Wilhelm Friedberg in his jounger years.
Photograph by J. Popiel (Lvov), courtesy of the Laboratory of the History of Polish Geology.

The Foraminifera of the Inoceramus beds in the vicinity of Rzeszów and Dębica

by

Wilhelm Friedberg

(with two plates)

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Introduced by member W. Szajnocha.

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During the course of investigations on geological maps of the Rzeszów-Łancut and Ropczyce-Dębica areas it was necessary to study the northern margin of the Carpathians, even though in my study area this belt is only a few kilometres wide and outcrops are poor. Excluding the sub-Carpathian Miocene deposits of the Rzeszów depression, the northern margin of the Carpathians is formed of the Inoceramus (Ropianka) beds[2]. These are exposed better to the west of Rzeszów and to the south of Debica and Ropczyca than in other areas.

The petrographic character of the Inoceramus beds is especially variable. They consist of sandstones with sole markings, friable sandstones that grade into loose sand, various claystones (gray, red, green, or bluish), hard marls, fucoidal marls, and shaly claystones. With the exception of sole markings and *Inoceramus*, the beds do not contain any visible organic remains. This inspired me to undertake studies of the microfauna. In addition, I wanted to convince myself whether the results of microscopic investigations in this area are consistent with those from other areas of the Carpathians[3].

My specimens are derived from about 30 samples, however not all of these contained foraminifera. The clays especially contained many specimens and species. In addition to the samples I collected myself from 26 localities, I also received picked samples from Stasiówka, Stobierna, Zawada, and Łopuchowa from Counsellor H. Walter, to whom I am most grateful. My samples were rather small, weighing on average only 250 grams. My student Kamil Bogacki was very helpful with the sample preparation. Work on the current study began two years ago. Because of some of the problems I have encountered in obtaining literature here in the Provinces, I was unable to complete the study until this date.

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[1] *[The date on the original paper must be a printing error. The paper was obviously delivered in 1901.]*

[2] *[The name "Ropianka beds" is an informal lithostratigraphic name used widely for Upper Cretaceous to Paleocene deposits in both the Magura and Skole basins.]*

[3] I have in mind here the works of Dr. J. Grzybowski, who has been the only one to carry out investigations on a large scale, and make assertions on the ages of the Carpathian deposits.

General Palaeontological Results

The results of my palaeontological studies are presented in several tables, given below. The first tables present the fauna according to locality. The samples from the Dębica region yielded significantly more foraminifera than other localities. This is due to the supplementary samples from this area donated by Mr. H. Walter. In the first tables, I do not consistently report the abundance of the species, since in most cases I had only a few specimens. In case I had more specimens, I reported the abundance as either common (8-15 specimens) or very common. The final table gives the stratigraphic ranges of the species I found in my samples. In this table, I selected only the species that have known stratigraphic ranges. Species with doubtful ranges were omitted.

List of species according to locality:

Matysówka, marly claystones
Dendrophrya excelsa Grzybowski

Słocina, red shales
Biloculina depressa d'Orbigny (vc)
Keramosphaera irregularis Grzybowski (c)
Rhabdammina abyssorum M.Sars
Rhabdammina linearis Brady (c)
Reophax difflugiformis Brady
Haplophragmium latidorsatum Bomeman.
Cornuspira gordialis (Jones & Parker)
Cornuspira angusta n.sp.
Trochammina coronata Brady
Orbitoides tenuicostata Gümbel ? (c)

Słocina, gray clay underlying red shales
Biloculina depressa d'Orbigny (vc)
Keramosphaera irregularis Grzybowski (c)
Rhabdammina abyssorum M.Sars
Rhabdammina subdiscreta Rzehak
Rhabdammina linearis Brady (c)
Reophax difflugiformis Brady
Haplophragmium irregulare Römer
Haplophragmium bulloidiforme Grzybowski
Cornuspira incerta d'Orbigny
Cyclammina retrosepta Grzybowski
Orbitoides dispansa Sov. (c)

Spring in the Chmielnik Stream, marly shales
Dendrophrya discreta n.sp.
Cristellaria lepida Reuss
Pulvinulina boueana d'Orbigny

Honie, friable sandstone
Dendrophrya excelsa Grzybowski
Dendrophrya robusta Grzybowski, var. *maxima* n.var.

Zagórzyce, conglomerate
fish teeth (*Oxyrrhina* ?)

Łopuchowa dark clay
Dendrophrya excelsa Grzybowski
Rhabdammina abyssorum M.Sars (c)
Reophax ovulum Grzybowski (c)
Haplophragmium turbinatum Brady
Verneuilina abbreviata Rzehak
Spiroplecta biformis Parker & Jones
Gaudryina pupoides d'Orbigny
Bulimina presslii Reuss
Bulimina conulus Rzehak
Nodosaria calomorpha Reuss
Globigerina cretacea d'Orbigny
G. bulloides var. *trilobus* Reuss
Truncatulina lobatula Walker & Jacob
Truncatulina akneriana d'Orbigny
Truncatulina insecta Schwager
Pulvinulina subcandidula Grzybowski
Pulvinulina bimammata Gümbel
Discorbina pusilla Uhlig
Discorbina exima Hantken
Discorbina uhligi Grzybowski (c)
Discorbina cf. parisiensis d'Orbigny

Zawada, dark marls
Nubecularia tibia Jones & Parker
Dendrophrya excelsa Grzybowski (c)
Rhabdammina abyssorum M.Sars (c)
Rhabdammina subdiscreta Rzehak
Rhabdammina linearis Brady (c)
Reophax placenta Grzybowski
Reophax difflugiformis Brady
Reophax ovulum Grzybowski (c)
Reophax nodulosa Brady
Trochammina contorta Grzybowski
Trochammina bifaciata n.sp.
Verneuilina abbreviata Rzehak
Bigenerina nodosaria d'Orbigny
Lagena globosa Montfort
Lagena apiculata Reuss var. *tetracarinata* n.var.
Nodosaria soluta Reuss
Nodosaria romeri Neugeborn

Nodosaria cylindrica Alth
Lingulina dentata Grzybowski
Cristellaria rotulata Lamarck
Flabellina reticulata Reuss
Polymorphina sororia Reuss
Polymorphina irregularis n.sp.
Pullenia quinqueloba Reuss
Globigerina aequilateralis Brady
Rotalia umbilicata d'Orbigny
Rotalia lithothamnica Uhlig
Rotalia orbicularia d'Orbigny
Truncatulina lobatula Walker & Jacob
Truncatulina livida Grzybowski
Pulvinulina subcandidula Grzybowski
Pulvinulina partschiana d'Orbigny
Pulvinulina bimammata Gümbel
Discorbina pusilla Uhlig (c)
Discorbina eximia Hantken
Discorbina umbonella Reuss ?
Discorbina turbo d'Orbigny
Inoceramus

Zawada, dark clay
Dendrophrya excelsa Grzybowski (c)
Dendrophrya robusta Grzybowski
Dendrophrya discreta n.sp.
Reophax placenta Rzehak
Reophax grandis Grzybowski
Chilostomella ovoides Reuss (vc)
Nodosaria communis d'Orbigny
Truncatulina lobatula Walker & Jacob
Pulvinulina subcandidula Grzybowski
Discorbina pusilla Uhlig
Discorbina eximia Hantken

Stobierna village, fucoidal marl
Miliolina tenuis n.sp.
Rhabdammina abyssorum M.Sars
Rhabdammina subdiscreta Rzehak (c)
Rhabdammina linearis Brady (c)
Rhabdammina annulata Rzehak
Hyperammina vagans Brady
Reophax placenta Rzehak (c)
Reophax difflugiformis Brady (vc)
Reophax ovulum Grzybowski (vc)
Reophax guttifer Brady var. *scalaria* Grzybowski
Reophax duplex Grzybowski
Trochammina mirabilis n.sp.
Trochammina coronata Brady
Textularia carinata d'Orbigny
Verneuilina abbreviata Rzehak
Verneuilina polystropha Reuss ?
Tritaxia tricarinata Reuss
Nodosaria calomorpha Reuss
Nodosaria communis d'Orbigny
Nodosaria cylindrica Alth
Cristellaria nuda Reuss
Globigerina cretacea d'Orbigny
Pulvinulina subcandidula Grzybowski
Pulvinulina karsteni Reuss
Discorbina pusilla Uhlig
Discorbina eximia Hantken
Inoceramus

Stobierna village, blue clay
Dendrophrya robusta Grzybowski
Dendrophrya discreta n.sp.
Rhabdammina abyssorum M.Sars
Cornuspira incerta Reuss
Trochammina subcoronata Grzybowski
Bulimina intermedia Reuss
Polymorphina lanceolata Reuss

Stobierna, Międzylesie, gray clay
Rhabdammina abyssorum M.Sars
Haplophragmium irregulare Römer
Cornuspira incerta Reuss
Trochammina subcoronata Grzybowski
Trochammina contorta Grzybowski
Textularia globifera Reuss
Bulimina murchisoniana d'Orbigny
Bulimina intermedia Reuss
Cristellaria sp. ?

Stobierna village, gray clay
Dendrophrya excelsa Grzybowski (vc)
Dendrophrya robusta Grzybowski
Cristellaria cultrata Montfort
Pulvinulina subcandidula Grzybowski
Discorbina pusilla Uhlig
Discorbina eximia Hantken

Stobierna, Kopalówka, gray clay
Nubecularia tibia Jones & Parker (c)
Dendrophrya robusta Grzybowski
Hyperammina nodata Grzybowski
Gaudryina pupoides d'Orbigny
Nodosaria soluta Reuss
Nodosaria consobrina d'Orbigny
Nodosaria subornata Reuss ?
Nodosaria boueana d'Orbigny
Nodosaria legumen Reuss
Cristellaria isidis\Schwager
Rotalia lithothamnica Uhlig
Truncatulina lobatula Walker & Jacob
Discorbina pusilla Uhlig (c)

Stobierna, black clay
Peneroplis pertusus Forskal
Dendrophrya excelsa Grzybowski
Trochammina contorta Grzybowski
Trochammina deformis Grzybowski ?
Trochammina trullissata Grzybowski
Trochammina sp. variae
Textularia globifera Reuss
Bulimina pupoides d'Orbigny
Lagena globosa Montfort
Pullenia sphaeroides d'Orbigny
Rotalia papillosa var. *compressiuscula* Reuss.

Stasiówka, next to the old pit, gray clay
Miliolina gramen n.sp.
Dendrophrya robusta Grzybowski
Rhabdammina annulata Rzehak
Reophax ovulum Grzybowski
Reophax duplex Grzybowski
Haplophragmium latidorsatum Bornemann
Haplophragmium turpe Grzybowski
Haplophragmium bulloidiforme Grzybowski
Cornuspira angusta n.sp.
Trochammina contorta Grzybowski (c)
Trochammina acervulata Grzybowski (c)
Trochammina deformis Grzybowski
Trochammina variolaria Grzybowski
Trochammina nucleolus Grzybowski
Trochammina carpenteri Grzybowski
Trochammina folium Grzybowski
Trochammina variegata n.sp.
Trochammina mirabilis n.sp.
Trochammina simplex n.sp.
Vaginulina legumen Linnaeus
Inoceramus
Ostracoda

Stasiówka, next to the old pit, conglomerate with coal
Nodosaria soluta Reuss
Rotalia articulata ? Dunikowski

Stasiówka, south of the village, gray clay
Nubecularia tibia Jones & Parker
Miliolina peregrina d'Orbigny
Dendrophrya excelsa Grzybowski (vc)
Dendrophrya robusta Grzybowski
Rhabdammina annulata Rzehak
Reophax difflugiformis Brady (c)
Reophax ovulum Grzybowski
Cornuspira incerta d'Orbigny
Trochammina contorta Grzybowski
Discorbina eximia Hantken

Stasiówka, south of the village, red clay
Dendrophrya excelsa Grzybowski
Reophax difflugiformis Brady

Gumniska Fox, gray shaly clay
Miliolina peregrina d'Orbigny
Rhabdammina linearis Brady
Dendrophrya excelsa Grzybowski
Hyperammina nodata Grzybowski
Reophax placenta Grzybowski
Reophax difflugiformis Brady
Cornuspira incerta d'Orbigny

Now I wish to discuss the some of the more important findings of this study concerning the age of the Inoceramus beds. Out of a total of 92 species, 44 are previously known from other Cretaceous formations, and 45 are known from the Tertiary and Recent. Of these latter, only three are still living today. On this basis, we can conclude that the Inoceramus beds cannot belong to the Cretaceous and are most probably younger. First of all, taxa that are not previously known from the Cretaceous comprise 53% of the fauna. However, many of these Tertiary forms have only been recorded once, having been recently described by Dr. Grzybowski. We cannot be certain that these taxa are truly Tertiary forms because we still lack data about their distribution in deposits of similar facies of undisputed Cretaceous age. The latest paper by J. Grzybowski is one such study, and it significantly reduces the number of Carpathian foraminifera known only from the Tertiary. Because the age of the Inoceramus beds in the vicinity of Gorlice is generally understood to be Cretaceous, we must regard Grzybowski's species not as typical Tertiary forms, but as also ranging into the Cretaceous.

I have not been able to take this into account in my table[4]. If we disregard these species (*Dendrophrya excelsa, D. robusta, Rhabdammina abyssorum, R. discreta, R. linearis, Hyperammina nodata, Reophax placenta, R. grandis, R. ovulum, R. nodosa, R. duplex, Haplophragmium turpe, Trochammina contorta, T. acervulata, T. coronata, T. subcoronata, T. deformis, T. variolaria, T, nucleolus, T. carpenteri, T. folium*), then only 26 species (28%) are known only from the Tertiary or Recent.

