

ATLAS OF FOSSILS

GEOLOGY OF POLAND



ATLAS OF FOSSILS

**Geology
of Poland**



**GEOLOGICAL
INSTITUTE**



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AND CHARACTERISTIC FOSSILS

Part 2a

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TRIASSIC

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PREFACE

For several decades a team of specialists from the field of paleontology has been acting in the Geological Institute. The team has gathered rich material of fossil fauna and flora from drillings and outcrops in several parts of the country (Polish Lowlands, Silesian-Cracow Upland, the Góry Świętokrzyskie Mts and the Carpathians).

Analytical results of studies of the above team of the Geological Institute, especially those obtained in the course of paleontological and biostratigraphic expertises, have as far as possible been published, contributing to the Polish and world biostratigraphic literature. This made it necessary for the Geological Institute, the oldest and biggest centre of geological sciences in the country, to undertake works aimed at gathering museum collections and synthesize most important biostratigraphic information dispersed in various sources.

Works on monograph *Atlas skamieniałości przewodnich i charakterystycznych*, the third volume of *Budowa Geologiczna Polski* and the first position of that type compiled in our country, were initiated in 1971. The team of researchers of the Geological Institute and the invited specialists from other research centres in the country which took part in that project has been led by Doc. Dr. Lidia Malinowska (Head of Laboratory of Paleozoology of Department of Stratigraphy, Tectonics and Paleogeography, Geological Institute) as the General Editor. Thanks to the deep concern of the General Editor, section editors, authors and editorial teams of the Department of Publications, Maps and Text (Geological Institute) and the Publishing House Wydawnictwa Geologiczne, it became possible to publish first of Mesozoic parts of Polish version of the monograph as early as 1979.

Presenting Mesozoic part of the monograph to the foreign Reader, the Geological Institute dedicates this publication unique in Polish geological literature to our paleontologists such as J. B. Pusch-Koreński, J. Siemiradzki, L. Zejszner, M. Raciborski and others who laid foundations for major achievements of Polish biostratigraphy.

Prof. Dr. hab. Wacław Ryka
Director of the Geological Institute

Warsaw, January 1984

INTRODUCTION TO MESOZOIC PART OF THE ATLAS

A few years after the appearance of the Polish version of the first parts of the *Atlas skamieniałości przewodnich i charakterystycznych* (*Budowa geologiczna Polski*, vol. III, Part 2 — *Mezozoik: 2a — Trias*, 1979, 2b — *Jura*, 1980, 3c — *Kreda*, 1984) we are presenting to the foreign reader its English version. The latter is simplified; it lacks descriptions of species as they had been previously published in foreign languages.

In the Mesozoic part are presented selected species of invertebrates and flora which are important for biostratigraphic and paleontological characteristics of Polish Triassic, Jurassic and Cretaceous strata. Moreover, brief descriptions of individual groups of fauna and flora are given. The work sums up the achievements of Polish paleontologists over the period of several decades. There are presented results of revisions of species described for the first time from the area of Poland and regarded as characteristic of this country, as well as guide ones, on which biostratigraphic subdivisions are based. This has a special significance as substantial part of Polish paleontological collections was either lost during the world war II or are in foreign museums.

The fauna and flora presented in this work are of great importance as documentation of biostratigraphic subdivisions which have so far been used in Poland, and the basis for faunistic and floristic correlations with other European countries and reconstructions of migration routes of fauna, paleoecology, paleozoology and paleophytogeography.

The selected paleontological taxa, presented in the systematic part of the work, were mainly revised on the basis of the existing material, and in the case when original material of the characteristic taxa was lost or kept in foreign museums — the revisions was carried out on the basis of the published works, from which there were also reproduced illustrations.

The Mesozoic part does not comprise the material kept in museums, including that of Vertebrata, the paleontological studies and taxonomic revision of which are planned for the next years.

The *Atlas of Guide and Characteristic Fossils*, similarly as other publications of this kind, does not contain discussions or proposals of solutions of controversial problems, e.g. interpretations of taxa of the specific rank. Individual chapters and the systematic part are authorized which enables the reader to get acquainted with opinion of a given author and — being given the summative

biostratigraphic correlation chart — to chose the most objective point of view.

