio of the tests.

*Remarks.* — *Tristix pomeraniae* sp. n. differs from *T. geinitzianus* Civrieux et Dessauvagie in considerably smaller number of chambers, which are more wide, especially in younger part; it is more triangular in the general, lateral outline.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## *Tristix mariusi* sp. n.

(pl. 3: 14)

*Holotypus*: IG 7360/85/F; pl. 3: 14.

*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).

*Locus typicus*: Chłapowo IG2, depth 738.5 m.

*Derivatio nominis*: after the name of my son, Mariusz.

*Material.* — Fifteen well preserved tests.

Dimensions (mm):

| Specimen No: | IG 7360/85/F | IG 7361/85/F | IG 7362/85/F |
|---|---|---|---|
| length | 0.280 | 0.224 | 0.168 |
| width | 0.168 | 0.140 | 0.140 |

*Diagnosis.* — Test triangular in cross-section, with rounded angles and weakly concave sides. Chambers 4—7 in number, distinctly overlapping, last chamber somewhat elongated towards the aperture.

*Description.* — Test uniserial, triangular in cross-section, with rounded angles and weakly concave sides. Chambers low, 4—7 in number, distinctly overlapping, slowly growing in size as added. Last chamber more inflated than the former ones and elongated towards the aperture. Proloculus globular, indistinct. Sutures bent, weakly incised. Aperture terminal, circular.

*Remarks.* — *Tristix* sp. n. differs from *T. pomeraniae* sp. n. in smaller number of chambers and more narrow and smaller test; its last chamber is inflated and elongated in contrast to that of *T. pomeraniae*, which is low and flattened.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## Family **Eouvigerinidae** Cushman, 1927

### Genus *Siphonodosaria*, 1924

### *Siphonodosaria magnifica* Scherp, 1962

(pl. 5: 9)

1962. *Siphonodosaria magnifica* Scherp: 319, pl. 12: 1—3.

*Material.* — Three well preserved tests.

Dimensions (mm):

| Specimen No. | IG 7363/85/F | IG 7364/85/F | IG 7365/85/F |
|---|---|---|---|
| length | 0.476 | 0.336 | 0.224 |
| width | 0.140 | 0.112 | 0.084 |

*Occurrence.* — Polish Lowlands — cyclothem PZ2. German basin — Werracarbonate.

## Ostracoda

(Systematics after R. C. Moore (ed.) 1961, Part Q, modified)

Order **Palaeocopida** Henningsmoen, 1953

Suborder **Beyrichicopina** Scott, 1961

Superfamily **Drepanellacea** Ulrich et Bassler, 1923

Family **Aechminellidae** Sohn, 1961

Genus *Cornigella* Warthin, 1930

### *Cornigella permiana* (Krömmelbein, 1958)

(pl. 7: 10)

1958. *Monoceratina*? permiana Krömmelbein: 115, pl. 1: 1—7.
1967. *Vollumoceratina rugensis* Knüpfer: 77, pl. 1: 5, pl. 5: 1.
1975. *Cornigella permiana* (Krömmelbein); Ivanov: 165, pl. 33: 5.

*Material.* — Three valves.

Dimensions (mm):

| Specimen No. | IG 7623/85/O | IG 7624/85/O | IG 7625/85/F |
|---|---|---|---|
| length | 0.700 | 0.616 | 0.476 |
| width | 0.364 | 0.308 | 0.224 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1, USSR, Baltic region — novoakmianskaya svita. Rügen — Lower Zechstein.

### *Cornigella* sp.

(pl. 6: 5, 6)

*Material.* — Twenty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7620/85/O | IG 7621/85/O | IG 7622/85/O |
|---|---|---|---|
| length | 0.476 | 0.336 | 0.252 |
| height | 0.224 | 0.140 | 0.140 |
| width | 0.224 | 0.112 | 0.112 |

*Description.* — Carapace ovate in lateral outline. Dorsal and ventral margins almost straight, anterior margin rather broadly rounded, posterior margin narrowly rounded, elongated. Along the dorsal margin there occur three spiny nodes; one in the anterior part and two in the posterior part; the anterior one is of a medium size, those situated at the posterior part are of unequal size, more anterior being larger than the posterior one. Two spiny nodes occur also along a ventral margin; smaller one is at the anterior end, and larger one, with a spine protruding outside, is at the posterior end. Valve surface smooth. Inner features unknown. In dorsal view, carapace is narrowing at both ends, more at the anterior one, with a protruding nodes at both sides.

*Remarks.* — *Cornigella* sp. differs from *C. permiana* in having nodes less numerous, differently shaped and distributed, and in carapaces smaller and more delicate.

*Occurrence.* — Polish Lowlands — cyclothem PZ2.

## Superfamily **Kirkbyacea** Ulrich et Bassler, 1906
## Family **Kirkbyidae** Ulrich et Bassler, 1906
## Genus *Kirkbya* Jones, 1859 emend. Knight, 1928
## *Kirkbya permiana* (Jones, 1850)
(pl. 8: 8, 10, 11)

1850. *Dithyroceris permiana* Jones; Ellis and Messina, Cat. of Ostracoda.
1967. *Kirkbya permiana* (Jones); Knüpfer: 75, pl. 4: 1, 2.
1975. *Kirkbya permiana* (Jones); Ivanov: 163, pl. 33: 1, 2.

*Material.* — Twelve rather well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7626/85/O | IG 7627/85/O | IG 7628/85/O |
|---|---|---|---|
| length | 0.840 | 0.644 | 0.560 |
| height | 0.420 | 0.280 | 0.280 |
| width | 0.364 | 0.252 | 0.252 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## ?Family **Scrobiculidae** Posner, 1951
## Genus *Roundyella* Bradfield, 1935
## *Roundyella lebaensis* Krömmelbein, 1958
(pl. 9: 1, 2, 8)

1958. *Roundyella lebaensis* Krömmelbein: 118, pl. 1: 11—15, pl. 3: 45, 46.
1967. *Roundyella lebaensis* Krömmelbein; Knüpfer: 76, pl. 1: 1.
1975. *Roundyella lebaensis* Krömmelbein; Ivanov: 164, pl. 33: 34, pl. 39: 4.

*Material.* — About fifty well-preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7629/85/O | IG 7630/85/O | IG 7631/85/O |
|---|---|---|---|
| length | 0.756 | 0.728 | 0.700 |
| height | 0.448 | 0.420 | 0.420 |
| width | 0.280 | 0.280 | 0.280 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1; USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate.

## ?Family **Aparchitidae** Jones, 1901
## Genus *Dorsoobliquella* Knüpfer, 1967
## *Dorsoobliquella pulchra* Knüpfer, 1967
(pl. 7: 11)

1967. *Dorsoobliquella pulchra* Knüpfer: 76, pl. 1: 2—4, pl. 4: 3.
1975. *Dorsoobliquella pulchra* Knüpfer; Ivanov: 162, pl. 32: 10—12.

*Material.* — About two hundred well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7632/85/O | IG 7633/85/O | IG 7634/85/O |
|---|---|---|---|
| length | 0.868 | 0.756 | 0.700 |
| height | 0.588 | 0.504 | 0.476 |
| width | 0.448 | 0.364 | 0.308 |

*Variability.* — Carapaces of this species slightly vary in shape — mostly in their length : height ratio; right valves are more or less overlapping the left ones along the dorsal margin.

*Occurrence.* — Polish Lowlands — cyclothems PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita, zhalghiriayskaya svita and ghalindackaya svita. German basin — Werrakarbonate.

## Order **Podocopida** Müller, 1894
## Suborder **Podocopina** Sars, 1866
## Superfamily **Bairdiacea** Sars, 1888
## Family **Bairdiidae** Sars, 1888
## *Genus Bairdia* McCoy, 1844
## *Bairdia plebeia* Reuss, 1854

(pl. 10: 7—10)

1854. *Bairdia plebeia* Reuss; Ellis and Messina, Cat. of Ostracoda.
1958. *Bairdia pommeriana* Krömmelbein: 125, pl. 2: 36—38.
1961. *Bairdia* sp. cf. *ardmorensis* Harlton; Odrzywolska-Bieńkowa: 545, pl. 2: 3.
1967. *Bairdia* sp. aff. *permiana* Geis; Knüpfer: 79—80, pl. 2: 1.
1970. *Bairdia pommeriana* Krömmelbein; Woszczyńska: 482, pl. 2: 5.
1975. *Bairdia plebeia* Reuss; Ivanov: 171—172, pl. 35: 1—5.

*Material.* — Twenty preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7635/85/O | IG 7636/85/O | IG 7637/85/O |
|---|---|---|---|
| length | 0.812 | 1.064 | 0.420 |
| height | 0.420 | 0.504 | 0.196 |
| width | 0.280 | 0.364 | 0.068 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita and zhalghiriayskaya svita. German basin — Werrakarbonate.

## *Bairdia knuepferi* Ivanov, 1975

(pl. 8: 4—7)

1962. *Bairdiocypris*? sp. 2, 3; Eichenberg, pl. 37: 4, 5.
1967. *Bairdia pisces* (Richter); Knüpfer: 78, fig. 2: 3.
1975. *Bairdia knuepferi* Ivanov: 173, pl. 36: 4, 5.

*Material.* — About one hundred fifty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7638/85/O | IG 7639/85/O | IG 7640/85/O |
|---|---|---|---|
| length | 0.840 | 0.812 | 0.812 |
| height | 0.504 | 0.420 | 0.420 |
| width | 0.364 | 0.336 | 0.364 |

*Variability.* — There is a considerable variability in *B. kneupferi* which concerns the degree of carapace inflation and overlapping of the right valve by the left one.

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita and zhalghiriayskaya svita. German basin — Werra-karbonate, Stassfurtkarbonate.

## *Bairdia ampla* Reuss, 1854
(pl. 8: 1)

1854. *Bairdia ampla* Reuss; Ellis and Messina, Cat. of Ostracoda.
1867. *Cythere (Bairdia) ampla* Reuss; Schmid: 581, pl. 6: 39.
1967. *Bairdia ampla* Reuss; Knüpfer: 79, pl. 2: 2.

*Material.* — Thirty quite well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7641/85/O | IG 7642/85/O | IG 7643/85/O |
|---|---|---|---|
| length | 0.980 | 1.008 | 0.980 |
| height | 0.616 | 0.644 | 0.560 |
| width | 0.448 | 0.476 | 0.364 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. German basin — Werra-carbonate.

## *Bairdia hisingeri* (Münster, 1830)
(pl. 9: 6)

1830. *Cythere hisingeri* Münster; Ellis and Messina, Cat. of Ostracoda.
1975. *Bairdia hisingeri* (Muenster); Ivanov: 172, pl. 36: 1—3.

*Material.* — About twenty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7644/85/O | IG 7645/85/O | IG 7646/85/O |
|---|---|---|---|
| length | 1.064 | 1.108 | 0.868 |
| height | 0.476 | 0.560 | 0.420 |
| width | 0.364 | 0.420 | 0.336 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. USSR, Baltic region — novoakmianskaya svita and zhalghiriayskaya svita. German basin — Stassfurtkarbonate. English basin — Carboniferous.