If we examine my table of geologic ranges of foraminifera, we immediately observe that there are many unchanging forms, those that live from ancient times until the present day. *Ammodiscus incertus, A. gordialis,* and *Truncatulina lobatula* are known from the Carboniferous to Recent; *Nubecularia tibia, Vaginulina legumen, Cristellaria rotulata,* and *Pulvinulina partschiana* occur from the Triassic to the present; and *Biloculina depressa, Hyperammina vagans, Lagena globosa* and *L. apiculata* range from the Jurassic to the Recent. In summary, three species range from the Carboniferous, four from the Triassic, five from the Jurassic are also known from the Cretaceous, and 20 are still living today. A conclusion drawn from this, one that is already known[5], is that foraminifera are very static forms that can survive throughout the various geological ages without change. For this reason, they are not useful for determining the age of sediments. Relatively few forms in my collection are known from a single formation. Only 10 species are restricted to the Cretaceous. Thirty-four species are known from the Tertiary, out of which 25 have been newly described by Dr. Grzybowski[6]. Finally, three species are regarded as modern forms.

I must conclude that I am not able to solve the question of the age of the Ropianka beds, because the result of my comparisons is that *foraminifera, as long-lived forms, are not useful for determining the age of sediments.* The results of my work suggest, that even if we attempt to use foraminifera for correlation of sediment horizons, they do not contradict the supposed Cretaceous age for the Ropianka beds. However in this case, it would be best assign them a Late Cretaceous age.

Concerning the nature of the foraminiferal tests, we observe that out of 105 species, 54 (or 51%) possess calcareous tests. The remainder possess siliceous ones. We do not observe a dominance of agglutinated forms over calcareous forms, and in terms of diversity both types are roughly equal. In terms of numbers of specimens, though, the agglutinated forms are numerically dominant, and certain genera, e.g. *Reophax, Rhabdammina* and *Trochammina,* are quite abundant. Among the calcareous forms, only *Chilostomella, Discorbina* and *Pulvinulina* are abundant. This does not support the statement by J. Grzybowski (1901) that "the lack of calcareous-shelled forms is the characteristic trait of the microfauna of the Inoceramus beds". It similarly does not support his further conclusion that this "unique characteristic of the fauna from the Inoceramus beds makes it different from all the Cretaceous faunas". In my opinion, the differences we observe between the chemical composition of the foraminiferal test at different localities can be explained in a different manner.

Comparing the chemical composition of the foraminiferal test with the petrographic nature of the rock in which they are found, we observe a certain correlation. In the Senonian marls from Lvov, the foraminiferal assem-

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[4] *[This paper was already in press when Grzybowski's study was published.]*

[5] *[Friedberg here is no doubt referring to the work of Carpenter, as stated in no uncertain terms in his text "Introduction to the Foraminifera". Although Friedberg makes no direct reference to this work, it was no doubt known to Grzybowski. Friedberg's next statement sounds as if it is paraphrased directly from Carpenter (1862). It is curious that the spectre of "Carpenterism" that was so prevalent in the English school of the time had infiltrated as far east as Krakow. Carpenter's beliefs were generally dismissed as untrue by his other continental European contemporaries.]*

[6] Eighteen of these have now been reported by Grzybowski from the Inoceramus beds in the vicinity of Gorlice.

blage is dominated by calcareous forms and agglutinated ones are rare. Dr. Grzybowski's (1894) material from Dukla, which was a calcareous conglomerate containing ca. 70% $CaCO_3$, only yielded a few agglutinated forms. The material from Wadowice studied by Grzybowski (1896) contained more agglutinated and siliceous forms (ca. 48%), because they were collected from clays and marls. We see from Grzybowski's table that agglutinated forms are more common in the clays, and that calcareous forms are in the marls. Grzybowski's fauna from Krosno contains 75% siliceous forms. The studied material was derived mainly from clays and shales, i.e. material that contains little carbonate.

It is most interesting that Grzybowski's fauna from the Inoceramus beds in the vicinity of Gorlice contained only one species of calcareous foraminifera, i.e. *Globigerina bulloides*. So these beds must contain extremely little or no carbonate. The chemical analyses of these clays would be an important study.

In my material I did not have access to raw sediment for every sample, and I did not carry out detailed analyses. I am only able to state whether the sediment contains carbonate or whether it does not. I tested this by observing its reaction with HCl.

The samples that did not react in HCl did not contain any foraminifera with calcareous tests, with the exception of one sample of gray clays from Stasiówka, which contained a single specimen of *Discorbina eximia*. The samples that reacted in acid contained a mixture of calcareous and siliceous forms, with the possible exception of a sample of gray clay from Stasiówka, which contained *Inoceramus* prisms, but only one calcareous species (*Vaginulina legumen*) among 19 siliceous ones, as well as a single sample from Gumniska Fox that contained seven siliceous species but no calcareous ones.

In general terms, we observe a correlation between the nature of the foraminiferal tests and the chemical nature of the sediment in which they are found. Perhaps further picking would reveal whether this relationship is real (e.g. whether calcareous forms would be found in the sample from Gumniska Fox). Measuring the percentage of carbonate in the sediment would also be helpful.

The composition of the sediment is dependant upon the composition of suspended material in sea water, and this in turn depends upon the chemical composition of the water. Foraminifera utilize the material available to them for the construction of their test, and in this manner, the sediment characteristics influence the nature of the test. If the sediments and sea water contains very little carbonate, then siliceous forms will predominate.

[Table 1 (on next two pages). A compilation of the known stratigraphic ranges of the foraminifera from the Inoceramus beds.]

Species Names:	Formation (age):						
	C	P	T	J	C	T	R
MILIOLIDAE:							
Nubecularia tibia Jones and Parker							
Biloculina depressa d'Orbigny							
Miliolina gramen n.sp.							
Miliolina tenuis n.sp.							
Miliolina pergina d'Orbigny							
Peneroplis pertusus (Forskal)							
Keramosphaera irregularis Grzybowski							
ASTRORHIZIDAE:							
Dendrophrya excelsa Grzybowski							
Dendrophrya robusta Grzybowski							
Dendrophrya robusta Grzybowski var. *maxima* n.var							
Dendrophrya discreta n.sp.							
Rhabdammina abyssorum M. Sars							
Rhabdammina subdiscreta Rzehak							
Rhabdammina linearis Brady							
Rhabdammina annulata Rzehak							
Hyperammina nodata Grzybowski							
Hyperammina vagans Brady							
LITUOLIDAE:							
Reophax placenta Grzybowski							
Reophax grandis Grzybowski							
Reophax difflugiformis Brady							
Rephax ovulum Grzybowski							
Reophax guttifera Brady var. *scalaria* Grzybowski							
Reophax nodulosa Brady							
Reophax duplex Grzybowski							
Haplophragmium irregulare Römer							
Haplophragmium latidorsatum (Bornemann)							
Haplophragmium turpe Grzybowski							
Haplophragmium bulloidiforme Grzybowski							
Haplophragmium turbinatum Brady							
Cornuspira incerta d'Orbigny							
Cornuspira gordialis (Jones and Parker)							
Cornuspira angusta n.sp.							
Trochammina contorta Grzybowski							
Trochammina acervulata Grzybowski							
Trochammina coronata Brady							
Trochammina subcoronata Rzehak							
Trochammina deformis Grzybowski							
Trochammina variolaria Grzybowski							
Trochammina trullissata Brady							
Trochammina nucleolus Grzybowski							
Trochammina carpenteri Grzybowski							
Trochammina folium Grzybowski							
Trochammina bifaciata n.sp.							
Trochammina variegata n.sp.							
Trochammina mirabilis n.sp.							
Trochammina simplex n.sp.							
Cyclammina retrosepta Grzybowski							
TEXTULARIDAE:							
Textularia globifera Reuss							
Textularia carinata d'Orbigny							
Verneuilina abbreviata Rzehak							

Species Names:	Formation (age):						
	C	P	T	J	C	T	R
Verneuilina cf. *polystropha* Reuss							
Tritaxia tricarinata Reuss							
Bigenerina nodosaria d'Orbigny							
Spiroplecta biformis Parker and Jones							
Gaudryina pupoides d'Orbigny							
Bulimina murchisoniana d'Orbigny							
Bulimina intermedia Reuss							
Bulimina pupoides d'Orbigny							
Bulimina preslii Reuss							
Bulimina conulus Rzehak							
Chilostomellidae							
Chilostomella ovoidea Reuss							
Lagenidae							
Lagena globosa Montfort							
Lagena apiculata Reuss *tetracarinata* n.var.							
Nodosaria soluta (Reuss)							
Nodosaria cf. *subornata* Reuss							
Nodosaria calomorpha Reuss							
Nodosaria (Dentalina) consobrina d'Orbigny							
Nodosaria romeri Neugeborn							
Nodosaria communis d'Orbigny							
Nodosaria (Glandulina) cylindrica (Alth)							
Lingulina dentata Grzybowski							
Vaginulina legumen (Linnaeus)							
Cristellaria rotulata (Lamarck)							
Cristellaria isidis Schwager							
Cristellaria lepida Reuss							
Cristellaria nuda Reuss							
Cristellaria cultrata (Montfort)							
Flabellina reticulata Reuss							
Polymorphina sororia Reuss							
Polymorphina irregularis n.sp.							
Polymorphina lanceolata Reuss							
Globigerinidae							
Pullenia sphaeroides (d'Orbigny)							
Pullenia quinqueloba (Reuss)							
Globigerina cretacea d'Orbigny							
Globigerina bulloides d'Orbigny							
Globigerina bulloides var. *triloba* Reuss							
Globigerina aequilateralis Brady							
Rotalidae							
Rotalia umbilicata d'Orbigny							
Rotalia lithothamnica Uhlig							
Truncatulina lobatula Walker & Jacob							
Truncatulina livida Grzybowski							
Truncatulina akneriana d'Orbigny							
Truncatulina insecta Schwager							
Pulvinulina subcandidula Grzybowski							
Pulvinulina karsteni (Reuss)							
Pulvinulina partschiana d'Orbigny							
Pulvinulina boueana d'Orbigny							
Discorbina pusilla Uhlig							
Discorbina eximia Hantken							
Discorbina uhligi Grzybowski							
Discorbina turbo (d'Orbigny)							
Discorbina parisiensis d'Orbigny							

Family MILIOLIDAE
Subfamily Nubecularinae
Genus *Nubecularia* Defrance
1. *Nubecularia tibia* Jones and Parker

Nubecularia tibia Jones and Parker. Brady, 1884, p. 135, pl. 1, fig. 1-4.
Nubecularia tibia Jones and Parker. Grzybowski, 1896, p. 273, pl. 8, fig. 1-4.
Nubecularia tibia Jones and Parker. Grzybowski, 1898, p. 271.
Nubecularia tibia Jones and Parker. Egger, 1902. p. 20, pl. 2, fig. 34.

Several fragments were found in Stasiówka, Stobierna, and Zawada. My specimens fully resemble Brady's and Grzybowski's drawings. They are only single-chambered fragments. My specimen from Zawada is highly compressed and shows a round depression on both sides of the test. Only the specimen from Stobierna has a calcareous test, all others have siliceous tests. *Nubecularia tibia* is a very long-ranging form. Recent ones live at various depths (from 27 to 702 m), and it is found as fossils in Triassic and even Rhetic formations.

Subfamily Miliolininae
Genus *Biloculina* d'Orbigny
2. *Biloculina depressa* d'Orbigny

Biloculina depressa d'Orbigny. Brady, 1884, p. 145, pl. 2, figs. 12, 15-17, pl. 3, fig. 1-2.
Biloculina lunula d'Orbigny, 1846, p. 264, pl. 15, fig. 1-2.
Biloculina depressa d'Orbigny. Karrer, 1868, p. 131.
Biloculina amphiconica Reuss, 1867, p. 67, pl. 1, fig. 8.
See Brady for further synonyms and literature.

This rather variable species I found in Słocina, and in the woods near "Lisi kąt" ["Foxes' corner"]. These forms are so abundant there that the shales are almost filled with them. Their tests are pink from the red colour of the shales. In gray claystones outcropping below the red shales, I found only a few poorly preserved specimens that possess a rough surface. In both outcrops the tests are siliceous, but they are smoother and more lustrous in the former.

Biloculina depressa is a Recent form and is known from the Tertiary at several localities. It is rather certain that it occurs in the older formations as well. According to Brady, a form described by Terquem and Berthelin (1875) from Middle Liassic of France as *Biloculina liassina* is identical to *Biloculina depressa*. The same is true for *Biloculina antiqua* described by Karrer from the Liassic of St. Veit near Vienna (Karrer, 1867, pl. 3, fig. 7). The greater inflation of chambers found in this form has also been found in *Biloculina depressa*. Karrer lists *Biloculina lunula* (= *B. depressa*) together with the calcareous foraminifera, while in my material the test is usually siliceous.

Genus: *Miliolina* Wiliamson
3. *Miliolina gramen* **n.sp.** [8]
pl. 1, fig. 1a-c

A single specimen from Stasiówka (coal shaft). Test siliceous, compressed, very narrow, elliptically elongated in outline but flattened on both sides. The dorsal wall on the oval side also rounded, flat on the compressed side. On one side four chambers are visible out of which the outer ones are larger, and the two inner are depressed and less distinct. There is most probably an additional chamber in the centre. On the other side two chambers are visible with a slit-like depression in between. Test narrows towards the apical and initial ends. At the initial end there is a small spike. The aperture is poorly visible and located at the apical end, slightly to one side. Length of test 0.8 mm.

4. *Miliolina tenuis* **n.sp.**
pl. 1, fig. 2a,b

A single specimen from Stobierna. Test agglutinated, surface slightly rough. The four visible chambers are S-shaped, and embracing one another in such a manner that the first one embraces the second one from the top, and the second one embraces the first one from the bot-

[8] *[Because the whereabouts of the Friedberg Collection are unknown, there is no possibility to restudy any of his species. Also, many of his new taxa were based on single specimens. In the editors' opinion, all of these new taxa should be assigned uncertain status (nomen dubium).]*

tom. This makes the whole test bent and elongated into a blunt spike at the top and bottom. An aperture is weakly visible at the top. The two outer chambers are very compressed, the inner ones more cylindrical, which gives an overall appearance as if the outer chambers create a peripheral keel over the inner ones. In the middle of the test there is a impurity that makes the first chamber invisible. Length of test 0.8 mm, the greatest width 0.5 mm.