In the book the systematics of major faunistic groups are mainly accepted after *The Treatise of Invertebrate Palaeontology* and *Osnovy Paleontologii*, taking into account some modifications introduced by specialists of a given group. Floristic groups are presented with reference to the natural systematics as given by J. Mowszowicz, and the morphographic systematics of R. Potonié.

The *Atlas of Guide and Characteristic Fossils* was mainly prepared by research workers of the Geological Institute, with the cooperation of those from other research centers in this country: Institute of Paleobiology of Polish Academy of Sciences, Warsaw, Museum of the Earth of Polish Academy of Sciences, Warsaw, Museum of Evolution of Polish Academy of Sciences, Warsaw, Department of Geology of Łódź University, Łódź, Institute of Geology of Warsaw University, Warsaw, Institute of Earth Sciences of Jagiellonian University, Cracow and Institute of Earth Sciences of Polish Academy of Sciences, Warsaw.

A substantial help in reconstruction of Polish Mesozoic holotypes was given by researchers from numerous foreign research institutions: Prof. Dr. E. Thenius, Dr. F. Steininger, Dr. L. Krystyn and Dr. B. Kunz of Paläontologisches Institut der Universität Wien, Prof. Dr. H. Nestler of Wissenschaftsbereich Geologie Ernst-Moritz-Arndt Universität in Greifswald, Prof. Dr. J. H. Callomon of the University College London, Prof. Dr. S. I. Pasternak of the Institute of Geology and Geochemistry of Ukrainian Academy of Sciences in Lvov, Prof. Dr. R. Enay of Université Claude-Bernard in Lyon, Dr. L. Dain of the Micropaleontological Laboratory of WNIGRI, Leningrad, Dr. K. I. Kusnetzova of the Institute of Geology of USSR Academy of Sciences, Moscow, Dr. T. Bilinkiewicz of the Natural History Museum of Ukrainian Academy of Sciences in Lvov, Dr. W. Schnabel of Geologisches Bundesanstalt in Wien, Dr. R. A. Gygi of Naturhistorisches Museum in Basel, Dr. G. Schairer of Bayerische Staatssammlung für Paläontologie und Historisches Geologie München, Dr. H. Keyser of Zoologisches Institut und Zoologisches Museum der Universität Hamburg, the Directors of the Zentrales Geologisches Institut (ZGI) in Berlin, and Dr. W. A. Hynda of the Natural History Museum of Ukrainian Academy of Sciences in Lvov. They all deserve appreciation and warm thanks.

I would like to express my warm thanks to the Board of Directors of the Geological Institute, first of all to R. Osika, whose encouragement inspired me to undertake editorial work on this extensive project.

Thanks are also due to O. Pazdro, K. Pożaryska, G. Biernat and A. Urbanek for numerous fruitful discussions, and due to the Section Editors, W. Bielecka and M. Rogalska, for their long-term cooperation. Especially warm thanks are due to Doc. Dr. H. Senkowiczowa for help in solving several troublesome scientific questions.

On behalf of the team of authors and my own I want to extend thanks to B. Słowańska and the team of the Division of the Publication of Maps and Texts of the Geological Institute, and to E. Piątkowska and B. Nowak and the editorial team of the Publishing House Wydawnictwa Geologiczne for their great assistance and help in solving some complex editorial problems. I also want to express my appreciation and thanks to our colleagues of the Scientific Photography Laboratory of the Geological Institute, Warsaw: D. Oleksiak, J. Mierzejewska, and R. Ufnal; thanks to their efforts the photographs and reproductions of illustrations of fauna and flora found their place in the work.

DISTRIBUTION OF THE TRIASSIC IN AREA OF POLAND

Triassic rocks are very widely distributed in Poland (Fig. 1). The exceptions include the Lublin region and eastern part of the Małopolska Massif, where the rocks are missing, and most southern and south-eastern Poland, where their cover appears discontinuous. In the latter case, distribution of the Triassic is found to be controlled by morphology of Paleozoic bedrock from time preceding