## Genus ?*Acratia* Delo, 1930
## *Acratia acuta* (Jones, 1850)
(pl. 10: 2, 3)

1850. *Cythere (Bairdia?) acuta* Jones; Ellis and Messina, Cat. of Ostracoda.
1958. *Bairdia* cf. *acuta* (Jones); Krömmelbein: 126, pl. 3: 42—44.
1975. *Acratia* sp.; Ivanov: 177, pl. 37: 7—9.

*Material.* — Thirty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7647/85/O | IG 7648/85/O | IG 7649/85/O |
|---|---|---|---|
| length | 0.924 | 0.896 | 0.840 |
| height | 0.364 | 0.392 | 0.420 |
| width | 0.364 | 0.392 | 0.336 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita and zhalghiriayskaya svita. German basin — Werrakarbonate. English basin —Lower Magnesian Limestone.

## *Acratia polonica* sp. n.

(pl. 6: 1)

*Holotypus*: IG 7620/85/O; pl. 6: 1.
*Stratum typicum*: sediments of cyclothem PZ2.
*Locus typicus*: bore-hole Kłanino IG1, depth 720.0 m.
*Derivatio nominis*: Latin *polonicus* — Polish.

*Material.* — Thirty tests.

Dimensions (mm):

| Specimen No. | IG 7650/85/O | IG 7651/85/O | IG 7652/85/O |
|---|---|---|---|
| length | 0.784 | 0.784 | 0.700 |
| height | 0.392 | 0.252 | 0.364 |
| width | 0.336 | 0.252 | 0.336 |

*Diagnosis.* — Carapace semicircular in lateral outline, strongly inflated. Anterior end gently pointed and elongated, posterior end more elongated than the anterior one, distinctly sharpened.

*Description.* — Carapace semicircular in lateral outline. Dorsal margin strongly arched, ventral margin almost straight. Posterior margin angularly rounded, gently pointed, posterior margin more elongated than the anterior one, distinctly sharpened. Surface of the carapace smooth. Left valve slightly larger than the right one overlapping it along the entire margin, stronger along of the middle part of the ventral margin. Inner features unknown in dorsal view carapace strongly inflated, with sharpened ends. Ventral side generally flattened.

*Variability.* — It concerns the carapace lateral and dorsal outline, mostly their length : height : width ratio. Ventral side may be flattened or slightly concave at the middle.

*Remarks.* — *Acratia polonica* sp. n. differs from *A. acuta* (Jones) in more inflated carapace, its shorter anterior end and less pointed posterior end.

*Occurrence.* — Polish Lowlands — cyclothem PZ2 and PZ3.

## Genus *Bairdiacypris* Bradfield, 1935
## *Bairdiacypris jonesiana* (Kirkby, 1858)

(pl. 10: 1)

1858. *Bairdia jonesiana* Kirkby; Ellis and Messina, Cat. of Ostracoda.
1975. *Bairdiacypris jonesiana* (Kirkby); Ivanov: 175, pl. 37: 1, 2, pl. 39: 10.

*Material.* — Seven well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7653/85/O | IG 7654/85/O | IG 7655/85/O |
|---|---|---|---|
| length | 1.316 | 1.344 | 1.260 |
| height | 0.560 | 0.560 | 0.476 |
| width | 0.476 | 0.476 | 0.420 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region, Belorussya — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Carboniferous.

## Genus *Bythocypris* Brady, 1880
## *Bythocypris kroemmelbeini* sp. n.
(pl. 10: 4—6)

1958. *Bairdiocypris*? sp.; Krömmelbein: 123, pl. 2: 28—31.
*non* 1967. *Bairdiocypris*? sp. *sensu* Krömmelbein; Knüpfer: 84, pl. 3: 1.

*Holotypus*: IG 7656/85/O; pl. 10: 4.

*Stratum typicum*: sediments of cyclothem PZ1.

*Locus typicus*: bore-hole Łochów IG1, depth 1602.0 m.

*Derivatio nominis*: after name of German geologist, K. Krömmelbein, who for the first time described the carapaces of this species.

*Material.* — Thirty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7656/85/O (holotype) | IG 7657/85/O (paratype) | IG 7658/85/O (paratype) |
|---|---|---|---|
| length | 0.644 | 0.588 | 0.588 |
| height | 0.280 | 0.336 | 0.308 |
| width | 0.308 | 0.252 | 0.252 |

*Diagnosis.* — Carapace angularly ovate in lateral outline, moderately and almost evenly inflated. Anterior margin somewhat obliquely and rather narrowly elongated, posterior end abruptly truncated.

*Description.* — Carapace angularly ovate in lateral outline, elongated, moderately and almost evenly inflated, with sides nearly parallel. Dorsal margin gently rounded, ventral margin slightly concave. Anterior end somewhat obliquely and narrowly elongated, posterior end abruptly, almost vertically truncated. Left valve overlaps the right one most strongly along the ventral margin. Surface of the carapace smooth. Inner features unknown. In dorsal view carapace ovate, elongated, with posterior end only slightly wider than the anterior one, and both ends rounded.

*Remarks.* — *Bythocypris kroemmelbeini* is similar to *B. exiqua* Kummerow, but it has slightly wider anterior end of the carapace. The posterior end is rounded in *B. exiqua* and bevelled in *B. kroemmelbeini*.

*Occurrence.* — Polish Lowlands — cyclothem PZ1.

## Genus *Fabalicypris* Cooper, 1946
## *Fabalicypris parvus* Kotschetkova, 1972
(pl. 6: 7)

1972. *Fabalicypris parvus* Kotschetkova *in* Kotschetkova and Guseva: 63, pl. 21: 2 (*fide* Ivanov 1975).
1975. *Fabalicypris parvus* Kotschetkova; Ivanov: 176, pl. 37: 3—6.

*Material.* About thirty carapaces.

Dimensions (mm):

| Specimen No. | IG 7659/85/O | IG 7660/85/O | IG 7661/85/O |
|---|---|---|---|
| length | 0.504 | 0.448 | 0.364 |
| height | 0.224 | 0.196 | 0.168 |
| width | 0.196 | 0.140 | 0. 40 |

*Remarks.* — The examined carapaces differ from those described by Ivanov (1975) in being more compressed and having more narrow posterior end.

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. USSR, Baltic region, novoakmianskaya svita.

## Family **Haworthinidae** Ivanov, 1975
## Genus *Haworthina* Kellett, 1935
## *Haworthina patria* Ivanov, 1975
(pl. 9: 7)

1970. *Bairdia subrotunda* Hou; Woszczyńska: 483, pl. 2: 3a b.
1975. *Haworthina patria* Ivanov: 178, pl. 38: 4, 5.

*Material.* — About fifty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7662/85/O | IG 7663/85/O | IG 7664/85/O |
|---|---|---|---|
| length | 0.700 | 0.560 | 0.560 |
| height | 0.392 | 0.364 | 0.336 |
| width | 0.336 | 0.280 | 0.280 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. USSR, Baltic region, novoakmianskaya svita.

## Superfamily **Cytheracea** Baird, 1850
## Family **Bythocytheridae** Sars, 1926
## Genus *Monoceratina* Roth, 1928
## *Monocerathina longissima* Krömmelbein, 1958
(pl. 9: 9—11)

1958. *Monoceratina? longissima* Krömmelbein: 117, pl. 1: 8—10.
1975. *Monoceratina longissima* Krömmelbein; Ivanov: 181, pl. 38: 10.

*Material.* — About fifty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7665/85/O | IG 7666/85/O | IG 7667/85/O |
|---|---|---|---|
| length | 0.392 | 0.363 | 0.308 |
| height | 0.168 | 0.168 | 0.140 |
| width | 0.168 | 0.168 | 0.140 |

*Remarks.* — Krömmelbein (1958) described *Monoceratina longissima* from the bore-hole Łeba 1 (depth 645.0) from sediments of cyclothem PZ1. I have not found, so far, this species in any carbonate sediments of the cyclothem PZ1. On the contrary to Krömmelbein's observations, this species is characteristic of sediments of the cyclothem PZ2 of Polish Lowlands.

*Occurrence.* — Polish Lowlands — cyclothem PZ2. USSR, Baltic region — zhalghiriayskaya svita.

## Family **Cytherideidae** Sars, 1925
## Genus *Basslerella* Kellett, 1935
## *Basslerella regularis* (Richter, 1867)
(pl. 6: 4)

1867. *Cythere regularis* Richter; Ellis and Messina, Cat. of Ostracoda.
1975. *Basslerella regularis* (Richter); Ivanov: 179, pl. 38: 1, 2.

*Material.* — Twenty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7668/85/O | IG 7669/85/O | IG 7670/85/O |
|---|---|---|---|
| length | 0.392 | 0.364 | 0.364 |
| height | 0.168 | 0.168 | 0.168. |
| width | 0.168 | 0.168 | 0.168 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2. USSR, Baltic region, Byelorussia — novoakmianskaya svita.

## *Basslerella suavis* Ivanov, 1975
(pl. 8: 9)

1975. *Basslerella suavis* Ivanov: 180, pl. 38: 3; pl. 39: 8.

*Material.* — About thirty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7671/85/O | IG 7672/85/O | IG 7673/85/O |
|---|---|---|---|
| length | 0.448 | 0.420 | 0.392 |
| height | 0.196 | 0.224 | 0.196 |
| width | 0.196 | 0.196 | 0.196 |

*Remarks.* — *Basslerella suavis* differs from *B. regularis* in carapaces more inflated, more oval in lateral outline and having considerably shorter posterior end. Carapaces from Poland are less inflated than those from the USSR.

*Occurrence.* — Polish Lowlands — cyclothems PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita.

## Suborder **Metacopina** Sylvester-Bradley, 1961
## Superfamily **Healdiacea** Harlton, 1933
## Family **Healdiidae** Harlton, 1933
## Genus *Healdia* Roundy, 1926
## *Healdia dahlgrueni* Krömmelbein, 1958
(pl. 9: 3—5)

1958. *Healdia dahlgrüni* Krömmelbein: 120, pl. 2: 16—23.
1975. *Healdia dahlgrüni* Kroemmelbein; Ivanov: 169, pl. 34: 1—3; pl. 39: 7.

*Material.* — Over sixty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7674/85/O | IG 7675/85/O | IG 7676/85/O |
|---|---|---|---|
| length | 0.644 | 0.616 | 0.616 |
| height | 0.420 | 0.420 | 0.392 |
| width | 0.336 | 0.308 | 0.308 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novo-akmianskaya svita. German basin — Werrakarbonate.

## *Healdia zechsteiniana* sp. n.

(pl. 6: 2)

*Holotypus*: IG 7677/85/O; pl. 6: 2.
*Stratum typicum*: carbonate sediments of cyclothem PZ2 (Zechstein).
*Locus typicus*: bore-hole Salino IG 1, depth 792.8 m.
*Derivatio nominis*: after its stratigraphic position.