5. ***Miliolina peregrina*** (d'Orbigny)

Quinqueloculina peregrina d'Orbigny, 1846, p. 292, pl. 19, fig. 1-3.

One specimen was found in the village Gumniska Fox, the other south of Stasiówka. My two specimens differ from d'Orbigny's drawing only by being narrower, which makes the lateral end more acute, and in their siliceous, not calcareous, tests. D'Orbigny described this form from Baden, and Karrer (1864) from the *Lithothamnium* marls of Nussdorf near Vienna.

Agathamina dubia, described by Grzybowski (1896) from Wadowice, fully resembles *Miliolina peregrina* d'Orbigny. Only two chambers are visible. The minute size of the initial chambers and the impurity filling the central depression obscures the others. The fact that the test is siliceous, not calcareous, does not constitute a basis for designating a new species.

Subfamily Peneroplidinae

Genus ***Peneroplis*** Montfort

6. ***Peneroplis pertusus*** (Forskal)

pl. 2, fig. 14a-c

Peneroplis pertusus Forskal. Brady, 1884, p. 204, pl. 13, figs. 12-25 (with synonyms).

A single specimen was found in Stobierna (Kopalówka woods). Test somewhat round, the larger diameter 0.9 mm, the smaller one 0.6 mm. On both sides only one whorl is visible. There is umbilical depression on one side only. Large aperture comprised of numerous small openings. This species is known to range from the Tertiary to Recent.

Subfamily Keramosphaerinae

Genus ***Keramosphaera*** Brady

7. ***Keramosphaera irregularis*** Grzybowski

Keramosphaera irregularis Grzybowski, 1896, p. 273, pl. 8, fig. 12-13.

The specimens, occurring commonly, were found in Słocina ("Lisi kąt"). They agree with Grzybowski's description and drawings, and are often damaged. A related species is *Keramosphaera murrayi* (Brady, 1884, p. 227) which inhabits great depths (up to 3,500 m) in the Indian Ocean south of Australia.

Family ASTRORHIZIDAE

Subfamily Astrorhizinae

Genus ***Dendrophrya*** T.S. Wright

8. ***Dendrophrya excelsa*** Grzybowski

Dendrophrya excelsa Grzybowski, 1898, p. 272, pl. 10, fig. 4.

An abundant species found almost everywhere as fragments. They are slightly ramifying, sometimes highly compressed, sometimes almost round. My specimens are from Matysówka and Zawada, Stobierna (Kopalówka), Stasiówka, Łopuchowa, Gumniska Fox , and also from sandstones on the road from Albigowa to Honie. Grzybowski found this form at various localities in the vicinity of Krosno (Potok, Toroszówka, Krościenko, Bóbrka, Wietrzno, Równe, Iwonicz, Ropianka). Wright and Brady characterize the genus *Dendrophrya* and the species *Dendrophrya erecta* T.S. Wright as living in very shallow waters.

9. ***Dendrophrya robusta*** Grzybowski

Dendrophrya robusta Grzybowski, 1898, p. 273, pl. 10, fig. 7.

I found this species only as small fragments in Zawada, Stobierna, and also Stasiówka (at the old coal shaft).

10. ***Dendrophrya robusta*** Grzybowski var. ***maxima*** **nov. var.**

pl. 1, fig. 4

I used this name for forms with wider than usual tests, up to 2 mm. They were found in sandstones from Honie (near Albigowa). The surface of the test is almost smooth, but the

embedded quartz grains make it sometimes rough. Wall thick, with a narrow central channel. Only found in fragments up to 1 mm long.

11. ***Dendrophrya discreta* n.sp.**
pl. 1, fig. 3a,b

Test completely compressed, about 0.5 mm wide, resembles strongly *Dendrophrya excelsa*, but differs from it in having many constrictions that divide the tube into 0.2 mm high chambers. On one 2 mm long fragment I counted 8 constrictions. These are visible not only on both sides of the test but also on the flat side in the form of slight furrows. The wall of the test is very thin, finely agglutinated, with grains joined by siliceous cement. My specimens are in the form of small fragments, rarely up to 3 mm long, and were found in Chmielnik (at the top of the stream), in Zawada and in Stobierna.

Subfamily Rhabdammininae
Genus ***Rhabdammina*** M. Sars

12. ***Rhabdammina abyssorum*** M. Sars

Rhabdammina abyssorum M. Sars. Brady, 1884, p. 266, pl. 21, fig. 1-13.
Rhabdammina abyssorum M. Sars. Grzybowski, 1896, p. 275, pl. 8, fig. 1-4.
Rhabdammina abyssorum M. Sars. Grzybowski, 1898, p. 274.

This is a very common species, found everywhere. My specimens, mostly small fragments, rarely with traces of ramification, resemble Brady's and Grzybowski's drawings. They occur in Słocina "Lisi kąt", in Zawada, Łopuchowa and in Stobierna (in the village, and at "Międzylesie"). This species is known from the Recent (Brady, 1884) and from the Oligocene of Nikoltschitz (Rzehak, 1887).

13. ***Rhabdammina subdiscreta*** Rzehak[9]

Rhabdammina subdiscreta Rzehak, 1887, p. 87.
Rhabdammina subdiscreta Rzehak. Grzybowski, 1896 p. 275. pl. 8, fig. 5-6.
Rhabdammina subdiscreta Rzehak. Grzybowski, 1898, p. 275.

I found only 3 specimens; one each in Słocina ("Lisi kąt"), in Zawada, and Stobierna. Grzybowski lists this species as very common from Wadowice and Krosno. *Rhabdammina discreta*, the Recent form, differs in its markedly larger constrictions (Brady, 1884, pl. 22, fig. 7-10).

14. ***Rhabdammina linearis*** Brady

Rhabdammina linearis Brady, 1884, p. 269, pl. 22, fig. 1-6.
Rhabdammina linearis Brady Grzybowski, 1896, p. 275, pl. 8, fig. 7.
Rhabdammina linearis Brady Grzybowski, 1898, p. 275.

My specimens occur in Słocina ("Lisi kąt"), Zawada, Stobierna, and Gumniska Fox. This species occurs commonly in the form of tubes 1.5 mm long and 0.2 mm wide. On two specimens from Stobierna I observed a round central inflation. Tubes finely agglutinated, sometimes nearly clear, lustrous. According to Brady, it is a Recent marine form living at various geographical latitudes.

15. ***Rhabdammina annulata*** Rzehak
pl. 1, fig. 5

Rhabdammina annulata Rzehak. Grzybowski, 1896, p. 276, pl. 8, fig. 8-9.
Rhabdammina annulata Rzehak. Grzybowski, 1898, p. 276.

I found only three specimens; one in Stasiówka (at the old coal shaft), and two specimens from Stobierna. These fully resemble Grzybowski's specimens. A differently shaped form was found in Stasiówka (next to the chapel by the unpaved road to Grudny), which is illustrated in fig. 5. The tube, 0.8 mm long, slightly bent, has 3 regular constrictions and two larger, inflated ones in the middle. Surface smooth, lustrous; width 0.2 mm, and 0.4 mm at the inflations. Because I only found one specimen, I include it in this species, but it is more that probable that this should be des-

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9 *[Authorship of this species as well as of others that were formally described by Grzybowski (1896) from Rzehak's material has been transferred to Grzybowski under the rules of the ICZN. See footnotes in Grzybowski (1896)]*

ignated as a separate species. *Rhabdammina annulata* is found in the Oligocene clays in Nikoltschitz.

Genus ***Hyperammina*** Brady

16. ***Hyperammina nodata*** Grzybowski

Hyperammina nodata Grzybowski, 1896, p. 275, pl. 8, fig. 16.

Hyperammina nodata Grzybowski, 1898, p. 274.

I found only two fragments: one from Gumniska Fox (the stream north of the village) and the second from Stobierna ("Kopalówka woods").

17. ***Hyperammina vagans*** Brady

Hyperammina vagans Brady, 1884, p. 260, pl. 24, fig. 1-9.

Hyperammina vagans Brady. Grzybowski, 1896, p. 275, pl. 8, fig. 18.

Hyperammina vagans Brady Grzybowski, 1898, p. 274.

Several specimens were found in Stobierna. This species, commonly living in the modern seas, is known from the Jurassic formations of Switzerland (Aargau Canton).

Family LITUOLIDAE

Subfamily Lituolinae

Genus ***Reophax*** Montfort

18. ***Reophax placenta*** Grzybowski

Reophax placenta Grzybowski, 1898, p. 276, pl. 10, fig. 9-10.

About 20 specimens were found in Zawada, Stobierna and Gumniska Fox (in the stream north of the village). On average the test is 1 mm in diameter. Rzehak found this species in the Oligocene clays from Nikoltschitz and designated it as *Trochammina placenta*.

19. ***Reophax grandis*** Grzybowski

Reophax grandis Grzybowski, 1898, p. 277, pl. 10, fig. 13-15.

A single specimen found in Zawada. It resembles best *Reophax difflugiformis* Brady but it differs in size (1.2 mm), and in the type of wall material. This species is discoidally compressed, and the aperture is located on the short neck, surface pronouncedly rough.

20. ***Reophax difflugiformis*** Brady

pl. 1, fig. 6a-e

Reophax difflugiformis Brady, 1884, p. 289, pl. 30, fig. 1-5.

Reophax difflugiformis Brady. Grzybowski, 1898, p. 277, pl. 10, fig. 11-12.

Reophax difflugiformis Brady. Grzybowski,1901, p. 266, pl. 7, fig. 4.

This is a common species that is quite variable, and often is quite different from the forms illustrated by Brady and Grzybowski. Several specimens have an oval form, but most of them are compressed and take the shape of a flat disc that often has a bowl-shaped depression on both sides. Often the test is obliquely compressed on one side where it creates a depression. Aperture an opening at the distal end of a small neck, sometimes elongated, at other times absent. Test of various size: oval tests have a greater diameter up to 0.4 - 0.6 mm long, the compressed ones are larger and attain 1.2 mm. Surface flat, quite lustrous, sometimes slightly rough.

Although all the forms are designated under one species name, I think that the fully compressed forms should be separated, because if these forms were originally oval, then during compression the test would crack, and it would not remain as smooth and regular as it appears in my material.

These specimens occur in Słocina, Zawada, Stasiówka, and Gumniska Fox. Grzybowski found *R. difflugiformis* only in Kroscienko. According to Brady, it is a common, Recent species that lives in the sea at various depths and geographical latitudes. He also suspects that the Cretaceous forms described by Berthelin as *Haplophragmium scuposum* and *H. lagenarium* belong to this species. It is also probable that *Haplophragmium lagenale* Römer described by Egger from the Cretaceous marls in the Bavarian Alps (Egger, 1899, pl. 2, fig. 34.) belongs to this species as well. The shape of the test fully resembles my compressed, flask-like specimens, and Egger himself doubts that his form is multichambered. This is typical for *Haplophragmium lagenale* Römer. Egger states: "Schale lässt aber nur eine Spur von Kammern wahrnehmen".

21. ***Reophax ovulum*** Grzybowski

Reophax ovulum Grzybowski, 1896, p. 276, pl. 8, fig. 19-21.

Rather common, found in Zawada, Stobierna, Stasiówka (next to the coal shaft and south of the village), and Łopuchowa. My specimens agree with the one presented by Grzybowski in fig. 19, but the shape of the test often varies as in *Reophax difflugiformis*. It differs from the previous species in its multichambered structure, which can be recognized by its two necks on the initial and distal ends of the test. Occasionally the necks are irregularly placed, for example slightly to the side, or as in my three specimens from Stobierna, in the middle of the flat surface.

There is one more question to be dealt with; does *Reophax ovulum* resemble the already known multichambered form, or should its fragments be designated as a new multichambered form? Grzybowski (1901, p. 268) described the new multichambered species *Reophax ovuloides* as a form with loose chambers open on both ends, and states that the form described in the Wadowice material as *Reophax ovulum* should belong with it. I noticed that the *Reophax ovuloides*, illustrated on pl. 7, fig. 3, only has the last chamber elongated in a stolon on both ends, and the other chambers are compressed on one side, and on the other they are provided with the stolon; the neck of one chamber goes into the depression in the next one. My specimens, about 50, have all two stolons as in *Reophax ovulum* from Wadowice as illustrated by Grzybowski on plated 8, fig 19 and 21. It is difficult to assume that only the last chamber was preserved from this multichambered test, and previous ones disappeared. Because of this, I believe my forms belong in *Reophax ovulum*.

I must change the description of this species. Grzybowski (1901, p. 265) described *Reophax ovulum* as: "Test almost smooth, ovoid, acute on the thinner end, where the aperture is found" and refers to fig. 20, pl. 8 in his study on foraminifera from Wadowice. But it could be easily noticed that this description and drawings refer to *Reophax difflugiformis* Brady if we carefully observe Brady's drawings (pl. 30, fig. 1-5) and take into account Brady's statement: "Test free, consisting of a single, elongate, oval or pyriform chambers, with or without a produced tubular neck... aperture simple".

In summary, I include in *Reophax ovulum* multichambered forms with ovoid or spherical chambers, often compressed, which are connected with each other by thin stolon. Forms included in *Reophax difflugiformis* have a single chamber according to Brady's description. I did not find any specimens belonging to *Reophax ovuloides*.

22. ***Reophax guttifera*** Brady var. ***scalaria*** Grzybowski

Reophax guttifera Brady var *scalaria* Grzybowski, 1896, p. 277, pl. 8, fig. 26.

Reophax guttifera Brady var. *scalaria* Grzybowski, 1898, p. 278.

I found two specimens of this species in Stobierna; one 3-chambered, and the other as a incomplete fragment. According to Brady (1884), *Reophax guttifera* is a rare, Recent marine species.

23. ***Reophax duplex*** Grzybowski

pl. 1, fig. 7

Reophax duplex Grzybowski, 1896, p. 276, pl. 8, fig. 23-25.