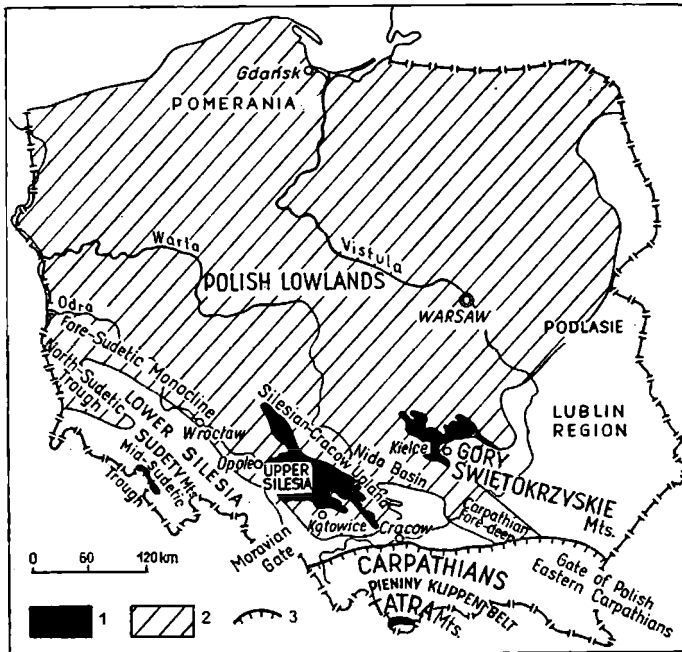


Fig. 1. Distribution of Triassic rocks in Poland (H. Senkowiczowa)
 1 — Quaternary subcrops of Triassic, 2 — distribution of Triassic beneath Tertiary, Cretaceous and Jurassic, 3 — front of Carpathian overthrust

deposition as the rocks did not originate on the highest elevations of the bedrock. Post-Triassic erosion was also of some importance, resulting in removal of the Triassic in several places.

In the Carpathians, rocks of that age are mainly known in the Tatra Mts. In the Pieniny Klippen Belt and Flysch Carpathians, they are unknown from the *in situ* occurrences but pebbles in younger strata only. (HS, ZK)

BIOSTRATIGRAPHIC CORRELATION OF THE TRIASSIC OF EXTRA-CARPATHIAN POLAND AND OTHER AREAS

Rocks of Polish Triassic have originated in eastern part of an epicontinental basin comprising area of Central Europe. Fauna and flora recorded in these rocks make possible only general reconstructions of connections between that zone of sedimentation and neighbouring ones (Table 1).

From the Upper Bundsandstein upwards, Polish sections display Mediterranean influences. The influences gradually increase to achieve their peak in upper part of the Lower Muschelkalk.

The Middle Muschelkalk is characterized by isolation from external influences, and the Upper Muschelkalk, Keuper and Rhaetian — by weak temporary contacts with the Mediterranean Basin.

The studies hitherto completed made it possible to state that the sedimentary basin comprising the present area of Poland and some parts of Lithuania represented an eastern extension of the German and, partly, French basins in the Early Buntsandstein. This is shown by both the development of lithological section and the presence of estherids *Asmussia germari* (Beyrich), recorded in the Fore-Sudetic Monocline and western Pomerania in Poland (S. Alexandrowicz, K. Słupczyński, 1971; A. Szyperko-Śliwczyńska, 1979). In Thuringia, this species may be also represented by specimens described as *Estheria albertii* Voltz and *Euestheria albertii* (Jones) (P. Reibl, 1962). In the Early Buntsandstein, vast land areas were separating the sedimentary basin from influences of all the open marine basins except for the Mediterranean. From the latter it was separated by a narrow Bohemian-Vindelindian land, in which zones sufficiently depressed for two-way contact of the basins still not originated at that time.

The Lower Bundsandstein fauna, especially that recorded in north-eastern Poland, comprises some species in common with Lower Triassic rocks of water reservoirs in Soviet part of the East European Platform. This suggests that the latter were in contact with that of Central Europe, through areas of north-eastern or eastern Poland but the nature of the contact still remains unclear.

Lower Buntsandstein rocks of Poland were found to yield phyllopods *Pseudolimnadiopsis nizmaensis* Molin (A. Szyperko-Śliwczyńska, 1979), known from the Lower Triassic in northern regions of Soviet part of the East-European Platform.