*Material.* — Thirty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7677/85/O | IG 7678/85/O | IG 7679/85/O |
|---|---|---|---|
| length | 0.560 | 0.532 | 0.392 |
| height | 0.336 | 0.308 | 0.224 |
| width | 0.252 | 0.280 | 0.196 |

*Diagnosis.* — Carapace subovate in lateral outline, elongated. On the right valve, in its posteroventral part, there occurs a small, blunt, backward directed spine.

*Description.* — Carapace subovate in lateral outline, elongated. Dorsal margin gently rounded, ventral margin almost straight. Anterior margin rounded, somewhat truncated in its upper part, posterior margin more broadly rounded. The left valve, larger than the right one, overlaps the latter along the entire margin. Carapace smooth; on the right valve, in its posteroventral part close to the ventral margin, there occurs a short spine directed backward. Inner features unknown. In dorsal view carapace subovate, with anterior end elongated and slightly pointed, whereas posterior end narrowly rounded.

*Variability.* — It concerns mostly the outline of the dorsal margin, the carapace inflation and the length of the posteroventral spine.

*Remarks.* — In comparison with *Healdia dahlgrueni* Krömmelbein, carapaces of the new species are less inflated laterally, without furrows on lateral sides and with only one spine developed on the right valve, in contrast to more numerous spines, in the former species.

*Occurrence.* — Polish Lowlands — cyclothems PZ2 and PZ3.

## Family **Bairdiocyprididae** Shaver, 1958

## Genus *Pseudobythocypris* Shaver, 1958

## *Pseudobythocypris eichenbergi* sp. n.

(pl. 7: 7—9)

1962. "*Bythocypris*" (?) sp. 2; Eichenberg: 505, pl. 1: 2, 4.

*Holotypus*: IG 7680/85/O; pl. 7: 7.
*Stratum typicum*: sediments of cyclothem PZ2.
*Locus typicus*: bore-hole Lidzbark Warmiński 1, depth 1554.0 m.
*Derivatio nominis*: from the name of German geologist, W. Eichenberg, who for the first time described carapaces of this species.

*Material.* — About two houndred well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7680/85/O (holotype) | IG 7681/85/O (paratype) | IG 7682/85/O (paratype) |
|---|---|---|---|
| length | 0.504 | 0.392 | 0.252 |
| height | 0.252 | 0.196 | 0.112 |
| width | 0.224 | 0.168 | 0.112 |

*Diagnosis.* — Carapace subovate in lateral outline, weakly inflated, especially in the central area. Anterior margin narrowly and rather obliquely rounded, posterior end broadly rounded.

*Description.* — Carapace small, ovate and elongated in lateral outline. Dorsal margin slightly rounded, ventral margin straight. Anterior end narrowly, rather obliquely rounded, posterior end broadly rounded. The left valve very weakly overlaps the right one. Carapace surface smooth. In dorsal view carapace rather slim, nearly evenly inflated (mostly at the centre) and pointed at the anterior end.

*Variability.* — It concerns mostly the general lateral outline of the carapace which may be more or less regularly ovate.

*Remarks.* — *Pseudobythocypris eichenbergi* most resembles *P. pediformis* (Knight), from which it differs in its carapace ends which are both regularly rounded whereas *P. pediformis* has the anterior end rounded and the posterior one slightly narrowed.

*Occurrence.* — Polish Lowlands — cyclothems PZ2, PZ3. German basin — Stassfurtkarbonate.

## Family ?**Cavellinidae** Egorov, 1950
## Genus *Cavellina* Coryell, 1928
## *Cavellina permiana* Kotschetkova, 1972

(pl. 7: 1—6)

1962. "*Bythocypris*" (?) sp. 1; Eichenberg: 505, fig. 1: 1, 3.
1962. *Bairdia* (?) sp. 5; Eichenberg, pl. 37: 1.
1967. *Cavellina* n. sp. Knüpfer: 84, pl. 3: 4.
1972. *Cavellina permiana* Kotschetkova *in* Kotschetkova and Guseva: 22, pl. 11: 1—7.
1975. *Cavellina permiana* Kotschetkova; Ivanov: 168, pl. 32: 6—9.

*Material.* — Over a hundred well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7683/85/O | IG 7684/85/O | IG 7685/85/O |
|---|---|---|---|
| length | 0.840 | 0.784 | 0.672 |
| height | 0.504 | 0.448 | 0.420 |
| width | 0.364 | 0.336 | 0.392 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1 (very rare), PZ2, PZ3. USSR, Baltic region — novoakmianskaya svita, zhalghiriayskaya svita and ghalindatskaya svita. German basin — Werrakarbonate, Stassfurtkarbonate.

## Suborder and Family unknown
## Genus *Microcheilinella* Geis, 1933
## *Microcheilinella artiensis* Guseva, 1972

(pl. 10: 11, 12)

1961. ?*Cytherella berwynensis* Bradfield; Odrzywolska-Bieńkowa: 546, pl. 3: 5.
1972. *Microcheilinella artiensis* Guseva *in* Kotschetkova and Guseva: 35, pl. 14: 5 (*fide* Ivanov 1975).
1975. *Microcheilinella artiensis* Guseva; Ivanov: 160, pl. 32: 2.

*Material.* — Fifteen well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7686/85/O | IG 7687/85/O | IG 7688/85/O |
|---|---|---|---|
| length | 0.420 | 0.364 | 0.336 |
| height | 0.224 | 0.224 | 0.196 |
| width | 0.252 | 0.280 | 0.224 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita.

### *Microcheilinella nuciformis* (Jones, 1850)

(pl. 6: 8—10)

1850. *Cythere nuciformis* Jones; Ellis and Messina, Cat. of Ostracoda.
1967. *Pachydomella nuciformis* (Jones); Knüpfer: 85, pl. 3: 5.
1975. *Microcheilinella nuciformis* (Jones); Ivanov: 160, pl. 32: 2.

*Material.* — Fifteen well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7689/85/O | IG 7690/85/O | IG 7691/85/O |
|---|---|---|---|
| length | 0.420 | 0.364 | 0.364 |
| height | 0.224 | 0.252 | 0.224 |
| width | 0.280 | 0.252 | 0.224 |

*Occurrence.* — Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita. German basin — Werrakarbonate. English basin — Lower Magnesian Limestone.

## Suborder **Cladocopina** Sars, 1866
## Family **Polycopidae** Sars, 1866
## Genus *Polycope* Sars, 1866
### *Polycope perminuta* (Kellett, 1933)

(pl. 8: 2, 3)

1933. *Paraparchites* (?) *perminutus* Kellett: 67, pl. 13: 31, 32.
1975. *Polycope perminutus* (Kellett); Ivanov: 167, pl. 33: 6—11.

*Material.* — Over thirty well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7692/85/O | IG 7693/85/O | IG 7694/85/O |
|---|---|---|---|
| length | 0.336 | 0.280 | 0.280 |
| height | 0.336 | 0.280 | 0.252 |
| width | 0.168 | 0.140 | 0.140 |

*Occurrence.* Polish Lowlands — cyclothem PZ1. USSR, Baltic region — novoakmianskaya svita; German basin — Werrakarbonate; North America — Pennsylvanian — Permian.

## *Nomina dubia*
## Genus *Kelletella* Delo, 1930

(pl. 6: 3)

1975. *Kelletella kotschetkovae* Ivanov: 162, pl. 32: 3—5.

*Material.* — About a hundred well preserved carapaces.

Dimensions (mm):

| Specimen No. | IG 7695/85/O | IG 7969/85/O | IG 7697/85/O |
|---|---|---|---|
| length | 0.504 | 0.504 | 0.420 |
| height | 0.280 | 0.280 | 0.224 |

*Occurrence.* — Polish Lowlands — cyclothems PZ1, PZ2 and PZ3. USSR, Baltic region and Lithuania — novoakmianskaya svita.

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STANISŁAWA WOSZCZYŃSKA

## OTWORNICE I MAŁŻORACZKI Z WĘGLANOWYCH OSADÓW CECHSZTYNU POLSKI

*Streszczenie*

Z osadów cyklotemów PZ1, PZ2 i PZ3 opisano i zilustrowano (plansze 1—10) 56 gatunków otwornic (17 nowych) oraz 26 gatunków małżoraczków (4 nowe). Próby do badań pochodzą z wierceń z następujących regionów (fig. 1, tabela 1): 1. synekliza peribałtycka, 2. obniżenie podlaskie, 3. strefa Koszalina-Chojnic i 4. monoklina przedsudecka. Zbadano 4.000 prób, z których mniej niż 30% zawierało mikrofaunę. Materiał do badań stanowią wyizolowane ze skały, dobrze zachowane skorupki i, na ogół, całe pancerzyki małżoraczków. Nie badano mikrofauny w szlifach skał.

Rozprzestrzenienie regionalne mikrofauny w cechsztynie Polski jest bardzo niejednolite: najbardziej zróżnicowane gatunkowo i najliczniejsze są otwornice

i małżoraczki w wierceniach z obszaru syneklizy peribałtyckiej i następnie, obniżenia podlaskiego, a najuboższy w mikrofaunę jest obszar monokliny przedsudeckiej.

Również rozprzestrzenienie stratygraficzne mikrofauny jest niejednakowe w poszczególnych cyklotemach (tabela 2). W Wapieniu Cechsztyńskim (cyklotem PZ1) mikrofauna, a zwłaszcza otwornice, jest bardzo zróżnicowana gatunkowo (w tym wiele nowych gatunków) i występuje bardzo licznie. Wykazuje ona duże powiązania z mikrofauną całej Europy (ponad 30 gatunków wspólnych z nadbałtyckim obszarem ZSRR i ponad 40 z basenami Europy zachodniej).

W Dolomicie Głównym (cyklotem PZ2) mikrofauna jest mniej zróżnicowana niż w Wapieniu Cechsztyńskim, a otwornice tracą dominującą rolę w zespołach faunistycznych. W porównaniu z otwornicami Wapienia Cechsztyńskiego, w Dolomicie Głównym występuje zespół odmienny, zawierający wiele nowych gatunków. Wśród małżoraczków większość gatunków przechodzi z Wapienia Cechsztyńskiego, lecz również pojawiają się nowe gatunki. Mikrofauna Dolomitu Głównego Polski różni się od mikrofauny pozostałych regionów Europy swoim dużym zróżnicowaniem. Ma ona większe powiązania z fauną Europy wschodniej (nadbałtycki obszar ZSRR), z którą łączy ją 7 gatunków, niż Europy zachodniej, z którą ma tylko 2 gatunki wspólne (tabela 2).

W Dolomicie Płytowym mikrofauna z obszaru Polski, licząca 16 gatunków (w tym nowy gatunek otwornicy), ma tylko 2 gatunki wspólne ze wschodnim obszarem Europy i żadnych elementów wspólnych z pozostałymi partiami basenu cechsztyńskiego.

Odmienny skład mikrofaunistyczny, jaki obserwuje się pomiędzy osadami poszczególnych cyklotemów pozwala na wyróżnienie dwóch zespołowych poziomów mikrofaunistycznych w cechsztynie Polski:

I — *Geinitzina richteri* — *Roundyella lebaensis*, który obejmuje osady cyklotemu PZ1 oraz

II — *Lingulina minima* — *Dorsoobliquella pulchra*, który obejmuje osady cyklotemów PZ2 i PZ3.