A single compressed specimen with two equal chambers, therefore resembling var. *alpha*, was found in Stobierna. At the old coal shaft in Stasiówka, I found a specimen that resembles forma *beta* of Grzybowski, but it was highly worn and deformed. The larger chamber is 0.8 m in diameter, and attached to it is a second compressed chamber that is only half the size of the first one. Tests are agglutinated, surface rough.

24. ***Reophax nodulosa*** Brady

Reophax nodulosa Brady, 1884, p. 294, pl. 31, fig. 1-9.

A small fragment from Zawada (1 1/2 chambers, length of one chamber 0.4 mm) probably belongs to this species. Surface siliceous,

smooth, lustrous. The test is somewhat compressed.

Grzybowski distinguished quite similar, but smaller, forms of this species as *Reophax subnodulosa* (Grzybowski, 1898, p. 279. pl. 10, fig. 17-18). Due to the lack of specimens I cannot judge this matter, but I believe that size alone does not constitutes the basis for designating a new species. In addition, Brady himself pointed out that *Reophax nodulosa* varies in size, and its length is between 0.5-2.5 mm or more. Recent specimens of *Reophax nodulosa* can be found in various seas and depths, mostly below 5400 m.

Genus ***Haplophragmium*** Reuss

25. ***Haplophragmium irregulare*** Römer

Haplophragmium irregulare Römer. Friedberg, 1897, p. 264, (with synonyms).

Haplophragmium aequale Reuss, 1863, p. 46, p. 29, pl. 1, fig. 1-7.

Haplophragmium aequale Reuss. Egger, 1899, p. 142, pl. 3, fig. 1-2, pl. 16, fig. 24.

Haplophragmium irregulare Römer. Egger, 1899, p. 144, pl. 3, fig. 4-7, 23.

One poorly preserved specimen (length 0.7 mm) was found in Słocina, the other, larger one with the straight part of the test, in Stobierna (Międzylesie). This species is known from the Cretaceous and in Poland, for example from Cenomanian of Lvov.

26. ***Haplophragmium latidorsatum*** (Bornemann)

Haplophragmium latidorsatum (Bornemann). Brady, 1884, p. 307, pl. 34, fig. 7-10, 14.

Haplophragmium latidorsatum (Bornemann). Egger, 1899, p. 141, pl. 3, fig. 24-26.

Synonyms and references can be found in Brady's and Egger's studies.

One specimen was found in Słocina, and another, slightly smaller one, about 0.4 mm in diameter, from Stasiówka. Test round, almost circular, 0.8 mm in diameter and 0.5 mm in thickness. A few chambers, five are visible, the two latter ones very large. Aperture is a half-moon slit on the lower edge of the septa of the last chamber. In the centre of the chamber on both sides, a depression is visible. Surface slightly rough, lustrous.

Haplophragmium latidorsatum is known from the Tertiary for example form the Septarian clays from Berlin (Bornemann), from the salt clays in Wieliczka (Reuss, *Haplophragmium crassum*), from the Clavulina szaboi beds in Hungary (Hantken, *Haplophragmium rotundidorsatum*), and from Cretaceous marls from the Bavarian Alps described by Egger. According to Brady, it is a Recent form inhabiting various seas at a great depths, even up to 7100 m.

27. ***Haplophragmium turpe*** Grzybowski

Haplophragmium turpe Grzybowski, 1896, p. 277, pl. 8, fig. 30.

Haplophragmium turpe Grzybowski, 1898, p. 279.

One specimen was found in Stasiówka.

28. ***Haplophragmium bulloidiforme*** Grzybowski

Haplophragmium bulloidiforme Grzybowski, 1896, p. 278, pl. 8, fig. 32-33.

Several poorly preserved specimens were found in Słocina and in Stasiówka.

29. ***Haplophragmium turbinatum*** Brady

Haplophragmium turbinatum Brady, 1884, p. 312, pl. 35, fig. 9.

One specimen was found in Łopuchowa. Test agglutinated, surface slightly rough, lustrous, comprised of sand grains partly cemented by calcareous cement. Diameter 0.7 mm. This specimen differs from Brady's form in its slightly greater compression. Also, its inner whorl on the spiral side is poorly visible because of there is a contaminated depression in this place. The last chamber is the largest. A modern marine form that lives mostly at greater depths (Brady, 1884).

Subfamily Trochammininae

Genus ***Cornuspira*** Schultze

The distinction between *Ammodiscus* and *Cornuspira* is so artificial that they should be combined together, since the species known as calcareous, hence *Cornuspira*, are often identical to the siliceous forms, (*Ammodiscus*).

Brady separated both species, but sometimes he puts together similar forms of one or the other species, which can be observed in case of *Ammodiscus incertus* d'Orbigny. Among this species' synonyms (1884, p. 330) he cites also *Cornuspira hörnesi*, despite the fact that Karrer (1866) classifies it as a calcareous form. *Ammodiscus involvens*, which is classified by Hantken and Grzybowski as a siliceous form, is recorded by Brady as a calcareous form (*Cornuspira involvens*), similar to Reuss and Karrer (1868). Likewise, the siliceous *Ammodiscus angygyrus* Grzybowski is classified by Karrer (1868) as a calcareous form.

In my opinion both these forms should be designated as a single genus. In my material I follow Grzybowski's pattern and join the identically shaped forms in one species disregarding the type of test material, and I use the name *Cornuspira* because it is older than *Ammodiscus*.

30. *Cornuspira incerta* (d'Orbigny)

Ammodiscus incertus (d'Orbigny). Brady 1884, p. 330, p. 38, fig. 1-2 (with synonyms).
Cornuspira polygyra Reuss, 1863, p. 39. pl. 1, fig. 2.
Cornuspira polygyra Reuss. Hantken, 1875, p. 19, pl. 1, fig. 2, pl. 2, fig. 1.
Ammodiscus polygyrus (Reuss). Grzybowski, 1896, p. 280, pl. 8, fig. 37.
Ammodiscus polygyrus (Reuss). Grzybowski, 1898, p. 281.
Ammodiscus angygyrus (Reuss). Grzybowski, 1896, p. 280. pl. 8, fig. 37.
Ammodiscus angygyrus (Reuss). Grzybowski, 1898, p. 282.
Cornuspira angygyra Reuss. Karrer, 1868, p. 130.
Ammodiscus involvens (Reuss). Grzybowski, 1896, p. 279. pl. 8, fig. 38 (with references).
Ammodiscus involvens (Reuss). Grzybowski, 1898, p. 282.
Cornuspira involvens (Reuss). Reuss., 1864, p. 450.
Cornuspira involvens (Reuss). Karrer, 1858, p. 131.
Operculina cretacea Reuss, 1845, p. 35, pl. 13, fig. 61-63.
Cornuspira cretacea (Reuss). Reuss, 1860, p. 177, pl. 1, fig. 1.
Cornuspira senonica Dunikowski, 1879, p. 104-5, pl. 1, fig. 1.
Ammodiscus gaultinus Berthelin. Egger, 1899, p. 16, pl. 1, fig. 1-3, 8-9, 30-31.

I have included here six species: *Ammodiscus incertus, A. polygyrus, A. angygyrus, A. involvens, Cornuspira senonica* and *C. cretacea*, together in one species. *Ammodiscus incertus* displays such mutability, that in my opinion, this combination is justifiably warranted, and it has been done before. As mentioned previously, Brady combined *Cornuspira hörnesi* with *Ammodiscus incertus*; and Hantken placed *Ammodiscus incertus* together with *Cornuspira polygyra* Karrer. The difference between the above species lies in the broader last whorl in the first species, and greater depression of test toward the centre and greater number of whorls in the second one. But there are transitional forms where both forms merge, as seen in Brady's drawings, for example, when comparing *Cornuspira involvens* (pl. 11, fig. 1) and *Ammodiscus incertus* (pl. 38, fig. 2). *Cornuspira angygyra* and *C. polygyra* do not differ from one other at all, as seen when comparing Reuss' and Grzybowski's drawing.

Cornuspira cretacea is a calcareous form, rather inconsistent and does not differ from the previous forms as seen from Reuss' (1860, 1863) descriptions and drawings. *Cornuspira senonica* Dunikowski cannot be differentiated from the previous species, especially that its characteristic trait, the end of the tube that does not narrow at the end, is also found in *Cornuspira cretacea* Reuss in the forms from the north German hils and gault, and from the Cretaceous in Bohemia. The slightly greater number of whorls present in the last species is not relevant.

Cornuspira rugulosa, described by Reuss from northern Germany (1856, p. 222. pl. 1, fig. 1) and Wieliczka (1867, p. 67) does not differ from the previously mentioned forms because its characteristic trait, the transverse striations, can also be found in other forms, as it is seen in Reuss's drawing of *Cornuspira cretacea* (1860). *Ammodiscus gaultinus* Berthelin fully resembles *Ammodiscus incertus* as Egger (1899, p. 17) points out.

My rather rare specimens occur in almost all samples and were found in Słocina, Stobierna, Zawada, "Międzylesie", Stasiówka (north of the village near the chapel) and in Gumniska Fox. They differ from one other considerably as can be seen from the following descriptions:

The specimen from Słocina has seven whorls, diameter 0.9 mm, surface lustrous and resembles *Ammodiscus involvens*, but the last whorl is not as wide as in the type specimen.

Two specimens were found in Międzylesie near Stobierna: the first one has eight whorls and resembles *Ammodiscus involvens*, the second one is ovate, with a rough surface and resembles *Cornuspira hörnesi* Karrer. From Stobierna there are three specimens that resemble *Ammodiscus polygyrus* or *A. angygyrus*; the larger one is 1.2 mm in diameter, the smaller one 0.8 mm.

Three specimens were found in Stasiówka: two of them resemble *Ammodiscus polygyrus* but are more convex toward the centre and in one of them a protruding tube that is slightly moved toward the centre can be visible at the end of the last whorl. The third specimen differs markedly from the previous ones. It is 0.8 mm in diameter and only 0.05 mm thick, with about six whorls. Its surface is siliceous, lustrous. Despite its thinness, the test is bent toward the centre into a bowl-shaped depression.

The specimen from Gumniska Fox is smaller than the previous ones, only 0.5 mm in diameter. It is also slightly thicker, its surface is less lustrous and it could be classified as a transitional form between *Ammodiscus polygyrus* and the previous specimen.

Ammodiscus incertus is among the forms found in older deposits. According to Brady it occurs in the Carboniferous, Permian, and Jurassic. As *Cornuspira cretacea* it is known from the Senonian from Lvov, from the Tertiary, and from modern seas. As typical for the foraminifera, it is a long-ranging form.

31. ***Cornuspira gordialis*** (Jones and Parker)

Ammodiscus gordialis (Jones and Parker). Brady, 1884, p. 333, pl. 38, fig. 7-8.

Ammodiscus gordialis (Jones and Parker). Grzybowski, 1896, p. 281, pl. 8, fig. 44-45.

Ammodiscus gordialis (Jones and Parker). Grzybowski, 1898, p. 284.

Single specimen of typical construction, 0.4 mm in diameter, with a smooth surface, slightly pink in colour, was found in Słocina ("Lisi kąt"). This species, similar to the previous one, has a long stratigraphic range and is known as as fossils from the Carboniferous to the Recent marine forms.

32. ***Cornuspira angusta*** **n.sp.**[10]

pl. 1, fig. 8a,b

Test elongated, comprised of 6-7 tightly appressed whorls; the tube is compressed at the lateral end, which gives the whole form an appearance of a tightly coiled tape. This is quite well visible on the specimen from Stasiówka. The test is differently shaped on each narrower end, one end is more acute, the other more narrow.

These specimens vary in the width of the last whorl, its degree of roundness of the periphery. The first specimen, found in Stasiówka, has a wider last whorl with a somewhat rounded periphery. The second one, from Słocina ("Lisi kąt") is not as broad or rounded at the periphery, but is highly compressed.

Because I have few specimens, I am not certain they should be designated as a new species. It is possible they are just different forms of *Ammodiscus incertus*.

Genus ***Trochammina*** Parker and Jones

33. ***Trochammina contorta*** Grzybowski.

Trochammina contorta Grzybowski, 1898, p. 287, pl. 11, fig. 12-14.

A common species agreeing with Grzybowski's description and drawing, were found in Zawada (south from the village), Stasiówka (near the old coal pit, and also near the

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[10] *[Laterally compressed forms are normally assigned to Ammodiscus peruvianus Berry, 1928. Friedberg's species undoubtedly has priority, but must be assigned uncertain status.]*

chapel) and in Stobierna (Kopalówka woods, and Międzylesie).

34. ***Trochammina acervulata*** Grzybowski
pl. 1, fig. 9a,b

Trochammina acervulata Grzybowski, 1896, p. 284, pl. 9, fig. 4.
About 10 specimens were found in Stasiówka (coal shaft). I assigned to this species specimens that show some differences with the form described by Grzybowski. They are fully compressed and the number of chambers on the umbilical side varies. There is more of them on the spiral side, two whorls not always quite distinguishable, numerous chambers on this side appear to be irregularly positioned. All chambers on both sides are fully compressed, separated from each other, umbilicus indistinct. Test up to 1.8 mm in diameter.

There is a distinct difference between these specimens and Grzybowski's forms, but these are deformed by pressure. I can see similarity between my species and *Trochammina coronata* Brady. The ones that have fewer chambers resemble *Trochammina subcoronata* Grzybowski from Wadowice (pl. 9, fig. 3). There are also specimens that are compressed laterally, therefore elongated, with fewer chambers, that show similarity to *Trochammina contorta* Grzybowski.

35. ***Trochammina coronata*** Brady
Trochammina coronata Brady, 1884, p. 340, pl. 40, fig. 10-12.
One specimen from Stobierna with an ovate test (longer axis 0.8 mm) probably belongs to this species. Test surface lustrous, irregular whorls, but this specimen is somewhat damaged. A second, typical, specimen fully agrees with Brady's drawing. It has a slightly pink test and was found in Słocina ("Lisi kąt"). Diameter 0.7 mm. According to Brady, it is a Recent marine form occurring at a depth from 700 to 7100 m.