The above mentioned connections seem to be further supported by the records of ostracods *Darwinula rotundata* Lubimova, *D. promissa* Lubimova and *D. fragilis* Lubimova in both Soviet part of the East-European Platform and north-eastern Poland.

Buntsandstein rocks occurring in Poland also yield oogonia of charophyte (Charophyta). Charophyte, assigned to a few species, were also recorded in Lower Triassic of the Pripyat' trough, Dnieper-Donets basin and north-western part of the Donets Basin. Comparison of charophyte occurring in Poland and Soviet

Stage	Mediterranean Basin				Mid-European Basin										Lithostratigraphic subdivision ***		
	Macrofaunistic zones /H. Zapfe, 1974; R. Assereto, 1974/		Conodont zones /K. Budurov & Trifonova 1974/	Faunistic and floristic zones /H. Kozur, 1972c/	Faunal and floral assemblages from extra-Carpathian Poland										Upper Silesia **	Polish Lowlands	Góry Świętokrzyskie Mts. **
	Macrofauna		Conodonts	Ostracods	Negaspores	Foraminifers	Ostracods	Megaspores	Miospores and Acritarcha	Algae	Conodonts	Macrofauna					
Rhaetian	<i>Charitoceras marokki</i>			<i>Rhaetoceras</i> zone				<i>Trileites pinguis</i>									Wielichowo Beds
Norian	Sevastian	<i>Shabdoceras succosi</i>															Zbąszynek Beds
	Alaunian	"Halorites zone"															Jarkowo Beds
	Lacian	<i>Cyrtopleurites biorevatus</i> <i>Aspidites magnus</i> <i>Halorites palucki</i> <i>Majusculites kemli</i>															Drawno Beds
Carnian	Tuvalian	<i>Anatropites spinosus</i> <i>Tropites subbullatus</i> ?	<i>abreptis</i>														Upper Gypsum Beds
	Julian	<i>Trachyceras conoides</i>	polygnathiformis														Reed Sandstone
	Cordevolian	<i>Trachyceras</i> sp.															Lower Gypsum Beds
Ladinian	Langobardian	<i>Protrachyceras archelans</i>	foliata marginata														Clay-coals
	Fassanian	<i>Protrachyceras reitzi</i>	omburgensis														
Anisian	Illyrian	<i>Aploceras ovatum</i>	ovatum														
		<i>Paraceratites trinodosus</i>	exrelus														
	Pelsonian	<i>Paraceratites binodosus</i>	kockeli regale														
	Bitynian	<i>Micromedites osmani</i>	gondolii-oides														
	Aegean	<i>Paraceratites</i>	carinata														
Scythian	Campilian	<i>Trileites cussianus</i>	komer triangularis														
	Seisian	<i>Eumorphotis venetiana</i>	Clareta cf. Clareti														

*The record of these species remains debatable.
 **Correlation of the Lower Muschelkalk in the Upper Silesia and the Góry Świętokrzyskie Mts. made on the basis of records of *Neospathoceras kockeli* /Tatge/, after J. Trammer and K. Zawadzka /1976/
 ***Lithostratigraphic subdivision and correlation of lithostratigraphic units in Tables 1, 4, 7-10 after H. Senkiewiczowa /1973/.

part of the East-European Platform may cast a new light on connections between these areas in the Early Triassic.

The beginning of the Late Buntsandstein, Rhöt, has been connected with a change in paleogeographic patterns, responsible for origin of depressions in area of the Bohemian-Vindelindian swell and, therefore, wide connections between the Alpine and Central European basins. From that time on, no species known from the Platform are present in Poland and the recorded assemblage of the Rhöt as well as Muschelkalk displays affinities with the Mediterranean ones only.

Contact zone of the above basins was situated in southern Poland (Moravian and Polish Eastern Carpathians gates) so the record of successive stages of migration of fauna is the best in that area.

Species identical as those of the Alpine region appear to be most common in the Silesian-Cracow area. Species occurring beyond that area appear more capable to accomodation to life conditions different of those of open sea. Some of the latter found the optimum conditions even in places fairly distant from the contact zone, which is indicated by their mass occurrences (e.g. *Coenothyris vulgaris* (Schlotheim), *Entolium discites* (Schlotheim), *Encrinus liliformis* (Schlotheim)).