Opracowane materiały są przechowywane w Muzeum Instytutu Geologicznego w Warszawie.

## EXPLANATION OF PLATES 1—10

Abbreviation used in plates 6—10: *C* carapace, *LV* left valve, *RV* right valve

### Plate 1

1. *Reophax belfordi* Crespin: IG 7216/85/F, ×120, Bielawa Górna N-19, depth 602.3 m, cyclothem PZ1.
2, 3. *Ammobaculites procera* Scherp: *2* IG 7225/85/F, ×120; *3* IG 7226/85/F, ×75, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

4—6. *Ammobaculites eiseli* (Spandel): *4* IG 7222/85/F, ×100; *5* IG 7223/85/F, ×150; *6* IG 7224/85/F, ×240, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
7, 8. *Agathammina pusilla* (Geinitz): *7* IG 7279/85/F, ×100; *8* IG 7280/85/F, ×94, Białogarda IG 1, depth 926.0 m, cyclothem PZ1.
9, 10. *Haplophragmoides probata* Scherp: *9* IG 7220/85/F, ×100; *10* IG 7219/85/F, ×220, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
11. *Agathammina miliolides* (Jones, Parker et Kirkby): IG 7282/85/F, ×100, Białogarda IG 1, depth 919.0 m, cyclothem PZ1.
12. *Glomospira regularis* Scherp: IG 7207/85/F, ×480, Sępopol 2, depth 1352.7 m, cyclothem PZ1.
13, 14. *Glomospira spirialis* Scherp: *13* IG 7211/85/F, ×300; *14* IG 7210/85/F, ×150, Lidzbark Warmiński 3, depth 1666.4 m, cyclothem PZ1.
15. *Cyclogyra kinkelini* (Spandel): IG 7276/85/F, ×220, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

## Plate 2

1, 2. *Geinitzina cylindrica* sp. n.: *1* paratype IG 7267/85/F, ×240; *2* holotype, IG 7268/85/F, ×220, Chłapowo IG 2, depth 738.5 m, cyclothem PZ2.
3. *Geinitzina wagneri* sp. n.: holotype, IG 7261/85/F, ×260, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
4, 5. *Spandelina kirkbyi minuta* (Scherp): *4* IG 7246/85/F, ×220; *5* IG 7247/85/F, ×150, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
6, 7. *Geinitzina richteri* Miklukho-Maklay: *6* IG 7249/85/F, ×100 Tłuszcz IG 1, depth 1618.2 m, cyclothem PZ1; *7* IG 7250/85/F, ×150, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
8, 11. *Trochammina brevis* Ukharskaya: *8* IG 7213/85/F, ×150; *11* IG 7214/85/F, ×150, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
9, 10. *Spandelina kirkbyi kirkbyi* (Richter): *9* IG 7240/85/F, ×150; *10* IG 7241/85/F, ×220, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
12. *Geinitzina gigantea lithuanica* Miklukho-Maklay: IG 7258/85/F, ×150, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
13. *Ammodiscus roessleri* (Schmid): IG 7204/85/F, ×100, Białogarda IG 1, depth 919.0 m, cyclothem PZ1.
14—16. *Ammodiscus bradynus* (Spandel): *14* IG 7206/85/F, ×120 Białogarda IG 1, depth 962.0 m, cyclothem PZ1; *15* apertural view, IG 7205/85/F, ×160; *16* side view IG 7203/85/F, ×100, Dębki IG 1, depth 555.3 m, cyclothem PZ2.

## Plate 3

1. *Lingulina zeichsteiniana* sp. n.: holotype, IG 7351/85/F, ×100, Chłapowo IG 2, depth 738.5 m, cyclothem PZ2.
2. *Lunucammina olgae* sp. n.: holotype, IG 7237/85/F, ×100, Jastarnia IG 1, depth 836.0 m, cyclothem PZ2.
3. *Spandelina cavernula* Paalzow: IG 7243/85/F, ×100, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
4. *Lunucammina hastata* Scherp: IG 7229/85/F, ×120, Kętrzyn IG 2, depth 1382.8 m, cyclothem PZ2.
5, 6. *Geinitzina postcarbonica* Spandel: *5* IG 7253/85/F, ×100, Kętrzyn IG 2, depth 1382.8 m; *6* IG 7252/85/F, ×100, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
7. *Lingulina magna* sp. n.: holotype IG 7345/85/F, ×100, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.

8. *Geinitzina compacta* sp. n.: holotype IG 7264/85/F, ×120, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
9—11. *Geinitzina triangularis* Chapman et Howchin: *9* IG 7257/85/F, ×100, Kętrzyn IG 2, depth 1382.8 m; *10* IG 7256/85/F, ×100, Kętrzyn IG 2, depth 1382.8 m; *11* IG 7255/85/F, ×100, Kłanino IG 1, depth 716.0 m, cyclothem PZ2.
12, 13. *Lunucammina plana* Scherp: *12* IG 7232/85/F, ×100, Kętrzyn IG 2, depth 1382.8 m; *13* IG 7231/85/F, ×120, Kłanino IG 1, depth 716.0 m, cyclothem PZ2.
14. *Tristix mariusi* sp. n.: holotype IG 7360/85/F, ×260, Salino IG 1, depth 786.5 m, cyclothem PZ2.
15. *Geinitzina flabellata* Miklukho-Maklay: IG 7270/85/F, ×150, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
16, 17. *Tristix pomeraniae* sp. n.: *16* holotype, IG 7357/85/F, ×110; *17* paratype IG 7361/85/F, ×100, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
18. *Pseudotristix tscherdynzevi* Miklukho-Maklay: IG 7340/85/F, ×180, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
19. *Frondicularia permiana* Woszczyńska: IG 7328/85/F, ×78, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.
20. *Lunucammina celsa* sp. n.: holotype, IG 7234/85/F, ×150, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
21. *Lingulina linguaeformis* Paalzow: IG 7343/85/F, ×150, Barciany 1, depth 1170.7 m, cyclothem PZ2.

## Plate 4

1, 2. *Nodosaria aequalis* sp. n.: *1* holotype, IG 7303/85/F, ×160; paratype, *2* IG 7304/85/F, ×130, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
3. *Calcitornella rotunda* Scherp: *a* flat and *b* convex side, IG 7285/85/F, ×120, Jastrzębia Góra IG 2, depth 602.9 m, cyclothem PZ2.
4—6. *Lingulina minima* sp. n.: *4* paratype IG 7349/85/F, ×100; *5* holotype IG 7348/85/F, ×240; *6* paratype IG 7350/85/F, ×100; Chłapowo IG 2, depth 705.0 m, cyclothem PZ2.
7, 8. *Nodosaria conicodensestriata* Paalzow: *7* IG 7294/85/F, ×110; *8* IG 7295/85/F, ×100, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
9. *Nodosaria striatula* sp. n.: holotype, IG 7300/85/F, ×110, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
10. *Dentalina farcimen* (Soldani): IG 7322/85/F, ×110, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
11. *Dentalina permiana* Jones: IG 7325/85/F, ×110, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
12. *Calcitornella extensa* Scherp: *a* and *b* side views, IG 7291/85/F, ×100, Dębki IG 1, depth 556.3 m, cyclothem PZ2.
13, 14. *Calcitornella inflata* Scherp: *13a* flat and *b* convex side, IG 7288/85/F, ×100, Czarny Młyn IG 2, depth 605.4 m, cyclothem PZ2; *14* IG 7288/85/F, ×260, Jastarnia IG 1, depth 836.0 m, cyclothem PZ2.
15. *Pachyploia schwageri* Civrieux et Dessauvagie: IG 7273/85/F, ×100, Kętrzyn IG 2, depth 1382.8 m, cyclothem PZ2.
16, 17. *Nodosaria permiana* (Spandel): *16* IG 7318/85/F, ×300; *17* IG 7319/85/F, ×100, Sępopol 2, depth 1660.6 m, cyclothem PZ1.
18. *Astacolus oblongus* Miklukho-Maklay: IG 7321/85/F, ×440, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.

Plate 5

1. *Nodosaria lineata* sp. n.: holotype, IG 7309/85/F, ×150, Chłapowo IG 2, depth 738.5 m, cyclothem PZ2.
2. *Pseudonodosaria levis* sp. n.: IG 7337/85/F, ×120, Chłapowo IG 2, depth 746.0 m, cyclothem PZ2.
3, 4, 7. *Lingulonodosaria jurkieviczi* Miklukho-Maklay: *3* IG 7355/85/F, ×100; *4* IG 7354/85/F, ×100; *7* IG 7356/85/F, ×320, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
5, 6. *Nodosaria polonica* sp. n.: *5* holotype, IG 7297/85/F, ×150; *6* paratype, IG 7298/85/F, ×110, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
8. *Nodosaria kingi* (Jones): IG 7312/85/F, ×72, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
9. *Siphonodosaria magnifica* Scherp: IG 7353/85/F, ×100, Białogarda IG 1, depth 822.0 m, cyclothem PZ1.
10. *Nodosaria candida* sp. n.: holotype, IG 7306/85/F, ×100, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
11, 12. *Nodosaria ovalis* Schmid: *11* IG 7315/85/F, ×100; *12* IG 7316/85/F, Białogarda IG 1, depth 922.0 m, cyclothem PZ1.
13. *Pseudonodosaria lata* Miklukho-Maklay: IG 7331/85/F, ×200, Tłuszcz IG 1, depth 1618.2 m, cyclothem PZ1.
14—18. *Pseudonodosaria limpida* sp. n.: *14* paratype, IG 7366/85/F, ×200; *15* paratype, IG 7368/85/F, ×100; *16* holotype, IG 7334/85/F, ×220; *17* paratype, IG 7335/85/F, ×240; *18* paratype, IG 7336/85/F, ×360, Chłapowo IG 2, depth 738.5 m, cyclothem PZ2.

Plate 6

1. *Acratia polonica* sp. n.: holotype, C *a* left side, *b* ventral side, IG 7620/85/F, ×150, Kłanino IG 1, depth 720.0 m, cyclothem PZ2.
2. *Healdia zeichsteiniana* sp. n.: holotype, C *a* left side, oblique view, *b* ventral side, *c* dorsal side, IG 7677/85/O, ×100, Jastrzębia Góra IG 2, depth 605.0 m, cyclothem PZ2.
3. *Kelletella kotschetkovae* Ivanov: C *a* lateral view, *b* dorsal view, IG 7695/85/O, ×100, Jamno IG 3, depth 1970.7 m, cyclothem PZ1.
4. *Basslerella regularis* (Richter): C *a* right side, *b* left side, IG 7668/85/O, ×100, Jamno IG 3, depth 1970.7 m, cyclothem PZ1.
5, 6. *Cornigella* sp.: *5* C left side, oblique view, IG 7620/85/O, ×100; *6* C ventral side, IG 7621/85/O, ×120, Chłapowo IG 3, depth 712.0 m, cyclothem PZ2.
7. *Fabalicypris parvus* Kotschetkova: C *a* right side, *b* dorsal side, IG 7659/85/O, ×100, Swarzewo IG 10, depth 700.5 m, cyclothem PZ2.
8—10. *Microcheilinella nuciformis* (Jones): *8* C *a* left side, *b* dorsal side, *c* ventral side, IG 7690/85/O, ×100, Jamno IG 3, depth 1970.7 m, cyclothem PZ1; *9* C right side, IG 7689/85/O, ×130; *10* C, dorsal side, IG 7690/85/O, ×130, Mielnik IG 1, depth 573.7 m, cyclothem PZ1.