36. ***Trochammina subcoronata*** Rzehak
Trochammina subcoronata Rzehak. Grzybowski, 1896, p. 283, pl. 9, fig. 3.
Trochammina subcoronata Rzehak. Grzybowski, 1898, p. 287, pl. 11, fig. 11.
A specimen found in Stobierna (Zawada) resembles Grzybowski's forms from Krosno, but it is strongly compressed and its chambers are more rounded. Diameter 1.2 mm. Rzehak found this species in the Oligocene clays from Nikoltschitz.

37. ***Trochammina deformis*** Grzybowski
Trochammina deformis Grzybowski, 1898, p. 288, pl. 11, fig. 20-22.
I only found two specimens that differ from a typical form by their very strong compression. They occur in Stasiówka (coal shaft) and in Stobierna (Kopalówka woods).

38. ***Trochammina variolaria*** Grzybowski
Trochammina variolaria Grzybowski, 1898, p. 288, pl. 11, fig. 15.
Only one specimen was found in Stasiówka (old coal shaft).

39. ***Trochammina trullissata*** Brady
Trochammina trullissata Brady, 1884, p. 343, pl. 40, fig. 13-16.
Two specimens were found in Stobierna (Kopalówka). They are 0.8 in diameter, with three visible whorls. The last whorl, the largest one, is comprised of nine chambers, two others are indistinct, convex. Periphery flat, obliquely compressed. It is a abyssal form.

40. ***Trochammina nucleolus*** Grzybowski
Trochammina nucleolus Grzybowski, 1898, p. 291, pl. 11, fig. 28-29.
A single specimen that resembles the form described and illustrated by Grzybowski was found in Stasiówka (coal shaft).

41. ***Trochammina carpenteri*** Grzybowski
Trochammina carpenteri Grzybowski, 1896, p. 283, pl. 9, fig. 1-2.
A single specimen from the same locality as *Trochammina nucleous* has a rather small last chamber, therefore it could belong to var. *angustior* illustrated in fig. 2.

42. ***Trochammina folium*** Grzybowski

Trochammina folium Grzybowski, 1898, p. 288, pl. 11, fig. 7-9.
One highly compressed specimen with two clearly visible whorls was found in Stasiówka (coal shaft).

43. ***Trochammina bifaciata* n.sp.**
pl. 2, fig. 1a,b
Only one specimen, found in Zawada (south of the village). Test round (0.8 mm in diameter), compressed to a shape of a disc, with uneven umbilical and spiral sides. On the spiral side two coils are clearly visible but the chambers are not distinct. There are probably ten in one whorl, with oblique sutures. On the opposite side there is only one well-marked and well-developed coil; chambers are not visible at all. At the end the test it widens and thickens, which makes the test thickened toward the centre. At the periphery the test is narrower and rounded, aperture a simple opening is better visible on the spiral side. Test finely agglutinated, surface only slightly rough. This species resembles *Truncatulina* in its shape. It bears slight resemblance to *Trochammina nucleous* Grzybowski.

44. ***Trochammina mirabilis* n.sp.**
pl. 2, fig. 2a-3b
Test minute, rounded (0.4 mm in diameter), compressed, shows two narrow whorls on the spiral side separated by distinct furrows, divided into a row of small chambers. The other side is comprised of three uneven chambers. At the apical end there is a chamber that occupies half of the test, at the initial end the slightly larger second one, and a one small one to the side. Aperture small, indistinct, probably at the end of the test in the place where the last whorl attaches itself to the previous one. One specimen from Stasiówka (coal shaft), the second, from Stobierna, does not differ from the illustrated one; it is ovate and larger (0.9 mm maximum diameter). This species may be related to *Trochammina squamata* Parker and Jones and it is similar to Brady's drawing (pl. 41, fig. 3), but the description varies.

45. ***Trochammina variegata* n.sp.**
pl. 1, fig. 10a,b
A single specimen was found in Stasiówka (coal shaft). Test minute, siliceous, compressed, with a smooth surface. It is only 0.5 mm in diameter. The test is spirally coiled with 2-3 irregularly coiled whorls on the spiral side. On this side its surface resembles *Trochammina lituiformis* Brady, no distinctly separated chambers on this side. On the opposite side there is only one whorl, very indistinctly divided into a few chambers. The last chamber is high, and protrudes above the outline of the test. Aperture indistinct, probably on this side of the test, at the end of the last chamber.

46. ***Trochammina simplex* n.sp.**
pl. 2, fig. 4a,b
A single specimen was found in Stasiówka (old coal shaft). Test rounded, but slightly elongated, the larger diameter is 0.5 mm long, smaller 0.4 mm. It is comprised of three overlapping chambers. On one side there are visible two irregularly-sized chambers overlapping in their full width. On the opposite side, one chamber attached to the previous two on its flat side. Surface almost smooth, slightly lustrous.

Subfamily Loftusinae
Genus ***Cyclammina*** Brady
47. ***Cyclammina retrosepta*** Grzybowski
Cyclammina retrosepta Grzybowski, 1896, p. 284, pl. 9, fig. 7-8.
Cyclammina retrosepta Grzybowski, 1898, p. 291.
Single specimen (0.4 mm) was found in Słocina.

Family TEXTULARIDAE
Subfamily Textularinae
Genus ***Textularia*** Defrance
48. ***Textularia globifera*** Reuss
Textularia globifera Reuss, 1860, p. 332, pl. 12, fig. 7-8.
Textularia globifera Reuss. Reuss, 1861, p. 320.
Textularia globulosa Reuss, 1845, p. 39, pl. 12, fig. 23.
Gümbelina globifera (Reuss). Egger, 1899, p. 33, pl. 14, fig. 35-36, 53-55.

A few specimens that fully resemble the one described by Reuss; 0.4-0.5 mm in length. This species occurs commonly in the Upper Cretaceous, e.g. in the Senonian of Westphalia, in Senonian tuffs from Maastricht, in Bohemia and in Cretaceous marls from Bavaria. These specimens were found in Stobierna (Kopalówka woods) and in "Międzylesie".

The similar species *Textularia globulosa* Ehrenberg known from Eocene is slightly different. Not having access to Ehrenberg's work I cannot make any observations but I can note that *Textularia globifera* is a variable species.

49. *Textularia carinata* d'Orbigny

Textularia carinata d'Orbigny. Brady, 1884, p. 360, pl. 42, fig. 15-16; includes references.

Textularia carinata d'Orbigny. Grzybowski, 1894, p. 186, pl. 1, fig. 3.

One specimen that matches the forms previously described was found in Stobierna. Length of test 0.7 mm, up to 0.1 mm wide. The margin is dentate; aperture indistinct. This species is known from the Recent. Its first known occurrence is in the Eocene.

Genus *Verneuilina* d'Orbigny

50. *Verneuilina abbreviata* Rzehak.

Grzybowski, 1896, p. 287, pl. 9, fig. 18.

Several specimens fully agree with the forms described by Grzybowski. They were found in Zawada, Stobierna and Łopuchowa. This species is known from the Nummulite beds from Michelsberg in Moravia (Rzehak, 1887).

51. *Verneuilina* cf. *polystropha* (Reuss)

Verneuilina polystropha (Reuss). Brady, 1884, p. 386, pl. 47, fig. 15-17 (with synonyms).

A single poorly preserved specimen from Stobierna probably belongs to this species. According to Brady it is a Recent, shallow-water species. Its first occurrence is in the beginning of Cretaceous (Reuss, 1845).

Genus *Tritaxia* Reuss

52. *Tritaxia tricarinata* (Reuss)

Tritaxia tricarinata (Reuss). Friedberg, 1898, p. 267 (with synonyms).

Tritaxia tricarinata (Reuss). Brady, 1884, p. 389, pl. 49, fig. 8-9.

Tritaxia tricarinata (Reuss). Grzybowski, 1894, p. 188, pl. 1, fig. 20.

Tritaxia tricarinata (Reuss). Egger, 1899, p. 40, pl. 14, fig. 62-3.

A single specimen 1.2 mm long was found in Stobierna. Preservation is poor, sutures indistinct, surface smooth, lustrous. This species is known from the Cenomanian, and occurs in the Cretaceous from Lvov. Brady found it at one locality together with Recent foraminifera.

Genus *Bigenerina* d'Orbigny

53. *Bigenerina nodosaria* d'Orbigny

Bigenerina nodosaria d'Orbigny. Brady, 1884, p. 360, p. 44, fig. 14-18, (with synonyms).

Bigenerina fallax Rzehak. Grzybowski, 1896, p. 288, pl. 9, fig. 20-21.

Two specimens from Zawada with siliceous tests, and with weakly calcareous cement. They fully resemble *Bigenerina fallax* as described and illustrated by Grzybowski. They also resemble *Bigenerina nodosaria* d'Orbigny, therefore I put them into one species. *Bigenerina nodosaria*, a Recent form, occurs in various sea and depths. As a fossil it is known from the Tertiary.

Genus *Spiroplecta* Ehrenberg

54. *Spiroplecta biformis* Parker and Jones

Spiroplecta biformis Parker and Jones, Brady, 1884, p. 376-377, pl. 45, fig. 25-27.

Spiroplecta biformis Parker and Jones, Egger, 1899, p. 30, pl. 22, fig. 37-38.

Spiroplecta lenis Grzybowski, 1896, p. 288, pl. 9, fig. 24-25.

Two specimens with a siliceous test were found in Łopuchowa. They agree with the description and drawing of *Spiroplecta lenis* Grzybowski.

Spiroplecta lenis does not differ much from *Spiroplecta biformis* as described by Brady. In this form and in *Spiroplecta lenis* Grzybowski, the spiral coiling at the beginning of the test is indistinct; somewhat less than in Brady's form, but this small difference does not constitute the basis for creating a new

species. *Spiroplecta biformis*, a modern form, has its first known occurrence in the Gault.

Genus ***Gaudryina*** d'Orbigny

55. ***Gaudryina pupoides*** d'Orbigny

Gaudryina pupoides d'Orbigny. Brady, 1884, p. 378, pl. 46, fig. 1-4. includes references.
Gaudryina pupoides d'Orbigny. Reuss, 1860, p. 229.
Gaudryina pupoides d'Orbigny. Reuss, 1863, p. 33.
Gaudryina pupoides d'Orbigny. Egger, 1899, p. 37, pl. 4, fig. 19-20.
Gaudryina pupoides d'Orbigny. Grzybowski, 1894, p. 188, pl. 1 fig. 9.
Gaudryina pupoides d'Orbigny. Grzybowski, 1896, p. 289.

A single, well-preserved specimen was found in the dark clays from Łopuchowa. It is less compressed than the specimen described by Grzybowski, and it is closer to Brady's drawing. The second specimen, more compressed, was found in Stobierna (Kopalówka woods). This Recent species, listed by Brady as an abyssal form, has its first occurrence in the Early Cretaceous.

Genus ***Bulimina*** d'Orbigny

56. ***Bulimina murchisoniana*** d'Orbigny

Bulimina murchisoniana d'Orbigny, 1840, p. 41, pl. 4, figs. 15-16.
Bulimina murchisoniana d'Orbigny. Reuss, 1845, p. 37, pl. 8, fig. 69, 72.
Bulimina murchisoniana d'Orbigny. Reuss, 1860, p. 41, p. 225.
Bulimina murchisoniana d'Orbigny. Egger, 1899, p. 51, pl. 15, fig. 49-50.

A single specimen corresponding to this species from Stasiówka (Międzylesie). Test built of sand grains with calcareous cement, and a rather rough surface. This species is known from the Cretaceous.

57. ***Bulimina intermedia*** Reuss

Bulimina intermedia Reuss. Friedberg, 1898, p. 268.
Bulimina intermedia Reuss. Egger, 1899, p. 51, pl. 15, fig. 3-4, (with synonyms).

Two specimens were found at Stobierna. This species is also known from the Cretaceous, e.g. from the Lvov Marls.

58 ***Bulimina pupoides*** d'Orbigny

Bulimina pupoides d'Orbigny. Brady, 1884, p. 400, pl. 50, fig. 15.
Bulimina pupoides d'Orbigny. Egger, 1899, p. 49, pl. 15, fig. 1-2.
Synonyms can be found in Brady and Egger.

A single specimen from Stobierna (Kopalówka) with a porcellaneous, lustrous test, corresponding to the forms figured by Brady and Egger. It differs in having an elongated suture between the last two chambers, which makes the aperture appear as a long slit. This species is known from the Eocene and Recent, and according to Egger (1899) is found in the Cretaceous. The living species is a deep-water form, occurring rarely in waters shallower than 1800 m (Brady, 1884).

59. ***Bulimina preslii*** Reuss

Bulimina preslii Reuss. Friedberg, 1898. p. 270, (with synonymy).
Bulimina preslii Reuss. Egger, 1899, p. 52, pl. 15, fig. 56.

A single specimen from Łopuchowa. Relatively large, 1.3 mm length, 0.8 mm maximum width. Test agglutinated. The last chamber is somewhat flattened, otherwise it conforms well to the type description. Aperture quite distinct. This species is known from the Senonian Lvov Marls and other Cretaceous formations.

60. ***Bulimina conulus*** Rzehak

Bulimina conulus Rzehak, 1888, p. 226.
Ataxophragmium conulus (Rzehak). Grzybowski, 1896, p. 290, pl. 9, fig. 20.

A single specimen from Łopuchowa. Test agglutinated.

Family Chilostomellidae

Genus ***Chilostomella*** Reuss

61. ***Chilostomella ovoidea*** Reuss

Chilostomella ovoidea Reuss. Brady, 1884, p. 436, pl. 55, figs. 12-23 (with synonymy).

Very common specimens were found in Zawada. It is strange that it is missing from other samples. Test calcareous, 0.8 mm in length, corresponding to Brady's figures, but differing in the larger size of the penultimate

chamber and in possessing more depressed sutures. Some of my specimens are compressed. Modern forms of this species are found at all depths, but predominantly in deep water. It is widely distributed in the Tertiary formations, e.g. in the Wieliczka salt.