Plate 7

1—6. *Cavellina permiana* Kotschetkova: *1* C (female), *a* left side, *b* ventral side, IG 7700/85/O; *2* C (male), right side, IG 7683/85/O, ×240; *3* C (male), ventral side, IG 7685/85/O, ×220; *4* C (male), dorsal side, IG 7684/85/O, ×200, Chłapowo IG 2,

depth 705.5 m, cyclothem PZ3; *5* C (female), left side, IG 7701/85/O, ×66, Dębki IG 1, depth 555.3 m; *6* C (female), dorsal side, IG 7702/85/O, ×72, Opalino IG 1, depth 727.0 m, cyclothem PZ2.

7—9. *Pseudobythocypris eichenbergi* sp. n.: *7* holotype, C right side, IG 7680/85/O, ×200, Chłapowo IG 2, depth 705.5 m, cyclothem PZ3; *8* paratype, C left side, IG 7681/85/O, ×130; *9* paratype, C dorsal side, IG 7682/85/O, ×150, Barciany IG 2, depth 1228.0 m, cyclothem PZ2.

10. *Cornigella permiana* (Krömmelbein): RV lateral view, IG 7623/85/O, ×150, Białogarda IG 1, depth 919.0 m, cyclothem PZ1.

11. *Dorsoobliquella pulchra* Knüpfer: LV lateral view, IG 7632/85/O, ×78, Dębki IG 1, depth 555.3 m, cyclothem PZ2.

## Plate 8

1. *Bairdia ampla* Reuss: C right side, IG 7641/85/O, ×60, Opalino IG 1, depth 727.0, cyclothem PZ2.

2. 3. *Polycope perminutus* (Kellett): *2* C *a* left side, *b* dorsal side, IG 7692/85/O, ×100; *3* C right side, IG 7693/85/O, ×220, Kętrzyn IG 1, depth 1397.4 m, cyclothem PZ1.

4—7. *Bairdia knuepferi* Ivanov: *4* C right side, IG 7638/85/O, ×120; *5* C left side, IG 7639/85/O, ×72, Mielnik IG 1, depth 573.7 m; *6* C dorsal side, IG 7699/85/O, ×180; *7* C ventral side, IG 7640/85/O, ×120, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

8, 10, 11. *Kirkbya permiana* (Jones) *8* C *a* right side, *b* dorsal side, IG 7628/85/O, ×50; *10* C right side, IG 7626/85/O, ×86; *11* ventral side, IG 7627/85/O, ×78, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

9. *Basslerella suavis* Ivanov: C *a* left side, *b* dorsal side, IG 7671/85/O, ×100, Swarzewo IG 10, depth 700.5 m, cyclothem PZ2.

## Plate 9

1, 2, 8. *Roundyella lebaensis* Krömmelbein: *1* C left side, IG 7629/85/O, ×130; *2* C ventral side, IG 7630/85/O, ×100; *8* C *a* left side, *b* ventral side, IG 7631/85/O, ×100, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

3—5. *Healdia dahlgrüni* Krömmelbein: *3* C right side, IG 7674/85/O, ×110; *4* C left side, IG 7675/85/O, ×120; *5* C ventral side, IG 7676/85/O, ×110, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

6. *Bairdia hisingeri* (Muenster): C left side, IG 7644/85/O, ×100, Mielnik IG 1, depth 573.7 m, cyclothem PZ1.

7. *Haworthina patria* Ivanov: C right side, IG 7662/85/O, ×130, Mielnik IG 1, depth 573.7 m, cyclothem PZ1.

9—11. *Monoceratina longissima* Krömmelbein: *9* C ventral side, IG 7667/85/O, ×200, Lidzbark Warmiński 1, depth 1554.0 m; *10* C right side, IG 7666/85/O, ×200, Krynica Morska IG 1, depth 1350.0 m, cyclothem PZ2, *11* C *a* left side, *b* dorsal view, IG 7665/85/O, ×100, Barciany IG 2, depth 1228.0 m, cyclothem PZ2.

## Plate 10

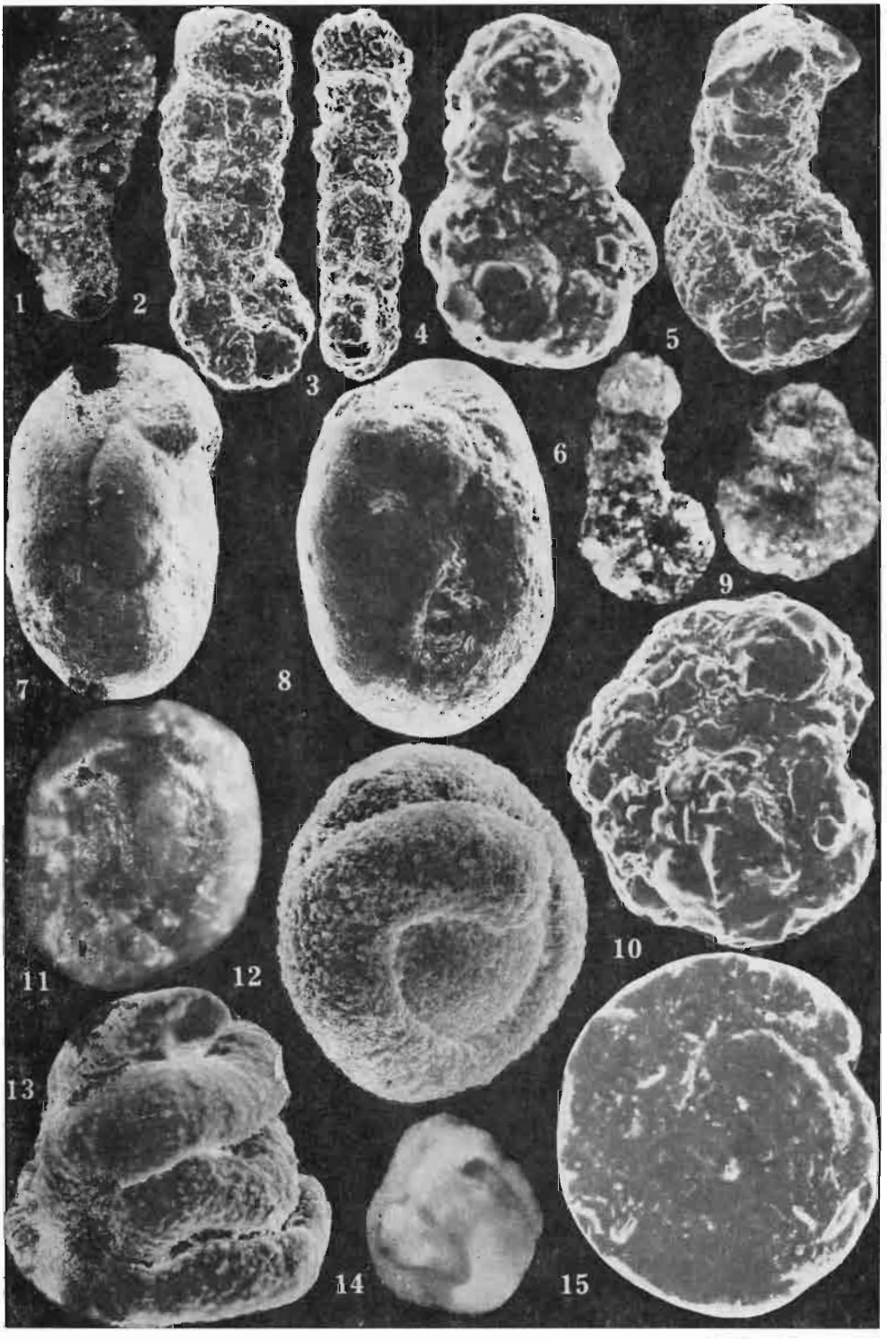
1. *Bairdiocypris jonesiana* (Kirkby): C right side, IG 7653/85/O, ×54, Mielnik IG 1, depth 573.7 m, cyclothem PZ1.

2, 3. *Acratia acuta* (Jones): *2* C right side, IG 7648/85/O, ×66; *3* C right side, IG 7647/85/O, ×50, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

4—6. *Bythocypris krommelbeini* sp. n.: *4* holotype, C right side, IG 7656/85/O, ×100; *5* paratype, C left side, IG 7657/85/O, ×110; *6* paratype, C dorsal side, IG 7658/85/O, ×100, Mielnik IG 1, depth 573.7 m, cyclothem PZ1.

7—10. *Bairdia plebeia* Reuss: *7* C right side, IG 7635/85/O, ×44; *8* C dorsal side, IG 7637/85/0, ×54; *9* C ventral side, ×54, IG 7636/85/O, Mielnik IG 1, depth 573.7 m, cyclothem PZ1; *10* C *a* right side, *b* ventral side, IG 7698/85/O, Łochów IG 1, depth 1602.0 m, cyclothem PZ1.