Family Lagenidae
Genus *Lagena* Walker and Boys
62. *Lagena globosa* Montfort

Lagena globosa Montfort. Brady, 1884, p. 452, pl. 54, fig. 1-3.
Lagena globosa Montfort. Egger, 1899, p. 102, pl. 5, fig. 3.
Lagena globosa Montfort. Olszewski, 1875, p. 97.
Lagena globosa Montfort. Grzybowski, 1894, p. 189, pl. 1, fig. 15.
Lagena globosa Montfort. Grzybowski, 1896, p. 291.

I have found two specimens; one from Zawada, the other from Stobierna (Kopalówka). The first one is elliptical, the other is smaller and nearly round. This species is known from various depths in the modern seas. It occurs from the Jurassic, and is an example of the continuity of form among the foraminifera. In our area, it is known from Grzybowski's material and from the Wieliczka Salt and the Lvov Marls.

63. *Lagena apiculata* Reuss var. *tetracarinata* n.var.

A single specimen conforming almost completely with the first-named species [*L. apiculata*], but differing from it in possessing four carinae extending from top to bottom. The carinae are rather indistinct. The surface is smooth, aperture radiate, and there is a small apical spine. My specimen was found at Zawada. *Lagena apiculata* Reuss is known to range from the Liassic (Brady, 1884).

Genus *Nodosaria* Lamark
64. *Nodosaria soluta* (Reuss)

Nodosaria soluta (Reuss). Brady, 1884, p. 503, pl. 62, fig. 13-16; pl. 64, fig. 28.
Nodosaria soluta (Reuss). Egger, 1899, p. 59, pl. 6, fig. 23; pl. 7, fig. 3.
Nodosaria cf. *soluta* (Reuss). Grzybowski, 1894, p. 193, pl. 2, fig. 9.

I found four incomplete specimens of this species (Stasiówka, Stobierna, Kopalówka, and Zawada). These are characterized by their large dimensions (although all my specimens have only two chambers, they are ca. 2.0 mm). This species is known from the Cretaceous to Recent. It occurs at various depths, from 220 to 2500 m (Brady, 1884).

65. *Nodosaria* cf. *subornata* Reuss

Nodosaria subornata Reuss, 1866, p. 459, fig. 9-10.

A fragment that probably belongs to this species was found in Stobierna. My specimen is 1.2 mm long and consists of the first three chambers. Chambers are equal in size, rectilinear, and the initial chamber has an apical spine. The test has numerous fine striae that are less prominent near the sutures, as in Reuss' specimens. Described by Reuss from Senonian chalks.

66. *Nodosaria calomorpha* Reuss.
pl. 2, figs. 5-6

Nodosaria calomorpha Reuss. Brady, 1884, p. 497, pl. 61, fig. 23-27 (with synonyms).
Nodosaria calomorpha Reuss. Grzybowski, 1894, p. 191, pl. 2, fig. 6.
Nodosaria calomorpha Reuss. Grzybowski, 1896, p. 293, pl. 10, fig. 31.
Nodosaria bistegia Dunikowski, 1879, p. 106, fig. 4.
Nodosaria bistegia Dunikowski. Friedberg, 1898, p. 106.

Two specimens: the first, from Łopuchowa, is 0.7 mm long and 0.4 mm wide, and comprised of two chambers. The first chamber is nearly spherical, the second is smaller, and has a simple aperture. Surface smooth. My specimens differ from the typical two-chambered forms (e.g. fig. 23 of Brady), in that the second chamber is not oval, but is spherical. The second specimen has two oval chambers and a radiate aperture. It conforms to *Nodosaria bistegia*, and was found in Stobierna.

Nodosaria bistegia Dunikowski does not differ from *N. calomorpha*. It is identical to the form that Grzybowski illustrated as *N. calomorpha* from Wadowice. This species is known from the Tertiary to Recent. It is known as *Nodosaria bistegia* from the Lvov Marls.

67. ***Nodosaria (Dentalina) consobrina*** d'Orbigny

Nodosaria consobrina d'Orbigny. Brady, 1884, p. 502, pl. 62, fig. 23-24.

Nodosaria consobrina d'Orbigny. Egger, 1899, p. 61, pl. 5, fig. 4; pl. 6, fig. 31-33, 36.

References and synonyms were given by Brady and Egger.

Several fragments of this very variable species were found in Kopalówka. The test is rectilinear and comprised of four chambers. The initial chamber is spherical, and has a distinct stolon at the bottom. The second chamber is smaller, and the others are larger. Although my specimens are fragmentary, they correspond to the drawings of d'Orbigny (1846).

The specimen described as *Dentalina mediolata* by Dunikowski (1879) from the Senonian Lvov Marls is very similar to this species, if not entirely synonymous, because of its irregular-sized chambers. *Nodosaria consobrina* is known from the Cretaceous to Recent.

68. ***Nodosaria romeri*** Neugeboren

Nodosaria romeri Neugeboren. Brady, 1884, p. 505, pl. 63, fig. 1

Nodosaria romeri Neugeboren. Egger, 1899, p. 58, pl. 6, fig. 17 (with synonyms).

Test 1 mm in length, somewhat bent, with indistinct, inclined sutures. Test has four chambers and tapers towards the initial end. Ultimate chamber is the largest and has a radial aperture, situated slightly to one side. My specimen, from Zawada, is somewhat compressed.

This species, which according to Brady lives in the North Atlantic at a depth of 720 m, is known as *Nodosaria nana* from the Gault (Reuss, 1863), and from the Septarian clay of Germany. It was also reported from the Miocene of Transylvania (Neugeboren, 1856), and from the Bavarian Alps (Egger, 1899).

69. ***Nodosaria communis*** (d'Orbigny)

Nodosaria communis (d'Orbigny). Brady, 1884, p. 504, pl. 62, fig. 19-22.

Nodosaria communis (d'Orbigny). Egger, 1899, p. 65, pl. 6, fig. 4 (with synonymy).

I found two specimens; from Stobierna and Zawada. The first has a straight test, bent towards the end, and is comprised of seven chambers separated by very shallow sutures. Aperture radiate. The second specimen is well-preserved, 1.4 mm in length, has a more delicate test and is strongly bent. This species ranges from the Cretaceous to Recent.

70. ***Nodosaria (Glandulina) cylindrica*** (Alth)

Glandulina cylindrica Alth. Friedberg, 1898, p. 276 (with synonyms).

Two specimens, from Stobierna and Zawada. The first has two very wide chambers and an indistinct suture between them. Chambers are not elongated, and the test is barrel-shaped. Length 0.5 mm. The second specimen is quite large (1.5 mm), multichambered, of which the ultimate chamber is largest, and elongated. The initial chamber is rounded. Aperture radiate.

Glandulina cylindrica is known from the Senonian Lvov Marls. Egger (1899) illustrated two specimens of *Glandulina cylindracaea* Reuss. The specimen on his fig. 19 has a rounded (not elongated) initial chamber, and is identical to *Glandulina cylindrica* of Alth. On fig. 20, Egger shows a specimen with an elongated initial chamber, which resembles the species of Reuss. In my opinion, it is not necessary to separate these two species, since the differences between them are so small. In addition, it may be necessary to synonymize these forms under *Nodosaria calomorpha* Reuss.

Genus ***Lingulina*** d'Orbigny

71. ***Lingulina dentata*** Grzybowski

Lingulina dentata Grzybowski, 1896, p. 296, pl. 10, fig. 19.

A single specimen from Zawada that agrees with the description of Grzybowski, except that the test is only slightly bent. This species displays close affinities to *Lingulina bohemica* Reuss, which has two fewer chambers, is less tapered towards the initial end,

and has a straight test. Because I found only one specimen, I cannot determine whether Grzybowski's species is only a variety of Reuss' species.

Genus *Vaginulina* d'Orbigny

72. *Vaginulina legumen* (Linnaeus)

Vaginulina legumen (Linnaeus). Brady, 1884, p. 530, pl. 66, fig. 13-15 (with synonyms).

I found only one specimen from Stasiówka (coal shaft). Test straight, 1.3 mm in length, 0.4 mm in width, compressed, with inclined, but not pronounced, sutures. The last chamber is largest, and has a terminal, radiate, aperture situated to one side. The initial end of the test is rounded, and weakly tapering. This species was reported by Brady from various seas to a depth of 3600 m or more. It is known from the Triassic. A similar species is *Cristellaria parallela* Reuss, which is known from the Hils of northern Germany.

Genus *Cristellaria* Lamarck

73. *Cristellaria rotulata* (Lamarck)

Cristellaria rotulata (Lamarck). Brady, 1884, p. 547, pl. 69, fig. 13 (with synonyms).

Robulina rotulata Lamarck. Grzybowski, 1894, p. 149, pl. 3, fig. 15

Robulina rotulata Lamarck. Grzybowski, 1898, p. 298.

I found two specimens of different size (diameter 0.5 mm and 1.0 mm) from Zawada. This species occurs at various depth throughout the modern seas, and is known from the Upper Triassic. In addition to the localities listed by Grzybowski, it is found in the Senonian of Lvov.

74. *Cristellaria isidis* Schwager

Cristellaria isidis Schwager, 1883, p. 110, pl. 26, fig. 12.

A single specimen from Stobierna-Kopalówka, agrees with Schwager's description. It is slightly larger (1 mm) and the oblique sutures (5) are less distinct. This species is only known from the Eocene of Libya, but Schwager notes its affinity to *Cristellaria rotulata* Lamarck and *C. inornata*.

75. *Cristellaria lepida* Reuss

pl. 2, fig. 8

Cristellaria lepida Reuss, 1845, p. 109, pl. 24, fig. 46.

Cristellaria lepida Reuss. Reuss, 1860, p. 215.

Test oval, highly compressed, 0.9 mm in length, 0.6 mm in width. Initial chambers tightly coiled, with a distinct umbo, later chambers uncoiling, forming an elongate test. Sutures indistinct. Test narrows towards the periphery, which is very acute. Aperture terminal, radiate. My specimen from Chmielnik differs from Reuss' drawing in its more prominent umbo and more compressed test.

This species displays affinity to *Cristellaria bronni* Römer, as illustrated by Uhlig (1883) from the Jurassic of Russia. Because *Cristellaria bronni* resembles *C. rotulata*, Uhlig believes the former is a more elongate form of the latter. *Cristellaria lepida* differs from *C. bronni* in its well-developed umbo and more tightly coiled test. It may be transitional between *C. bronni* and *C. rotulata*. This species is known from the Cretaceous of Westphalia and Bohemia.

76. *Cristellaria nuda* Reuss

Cristellaria nuda Reuss, 1861, p. 328, pl. 6, fig. 1-3.

Cristellaria nuda Reuss. Reuss, 1863, p. 72, pl. 8, fig. 2.

Cristellaria nuda Reuss. Friedberg, 1898, p. 278.

Cristellaria nuda Reuss. Egger, 1899, p. 117, pl. 12, fig. 25-26.

Test oval, 0.8 mm long, strongly convex, more so than in the type specimens. My specimen is entirely comparable to the ones illustrated by Reuss from the Cretaceous of Rugia, and by Egger. It differs though, in being strongly convex and having fewer chambers. Only four sutures are visible, and the periphery is acute. The last suture is nearly horizontal. Aperture radiate.

My specimen is quite similar to *C. abcisa* Grzybowski, 1896. It differs only in the smaller number of chambers and in having an apertural face that is not entirely flat. However, I place it in *Cristellaria nuda*, because in his type description Reuss (1861) noted that the species is quite variable, being convex to a lesser or greater degree. In this case, *C. abcisa*

of Grzybowski may represent a more convex specimen of *C. nuda*. They are very similar in appearance, if not synonymous. Another related species is *Cristellaria truncata*, described by Reuss from the Lvov Marls. It differs from *C. nuda* and *C. abcisa* in being more compressed

Cristellaria nuda is reported from the Cretaceous of Westphalia, Rugia, Bavaria, and from the Senonian Lvov Marls, where I found one specimen. My specimen is from Stobierna.

77. ***Cristellaria cultrata*** (Montfort)

Cristellaria cultrata (Montfort). Brady, 1884, p. 550, pl. 70, fig. 4-6, 7-8.

Cristellaria cultrata (Montfort). Egger, 1899, p. 123, pl. 11, fig. 11-12.

Robulina pectinata Grzybowski, 1896, p. 298. [pl. 10, fig. 27.]

A single specimen, 0.5 mm in diameter, from Stobierna. It agrees with the type specimen, but the umbo is somewhat larger and it has limbate sutures. *Robulina pectinata*, which Grzybowski (1896) described as a new species, does not differ from *C. cultrata*. The author himself does not explain the difference between the two species, and only notes that "The present form belongs to the group of *Robulina cultrata* and resembles the latter very strongly". *Cristellaria cultrata* is known from the Liassic to Recent. Egger reported it in the Cretaceous marls of the Bavarian Alps.

Genus ***Flabellina*** d'Orbigny

78. ***Flabellina reticulata*** Reuss

pl. 2, fig. 7

Flabellina reticulata Reuss, 1851, p. 30, pl. 1, fig. 22.

Flabellina reticulata Reuss. Reuss, 1863. p. 326.

Flabellina reticulata Reuss. Friedberg, 1898. p. 280.

Flabellina reticulata Reuss. Egger, 1899, p. 107, pl. 13, fig. 5-7.

A single specimen from Zawada. Test lanceolate, 1.4 mm in length, 0.7 mm wide, consisting of about eight partially embracing chambers, the last of which is widest and tapers towards the apex in a blunt neck on which a radiate aperture is situated. The sutures are raised, limbate, and display rare branching. The initial chambers (not counting the following eight) are inflated. The raised sutures connect in the centre of the test in a very irregular manner. In places they form polyhedral buttons, others are linked up by two central longitudinal sutures. My specimen differs from the one illustrated by Egger (fig. 7) in the distinct development of "buttons" and in its more lanceolate shape. This species is known from the Senonian Lvov Marls, from the chalks of Rugia, and from the Bavarian Alps.

Genus ***Polymorphina*** d'Orbigny

79. ***Polymorphina sororia*** Reuss

pl. 2, fig. 9

Polymorphina sororia Reuss, 1863, pl. 7, fig. 72-74.

Polymorphina sororia Reuss. Reuss, 1867, p. 89,

Polymorphina sororia Reuss. Brady, 1884, p. 162, pl. 71, fig. 15-16.

Polymorphina sororia Reuss. Egger, 1899, p. 126, pl. 17, fig. 6-7.

Test barrel-shaped, rounded at the initial end, tapered at the apex, with a radiate aperture. Sutures oblique, poorly visible. My specimen from Zawada differs from the type specimen of Reuss in its more barrel-shaped test, and in its somewhat flattened sides such that it is slightly triangular. Length 0.8 mm, width 0.4 mm. *Polymorphina sororia* is known from the Recent, from the salt clays in Wieliczka, from the Tertiary of Germany, and from the Cretaceous marls of Bavaria.

80. ***Polymorphina irregularis*** n.sp.

pl. 2, fig. 10a,b

One specimen was found at Zawada. Test 0.8 mm in length, 0.5 mm in width, irregularly flattened, siliceous, with a roughened surface. On one view (fig. 10a) the test is concave towards the top and rounded at the bottom. Its upper surface narrows to a produced neck, with a radiate aperture situated slightly to one side. On this side, two intersecting sutures are visible. The other side of the test (fig. 10 b) is convex. The central portion, separated by a round suture, is very convex. I was unable to find anything resembling this form in the literature.

81. ***Polymorphina lanceolata*** Reuss

Polymorphina lanceolata Reuss, 1863, p. 58, pl. 7, fig. 75-88.

Polymorphina lanceolata Reuss. Brady, 1884, p. 564, pl. 72, fig. 5-6.

Polymorphina lanceolata Reuss. Egger, 1899, p. 125, pl. 17, fig. 2.

Polymorphina lanceolata Reuss. Grzybowski, 1894, p. 197, pl. 2, fig. 2.

A single specimen from Stobierna agrees with the illustrations of Reuss and Brady, but differs from those of Egger and Grzybowski. Test elongated, circular in cross section, 0.8 mm in length, strongly tapered at both ends. Sutures are indistinct in the initial portion, but the later portion is comprised of a single large chamber. Surface smooth. *Polymorphina lanceolata* lives in modern seas to a depth of 3300 m. It is known from the Cretaceous marls of the Bavarian Alps and from the Tertiary.

Family Globigerinidae

Genus ***Pullenia*** Parker and Jones

82. ***Pullenia sphaeroides*** (d'Orbigny)

Pullenia sphaeroides (d'Orbigny). Brady, 1884, p. 615, pl. 84, fig. 12-13.

Pullenia quaternaria Olszewski, 1875, p. 118.

Pullenia bulloides (d'Orbigny). Friedberg, 1898, p. 283.

Pullenia sphaeroides (d'Orbigny). Egger, 1899, p. 174, pl. 21, fig. 27-28.

A single specimen in its typical form, 0.3 mm in diameter, from Stobierna-Kopalówka. *Pullenia sphaeroides* is a deep-water form, living at depths as great as 4950 m (Brady, 1884). In the older formations, it is known from the Senonian Lvov Marls, from the Bavarian Alps, and from the Tertiary of Wieliczka.

83. ***Pullenia quinqueloba*** (Reuss)

Pullenia quinqueloba (Reuss). Brady, 1884, p. 617, pl. 84, fig. 14-15,

Pullenia compressiuscula var. *quadriloba* Grzybowski, 1986, p. 300, pl. 11, fig. 1.

A single specimen from Zawada. Differs from the above species [*P. sphaeroides*] in its larger dimensions (0.7 mm) and greater compression. My specimen has five chambers in the last whorl, of which the penultimate is the smallest, as if stunted. This species has a wide bathymetric distribution, from 36 to 4950 m (Brady, 1884). It is known from the Tertiary of Wieliczka (Reuss, 1867) and from Wadowice (Grzybowski, 1896).

Genus ***Globigerina*** d'Orbigny

84. ***Globigerina cretacea*** d'Orbigny

Globigerina cretacea d'Orbigny. Brady, 1884, p. 596, pl. 82, fig. 10-11.

Globigerina cretacea d'Orbigny. Egger, 1899, p. 169, pl. 21, fig. 1-3.

Globigerina cretacea d'Orbigny. Friedberg, 1898, p. 282.

References and synonyms in Brady and Egger.

Several typical specimens from Stobierna and Łopuchowa. Test ca. 0.5 mm in diameter, with five rounded chambers in the last whorl. This species is cosmopolitan in the Cretaceous. I found it in the Senonian Lvov Marls.

85. ***Globigerina bulloides*** d'Orbigny

Globigerina bulloides d'Orbigny. Brady, 1884, p. 593, pl. 77, pl. 79, fig. 3-5.

Globigerina bulloides d'Orbigny. Egger, 1899, p. 170, pl. 21, fig. 5-7.

Globigerina bulloides d'Orbigny. Grzybowski, 1896, p. 300.

Globigerina bulloides d'Orbigny. Grzybowski, 1898, p. 298.

Globigerina bulloides d'Orbigny. Grzybowski, 1901, p. 286.

Synonyms were listed by Brady and Egger.

One specimen from Stobierna. It is quite small, 0.3 mm, with a lustrous surface, and agrees with the type specimens. Four globular chambers in the last whorl. This species is known from modern seas and the Cretaceous formations.

86. ***Globigerina bulloides*** var. ***triloba*** Reuss

Globigerina bulloides var. *triloba* Reuss. Brady, 1884, p. 595, pl. 79, fig. 1-2; pl. 81, fig. 2-3.

Globigerina triloba Reuss. Egger, 1899, p. 171, pl. 21, fig. 8.

Globigerina triloba Reuss. Grzybowski, 1896, p. 300.

Globigerina triloba Reuss. Grzybowski, 1898, p. 298.

One typical specimen, of small size (0.3 x 0.2 mm), from Łopuchowa. This variety is equiva-

lent to the type species because of its geological occurrence.

87. ***Globigerina aequilateralis*** Brady

Globigerina aequilateralis Brady, 1884, p. 605, pl. 80, fig. 18-21.

Globigerina aequilateralis Brady. Egger, 1899, p. 169, pl. 21, fig. 9, 11, 21-23.

A single specimen from Zawada. Test 0.3 mm in size, identical on both sides. The last whorl contains six globular chambers, of which the final three are strongly convex. This species is known from the Cretaceous to Recent.

Family Rotalidae

Genus ***Rotalia*** Lamarck

88. ***Rotalia umbilicata*** d'Orbigny

Rotalia umbilicata d'Orbigny. Friedberg, 1898, p. 283 (with synonyms).

Rotalia umbilicata d'Orbigny. Egger, 1899, p. 156, pl. 20, fig. 7-9.

One typical specimen was found in Zawada. Test strongly convex, 0.7 mm in diameter. The species is known from many localities, e.g. the Senonian of Lvov.

89. ***Rotalia lithothamnica*** Uhlig

Rotalia lithothamnica Uhlig, 1886, p. 195, pl. 5, fig. 9-11.

Rotalia lithothamnica Uhlig. Grzybowski, 1894, p. 204, pl. 4, fig. 13-14.

Rotalia lithothamnica Uhlig. Grzybowski, 1898, p. 300.

Four typical specimens were found at Zawada and Stobierna-Kopalówka. This species is known from the Eocene of Dukla and the Menilite shales of the Krosno area.

90. ***Rotalia*** cf. ***articulata*** Dunikowski
pl. 2, fig. 11

Rotalia articulata Dunikowski, 1879, p. 133, fig. 28.

A single specimen from Stasiówka probably belongs in this species, although it is slightly different. Both sides are nearly identically convex, although the ventral side slightly more. Chambers triangular, separated by sutures infilled with a white substance. The chambers themselves are grey in colour. The white substance is also present in the umbilicus. On the spiral side an inner whorl is visible. Distinct pores are visible in the white substance. If this substance were absent, my specimen would conform to the species described by Dunikowski. I hesitate to describe a new species because I found only one specimen. Because Professor Dunikowski also described his species based on one specimen I cannot state whether they are the same.

91. ***Rotalia*** cf. ***orbicularis*** d'Orbigny

Rotalia orbicularis d'Orbigny. Brady, 1884, p. 706, pl. 107, fig. 5; pl. 105, fig. 6.

A single specimen from Zawada. Test 0.4 mm in diameter, spiral side flat and displays three whorls. Sutures on the spiral side are indistinct, surface lustrous. Because of the lack of sufficient material, I cannot indentify this species with certainty.

92. ***Rotalia papillosa*** var. ***compressiuscula*** Brady

Rotalia papillosa var. *compressiuscula* Brady, 1884, p. 708, pl. 107, fig. 1, pl. 108, fig. 1.

A single specimen from Stobierna-Kopalówka probably belongs in this species, but is about half the size. The type specimen of Brady was found in the Pacific in shallow waters.

Genus ***Truncatulina*** d'Orbigny

93. ***Truncatulina lobatula*** Walker and Jacob

Truncatulina lobatula Walker and Jacob. Brady, 1884, p. 660, pl. 92, fig. 10; pl. 93, fig. 1, 4, 5; pl. 95, fig. 4-5.

Truncatulina lobatula Walker and Jacob. Egger, 1899, p. 151, pl. 23, fig. 12-14.

Truncatulina communis Römer. Grzybowski, 1894, p. 200, pl. 3, fig. 12.

Synonyms listed by Egger and Brady.

Seven specimens from Zawada, Łopuchowa, and Stobierna-Kopalówka. Tests are typically developed, and 0.3 - 0.5 mm in diameter. This species is found at various depth in the modern ocean, and is known from the Carboniferous as *Truncatulina dekayi* Reuss. I have found it in the Senonian Lvov Marls.

94. ***Truncatulina livida*** Grzybowski

Truncatulina livida Grzybowski, 1894, p. 200, pl. 4, fig. 19.
A single specimen, 0.6 mm in diameter, from Zawada. Differs from Grzybowski's specimen only in the smaller number of chambers, which are somewhat wider.

95. ***Truncatulina akneriana*** d'Orbigny
Truncatulina akneriana d'Orbigny. Brady, 1884, p. 663, pl. 94, fig. 8.
A single small specimen from Łopuchowa, 0.3 mm in diameter, with only one whorl visible on the umbilical side, which distinguishes this species from *T. lobatula*. This species is known from the Tertiary to Recent.

96. ***Truncatulina insecta*** Schwager
Truncatulina insecta Schwager, 1883, p. 50, pl. 5, fig. 1-2.
A single well-preserved specimen from Łopuchowa. Test oval, 0.5 x 0.3 mm, flattened, nearly identical on both sides, which makes this species resemble *Nonion*. Two whorls are visible on the spiral side. The last whorl consists of numerous chambers which increase rapidly in thickness, such that the younger part of the test is thicker than the early part, and the inner whorl lies in a depression.[11] Periphery rounded, but more acute in the early portion of the test. Surface smooth, with numerous pores. *Truncatulina insecta* resembles the Recent species *Discorbina rugosa* (Brady, 1884, pl. 87, fig. 3; pl. 91, fig. 4). It is also known from the Eocene.

Genus ***Pulvinulina*** Parker and Jones
97. ***Pulvinulina subcandidula*** Grzybowski
Pulvinulina subcandidula Grzybowski, 1896, p. 303, pl. 11, fig. 10-11.
A common species, I found nine specimens from Zawada, Łopuchowa and Stobierna. Test 0.4 - 0.6 mm in diameter, weakly convex on both sides, with an acute periphery. On the spiral side 2 1/2 whorls are visible, with somewhat oblique, poorly defined, sutures. One whorl is visible on the ventral side. Sutures converge in the centre, which is not depressed. Surface smooth and lustrous.

98. ***Pulvinulina karsteni*** (Reuss)
Pulvinulina karsteni (Reuss). Brady, 1884, p. 698, pl. 105, fig. 8-9.
Pulvinulina karsteni (Reuss). Egger, 1899, p. 161, pl. 20, fig. 32-34.
Two specimens from Stobierna, 0.4 mm in diameter. They differ from the types only in lacking an umbilical depression. This species is known from the modern polar seas, as well as from the Cretaceous. It has been found in the Bavarian Alps (Egger, 1899), Mecklenberg, and in greensands from New Jersey.

99. ***Pulvinulina partschiana*** d'Orbigny
Pulvinulina partschiana d'Orbigny. Brady, 1884, p. 699, pl. 105, fig. 3.
Pulvinulina partschiana d'Orbigny. Egger, 1899, p. 154, pl. 20, fig. 10.
Pulvinulina partschiana d'Orbigny. Grzybowski, 1898, p. 299, pl. 12, fig. 25.
Synonyms and references are listed by Brady and Egger.
A single specimen from Zawada. Test 0.8 mm in diameter, strongly convex on both sides, agrees with Egger's figure, but differs in its convex umbilical side and lack of a raised suture between the chambers and whorls. This is a very stable form, known from the Triassic to Recent.

100. ***Pulvinulina*** cf. ***bimammata*** Gümbel
pl. 2, fig. 13
Pulvinulina cf. *bimammata* Gümbel. Uhlig, 1886, p. 192, pl. 3, fig. 7-8; pl. 5, fig. 4, 5, 8.
Pulvinulina cf. *bimammata* Gümbel. Grzybowski, 1894, p. 203.
Specimens which probably belong to this species have an indistinct surface. The test is unequally biconvex (more convex on the umbilical side), and displays several whorls on the spiral side. Only one whorl is visible on the umbilical side. Sutures indistinct, probably with numerous chambers. Two small specimens

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11 *[The next sentance may contain a printer's error because it contradicts what is written above. It reads "One and one-half whorls visible on the spiral side".]*

(0.4 mm) were found in Łopuchowa, one larger one is from Zawada. This species is known from the Eocene at several localities, e.g. Dukla (Grzybowski, 1894) and Wola Luzanska (Uhlig, 1886).