11—12. *Microcheilinella artiensis* Guseva: *10* LV lateral view, IG 7686/85/O, ×150; *11* dorsal view, IG 7687/85/O, ×110, Mielnik IG 1, cyclothem PZ1.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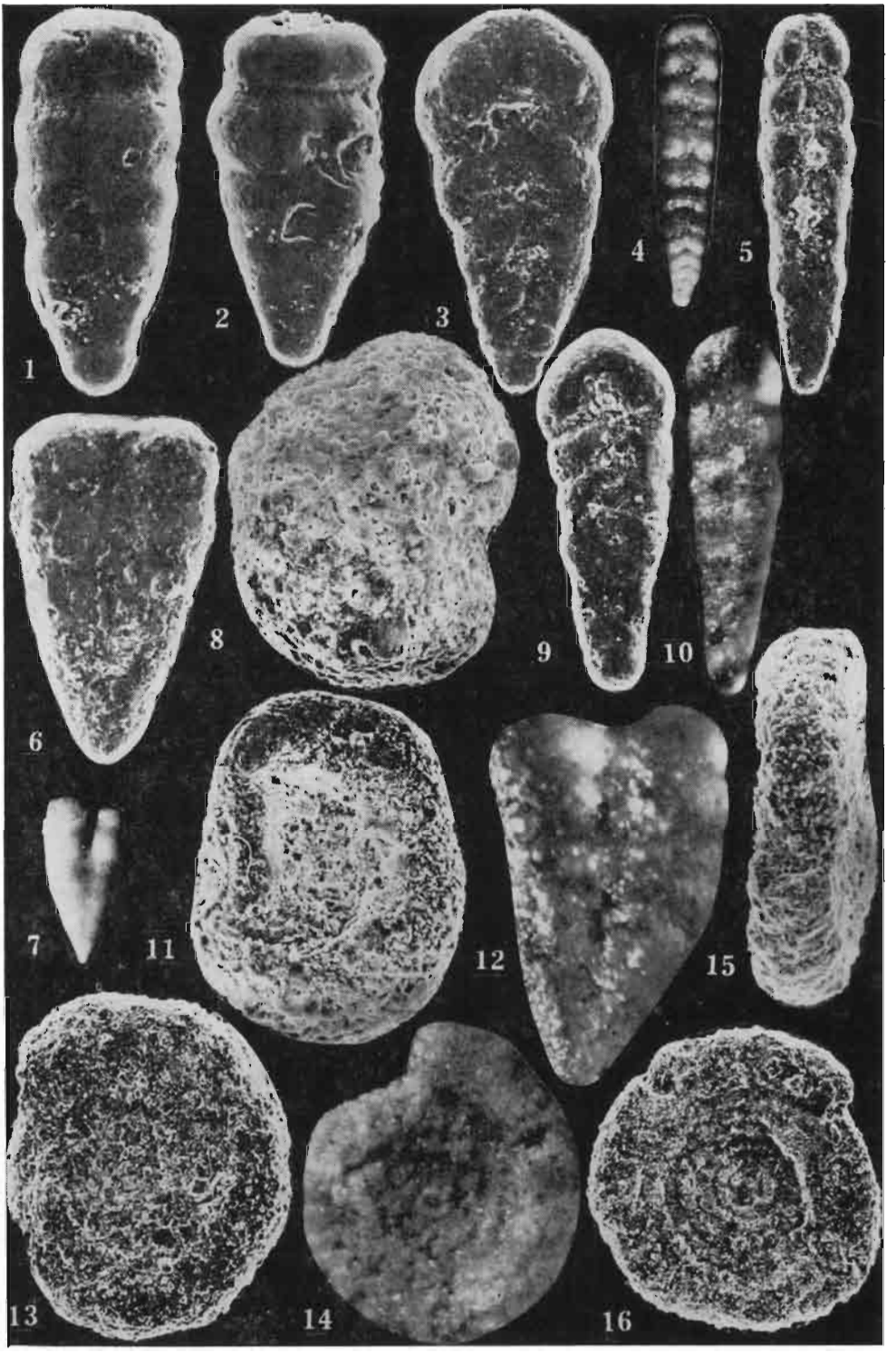
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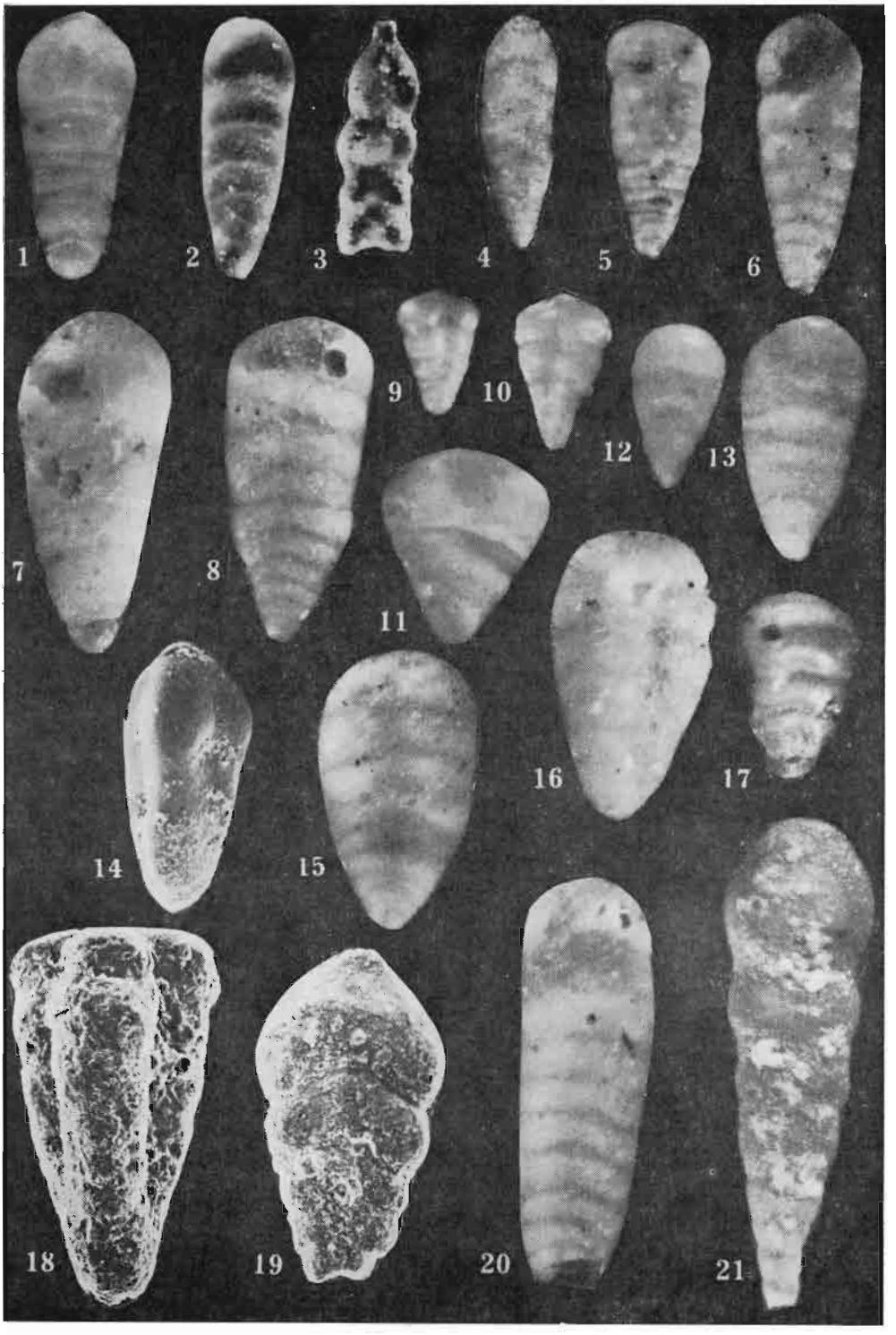
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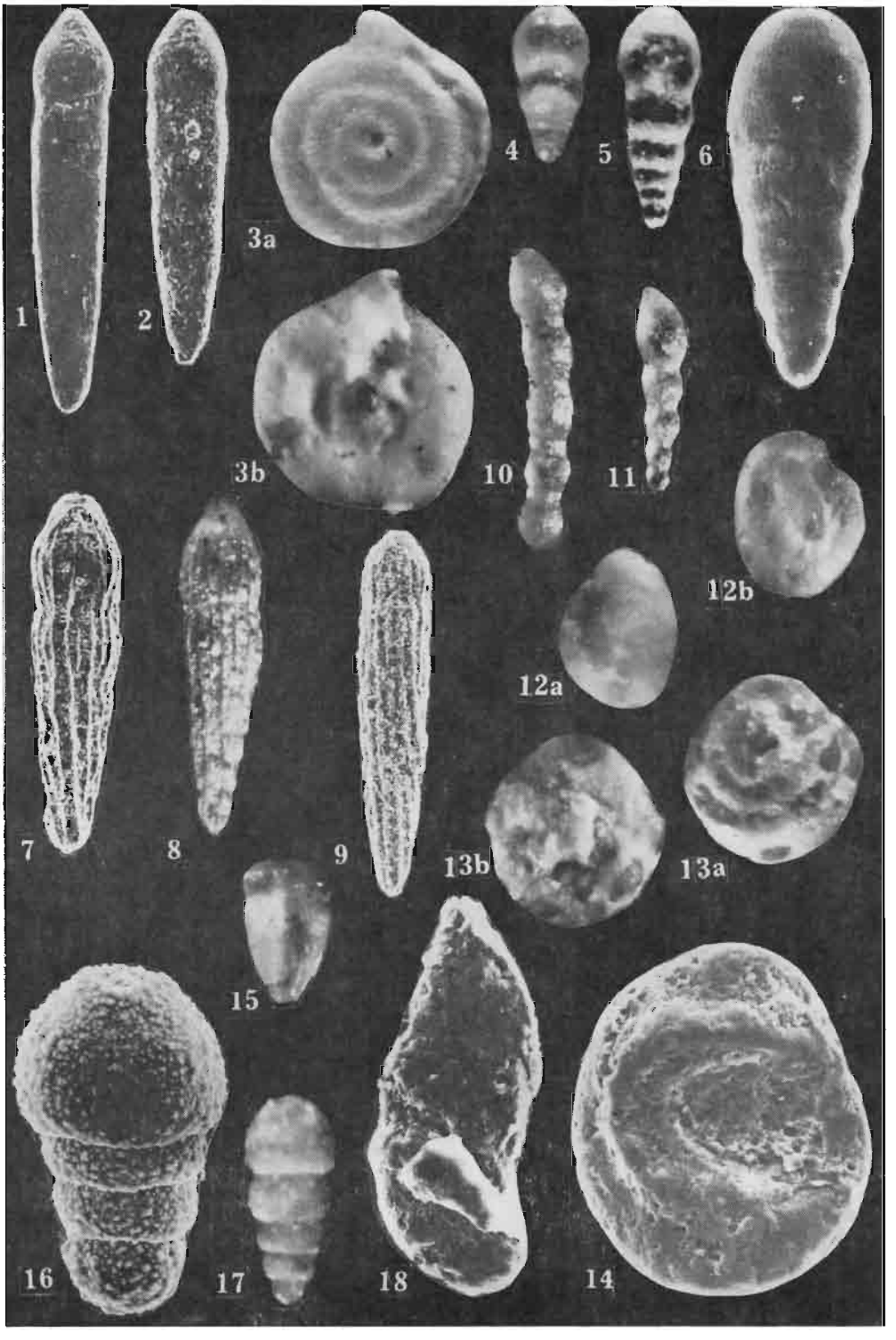
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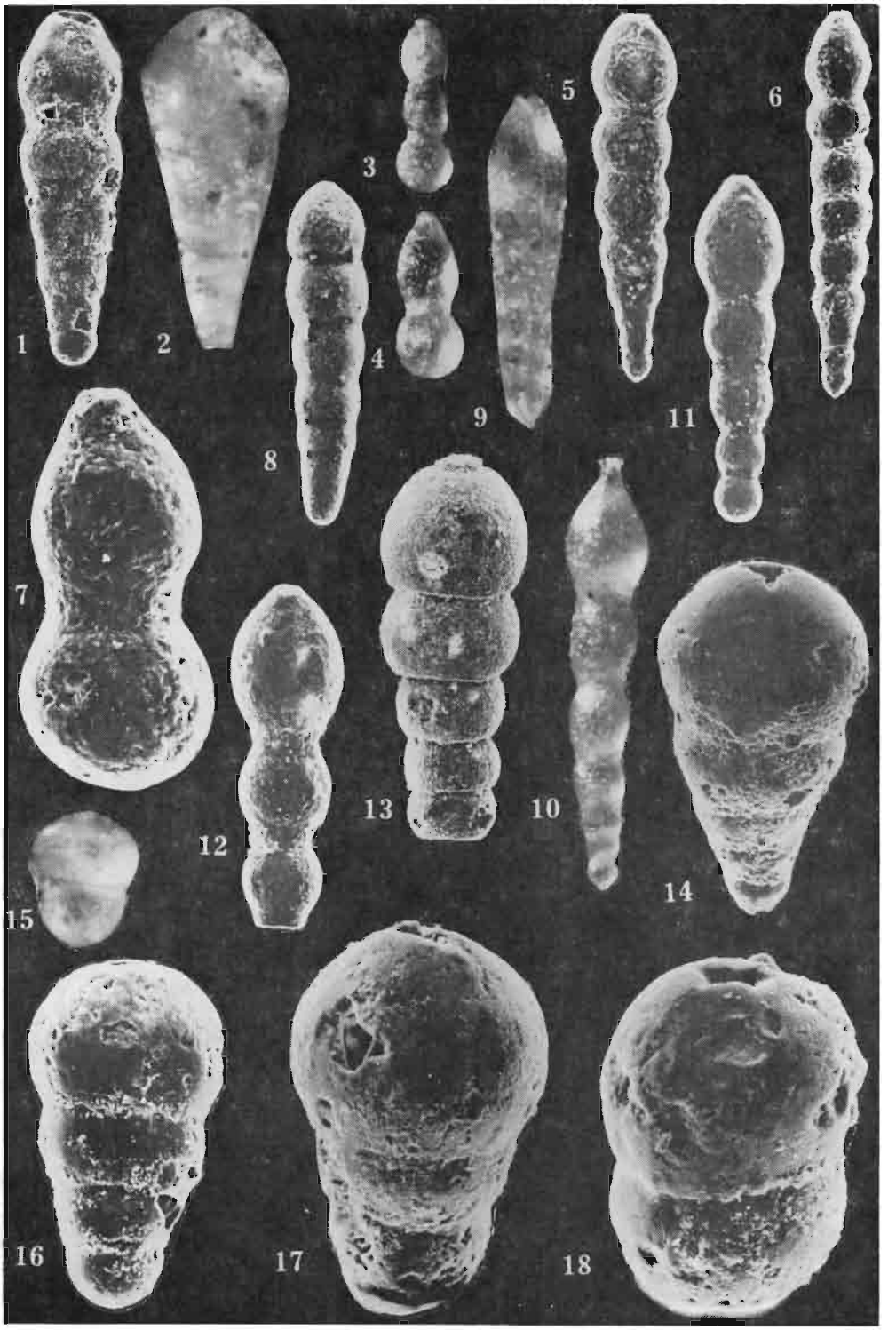
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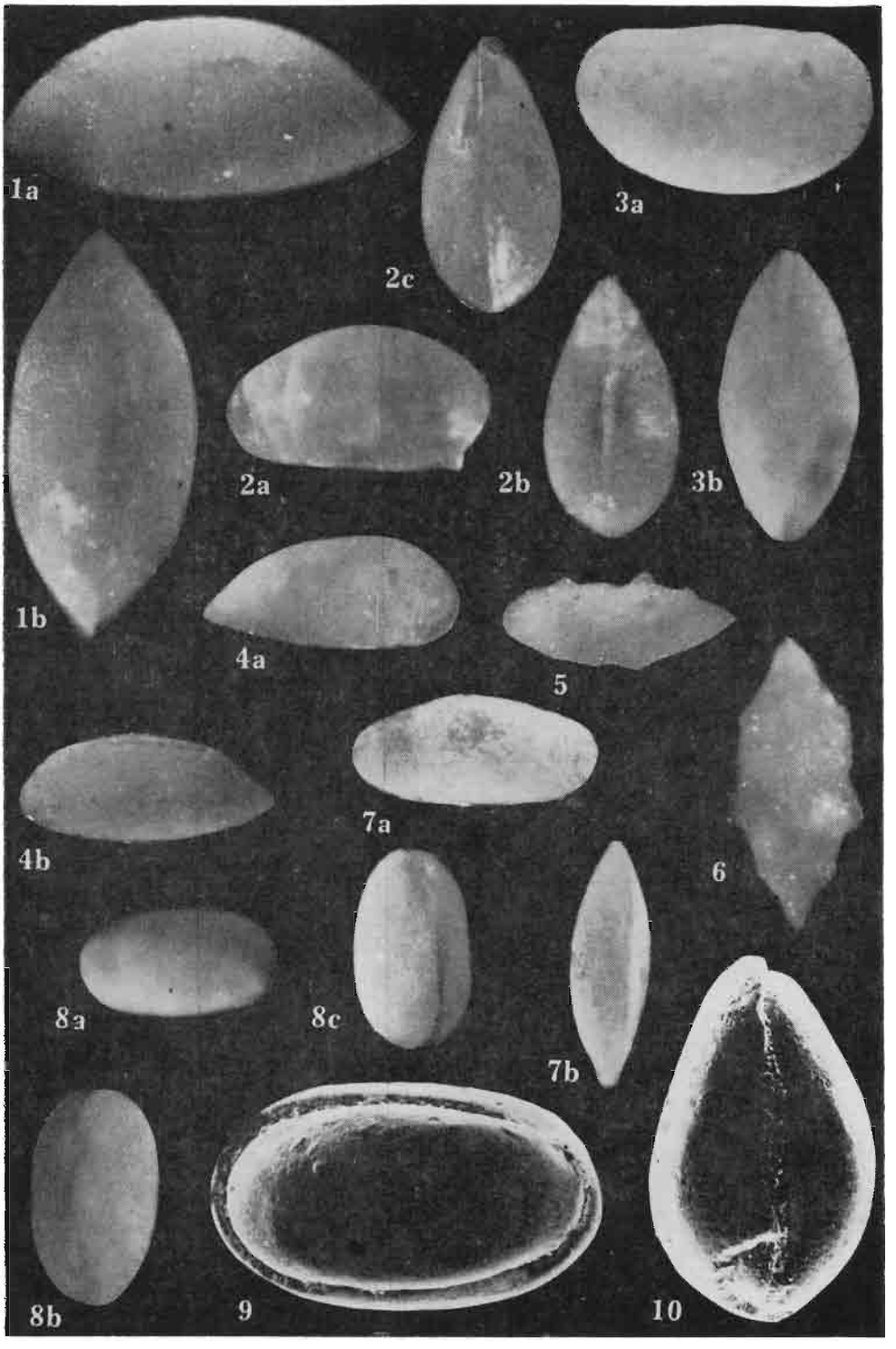
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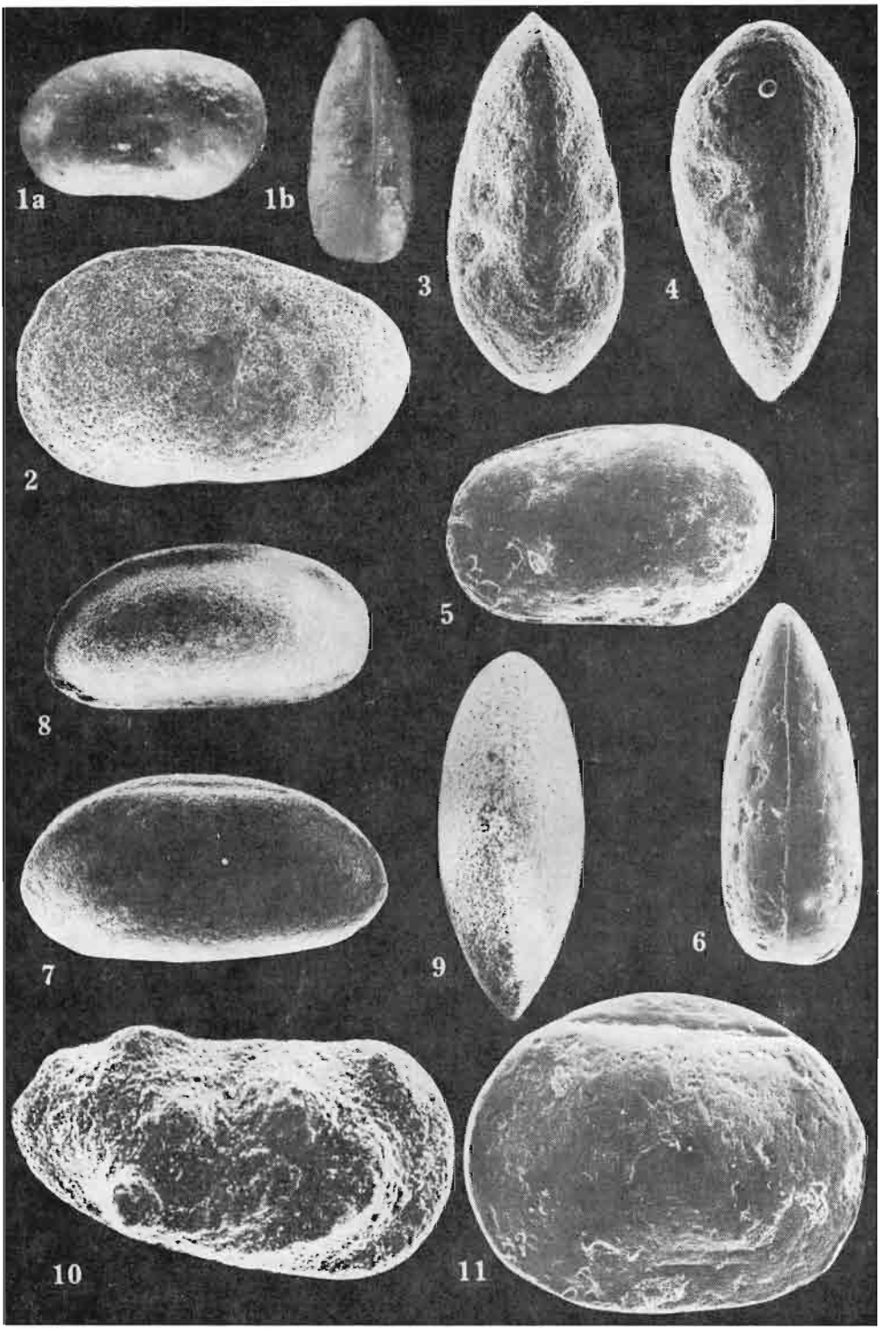