101. ***Pulvinulina boueana*** d'Orbigny

Pulvinulina boueana d'Orbigny, 1846, p. 152, pl. 7, fig. 25-27.

Pulvinulina boueana d'Orbigny. Brady, 1884, p. 627.

One very small specimen (0.3 mm) was found in Chmielnik. On the spiral side the test is slightly convex, and displays two whorls. Chambers are separated by raised, oblique sutures. The last chamber is greater in size. The sutures converge in the centre of the test, where there is a slightly raised umbo. Periphery is acute. My specimen differs from d'Orbigny's drawings in having raised sutures on the umbilical side, and in the raised umbo. My specimen displays affinity to *Rotalia spinulifera* described by Reuss (1863, pl. 13, fig. 3-5), from the Gault of Folkestone, and to the specimen figured by Egger (1899, pl. 21, fig. 42-44) from the Cretaceous of Bavaria. The typical *P. boueana* was described from the Miocene at Baden, and lives in modern seas.

Genus *Discorbina* Parker and Jones

102. ***Discorbina pusilla*** Uhlig

Discorbina pusilla Uhlig, 1886, p. 182, pl. 5, fig. 12-13.

Discorbina pusilla Uhlig. Grzybowski, 1894, p. 187, pl. 3, fig. 3-7

Discorbina pusilla Uhlig. Grzybowski, 1898, p. 298.

My specimens were found in Zawada, Stobierna, and Łopuchowa. A very common and variable species. My specimens are 0.4 - 0.8 mm in diameter. Test is unequally biconvex, but the spiral side is nearly flat. Sutures on the spiral side are oblique, and sometimes have raised sutures. The last chamber is sometimes larger than the preceding ones. On the ventral side, five chambers are visible, separated by depressed sutures. The umbilicus is usually small, but occasionally is larger and filled with calcareous matrix.

103. ***Discorbina eximia*** Hantken

Discorbina eximia Hantken, 1875, p. 76, pl. 9, fig. 3; pl. 15, fig. 7-8.

Discorbina eximia Hantken. Brady, 1884, p. 646, pl. 88, fig. 9.

Several specimens from Zawada, Stobierna, and Łopuchowa are consistent with the illustrations of Hantken, but are half the size (0.5 - 0.8 mm diameter). This species is known from the Oligocene of Hungary and from the modern seas.

104. ***Discorbina*** cf. ***parisiensis*** d'Orbigny pl. 2, fig. 12.

Discorbina parisiensis d'Orbigny. Brady, 1884, p. 648, pl. 90, fig. 5, 6, 9-12.

Discorbina parisiensis d'Orbigny. Grzybowski, 1894, p. 198, pl. 4, fig. 8.

A single specimen from Łopuchowa agrees more with Grzybowski's figure than with Brady's. Test round, 0.6 mm in diameter. On one side the test is nearly flat, with 1 1/2 whorls, the last of which has arched sutures. The other side is weakly convex, with 6-7 chambers and extremely oblique sutures, such that they are nearly parallel to the periphery. Typical *Discorbina parisiensis* lives in the modern seas in shallow water. As a fossil it is known from the Eocene.

105. ***Discorbina uhligi*** Grzybowski

Discorbina uhligi Grzybowski, 1894, p. 199, pl. 4, fig. 10-11.

Over a dozen specimens from Łopuchowa, agreeing with Grzybowski's description. The only difference is their somewhat more distinctly separated chambers on the ventral side.

106. ***Discorbina turbo*** (d'Orbigny)

Discorbina turbo (d'Orbigny). Brady, 1884, p. 642, pl. 87, fig. 8.

A single specimen from Zawada. Test concavo-convex, slightly elongate, 0.5 mm in diameter, with an uneven periphery. On the spiral side the outer whorl is narrow, with indistinct sutures. Internal whorls form a conical spire above the outer whorl. The concave ventral side has six flat chambers, with distinct

sutures. This species is known from the Cretaceous to Recent.

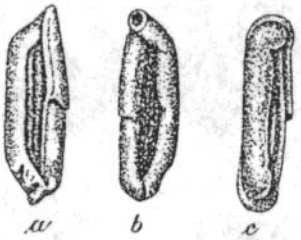
In addition to the above described species, I also found several ostracods, fish teeth that probably belong in the genus *Oxyrrhina*, as well as *Inoceramus* prisms. In one locality, in the vicinity of Słocina, I found numerous fragments of *Orbitoides*. Due to their rather small size (0.5-0.7 mm in diameter), and the lack of literature and thin sections I could not positively identify them.

Explanations to Plates:

(Magnifications not given)

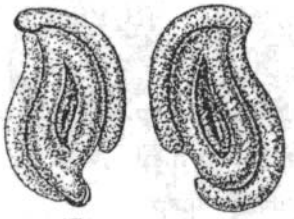
Rozprawy Wydz. mat.-przyr. Tom XLI. Ser. B

I.



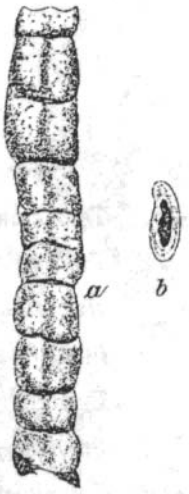
a *b* *c*

Fig. 1.



a *b*

Fig. 2.



a *b*

Fig. 3.

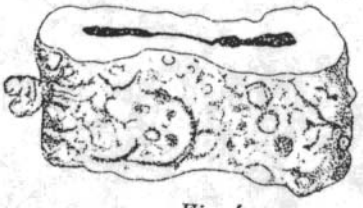
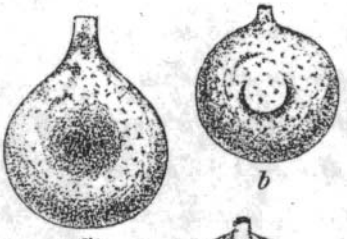


Fig. 4.



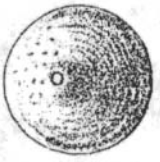
a *b*

c

Fig. 5.

a *b*

Fig. 8.



e

Fig. 6.

d

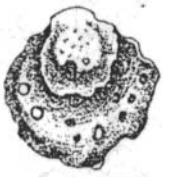
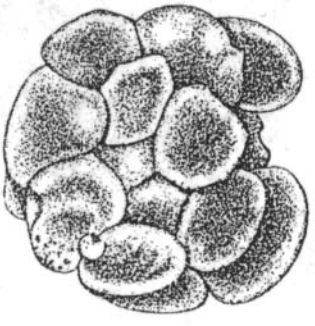


Fig. 7.

a

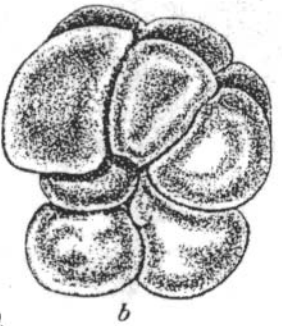
b

Fig. 10.



a

Fig. 9.



b

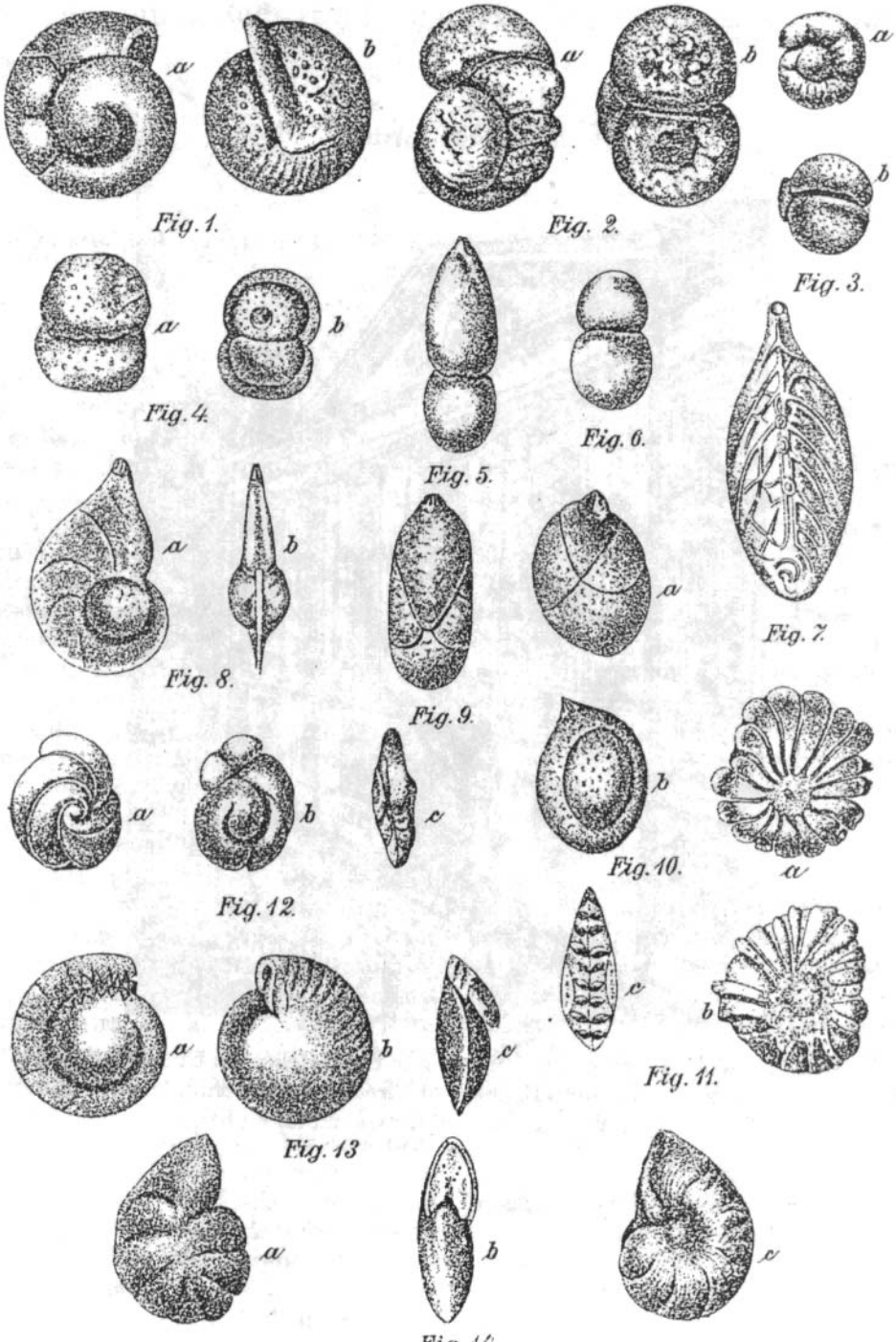
W. Friedberg.

Plate 2

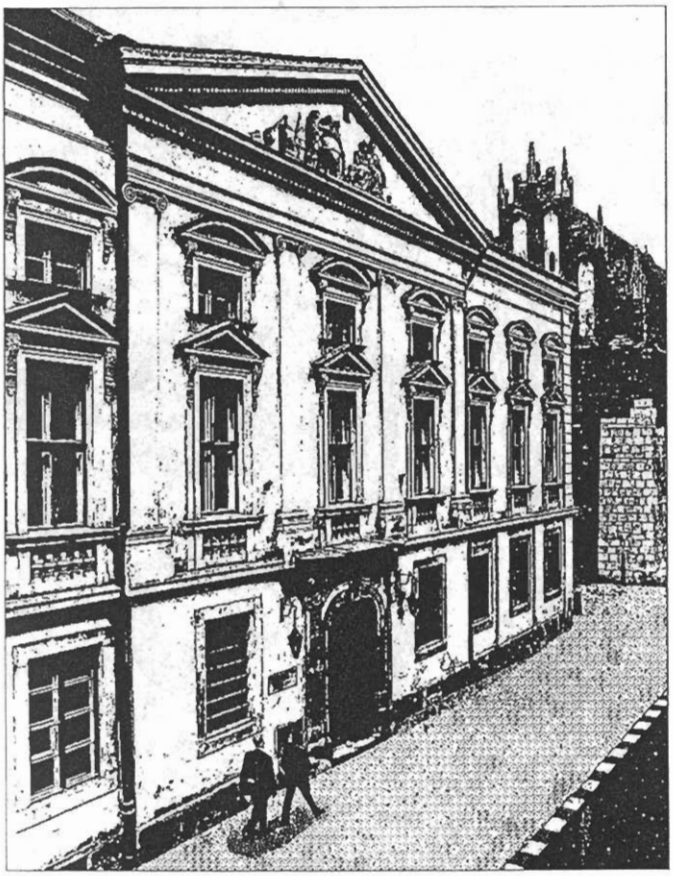
Fig. 1a,b. *Trochammina bifaciata* **n.sp.**
Fig. 2a-3b. *Trochammina mirabilis* **n.sp.**
Fig. 4a,b. *Trochammina simplex* **n.sp.**
Fig. 5-6. *Nodosaria calomorpha* Reuss.
Fig. 7. *Flabellina reticulata* Reuss
Fig. 8. *Cristellaria lepida* Reuss
Fig. 9. *Polymorphina sororia* Reuss
Fig. 10a,b. *Polymorphina irregularis* **n.sp.**
Fig. 11a,b *Rotalia* cf. *articulata* Dunikowski
Fig. 12a-c. *Discorbina* cf. *parisiensis* d'Orbigny
Fig. 13a-c. *Pulvinulina* cf. *bimammata* Gümbel
Fig. 14a-c. *Peneroplis pertusus* (Forskal)

Tab. XIX.

II.



Lit. K. Hranikowski, Kraków.



A view of the old Geology Department building of the Jagiellonian University on Św. Anna Street, where Grzybowski and Friedberg lectured and palaeontological collections were housed (scanned from a photograph).