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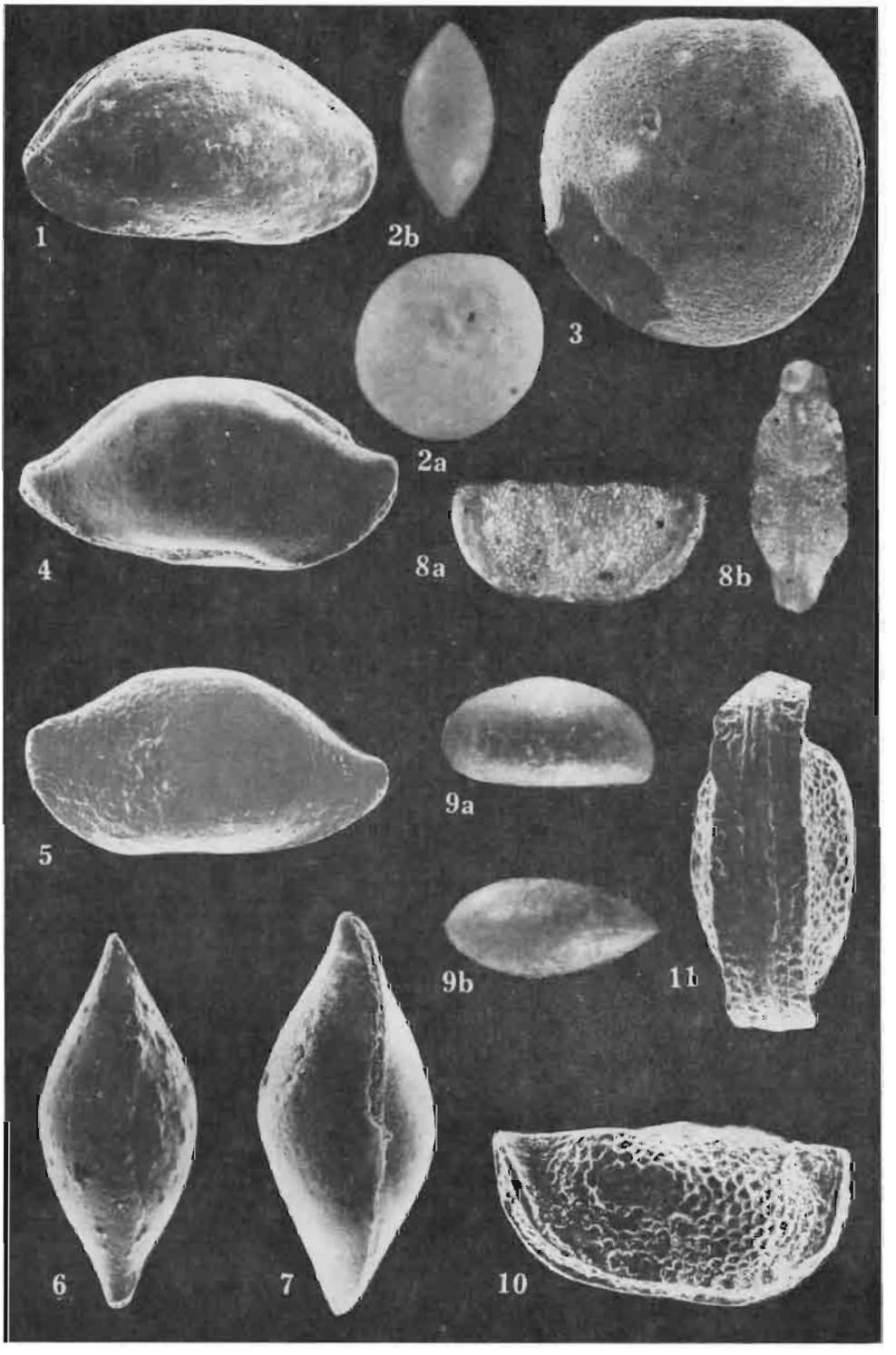
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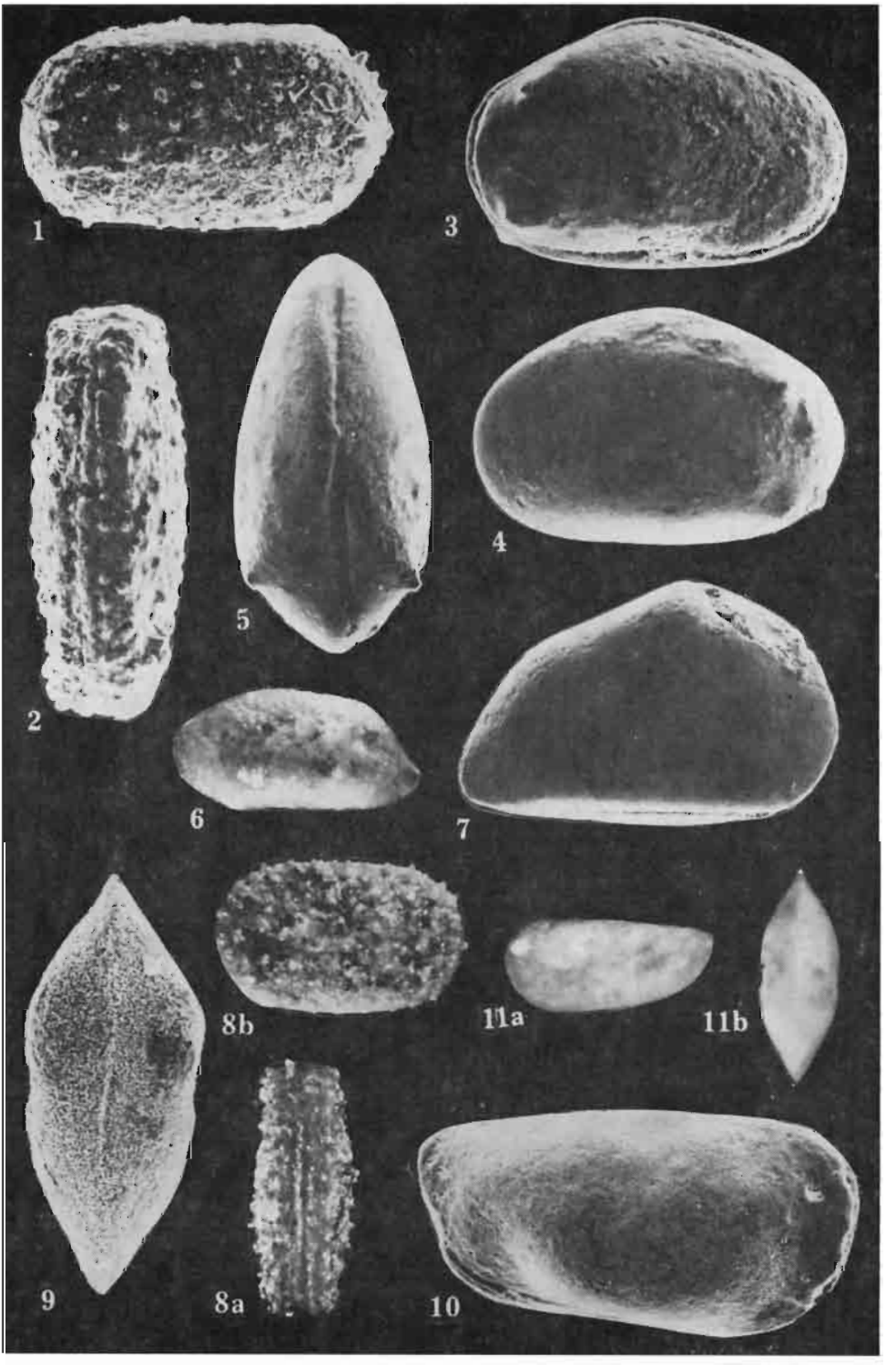
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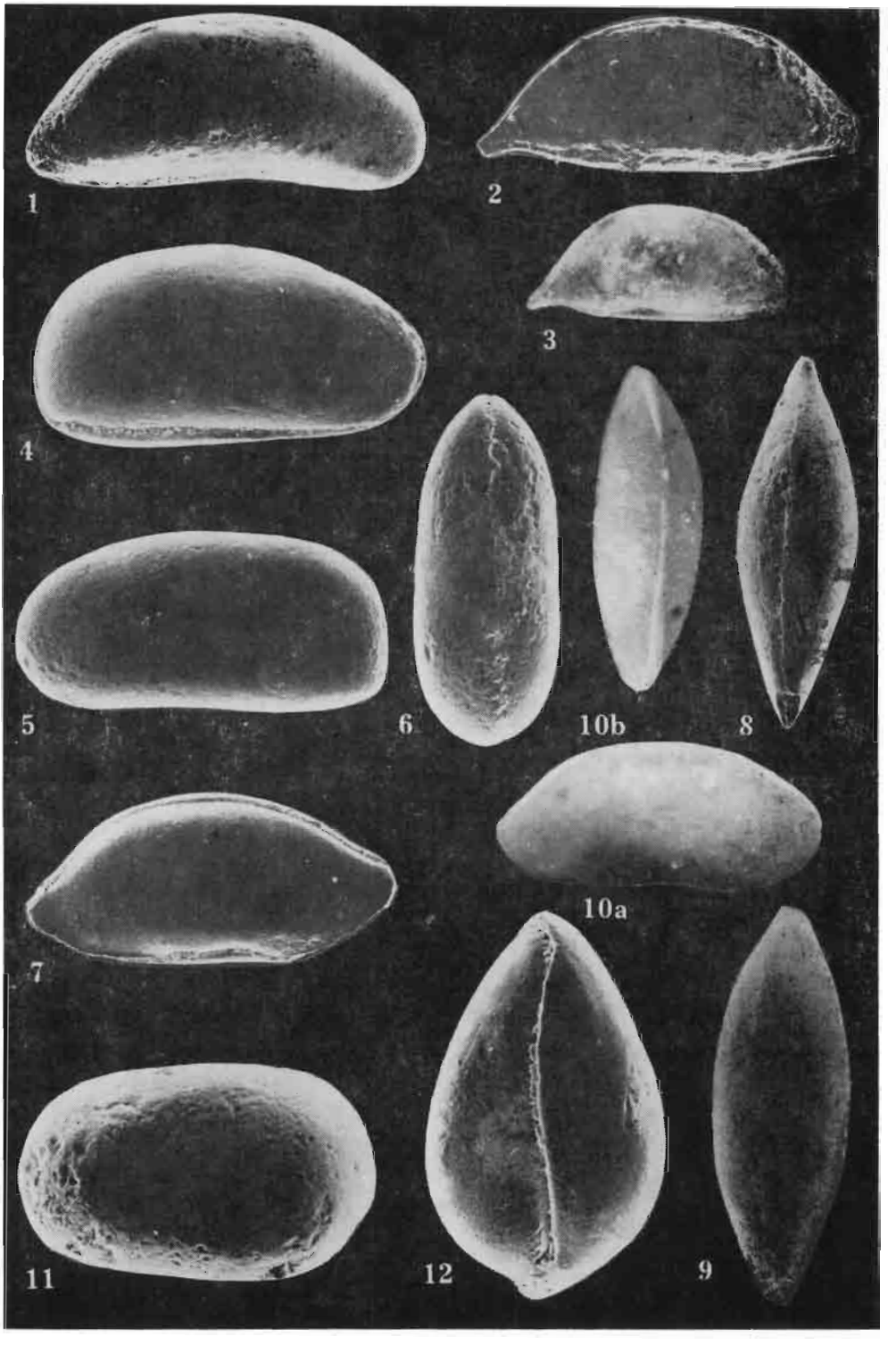
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