Among numerous species which migrated to the Central European basin, there were identified some guide species for individual stages and substages of Mediterranean Triassic (Table 1). Of these, bivalve *Costatoria costata* (Zenker), characteristic of the Rhöt, is present almost throughout the whole basin. Crinoids *Dadocrinus gracilis* (Buch), characteristic of the Lower Anisian, also appear widely distributed in the basin, except for its northern parts. The available data show that Anisian brachiopods *Decurtella decurtata* (Girard) and algae *Diplopora annulatissima* Pia appear limited to the Silesian-Cracow region only. Besides macrofauna, also some ostracods and foraminifers invaded areas of southern Poland (A. Gaździcki *et al.*, 1975). The latter include some guide species: *Glomospira densa* (Pantič), *?Meandrospira deformata* Salaj. Similar is the case of conodonts, represented here by some guide species — *Neospathodus kockeli* (Tatge) and *Gondolella excelsa* (Mosher) — which make possible correlation of rocks of upper parts of the Lower Muschelkalk of southern Poland and the Pelsonian and Illyrian of the Austro-Alpine zone (J. Trammer, K. Zawidzka, 1976).

Middle Muschelkalk section reflects a period of isolation of the basin, connected with marked increase in salinity of water and, therefore, almost complete extinction of fauna in Polish part of the basin, similarly as in the remaining ones. The exception is here the Upper Silesia, where the *Diplopora* Dolomites were found to yield rich fauna and algae, e.g. *Diplopora annulata* (Schafhäütl), typical of the Ladinian (J. Pia, 1930; P. Assman, 1944; C. Pastwa-Leszczynska, S. Śliwiński, 1960). It should be noted that the records of *Diplopora annulatissima* Pia, *Physoporella minutula* (Gümbel) Pia, and especially *Physoporella praealpina* Pia (Z. Kotański, G. A. Čatalov, 1973), which are characteristic of the Upper Anisian (Illyrian, Table 16), are much better there.

The contact of the Upper Muschelkalk and Mediterranean basins is still poorly known. The influx of open sea water has been undoubtedly taking place here, leading to decrease in salinity to closer to normal marine and rejuvenation of the basin and, therefore, making possible development of fauna. It should be emphasized here that macrofauna of the Upper Muschelkalk mainly comprise

forms either known from older, Lower Muschelkalk strata or those characteristic for the Central European basin only. The recorded Upper Muschelkalk assemblage does not comprise species inhabiting at that time the Ladinian sea. It should be also noted that cephalopods characteristic of the Upper Muschelkalk, ceratitids, failed to reach the Mediterranean zone. In the case of better known microfauna, including conodonts, the species recorded in the Upper Muschelkalk, from the top of the *C. compressus* zone upwards, appear limited in their distribution to the Central European basin only.

In the Keuper and Rhaetian, the Central European basin was subjected to faunistic influences of the Mediterranean province. This is shown by the presence of *Costatoria goldfussi* (Alberti), the species most widely distributed in the Lower Carnian and known from the Border Dolomite in Poland. In this country, the Reed Sandstone was found to yield ostracods, including *Simeonella brotzenorum alpina* Bunza et Kozur, known from the Lower Carnian in Israel, *i.e.* at southern side of the Mediterranean basin. The composition of the remaining elements of the micro- and macrofaunal assemblages is close to those from central parts of the Central European basin, situated in area of the GDR and FRG.

In the Silesian-Cracow region, the Lower Keuper was found to yield Charophyta (W. Bilan, 1969). The assemblage comprises some species identical as those known from southern part of the East-European Platform and some known from Scania (borehole Höllviken II).

In the Rhaetian, the basin was of the landlocked sea type but weak, temporary contacts with the Alpine sea (R. Dadlez, J. Kopik, 1963) made possible immigration of foraminifers *Diploremina* sp. and *Variostoma* sp. as well as ostracods *Hungarella* sp. to the area of Poland. This indicates that the Rhaetian basin was still situated within the extent of Mediterranean influences. The influences were, however, marked not further northwards than the Fore-Sudetic Monocline and Góry Świętokrzyskie Mts.

The Lower Rhaetian of Poland yields bivalves *Unionites posterus* (Deffner et Fraas) and not very rich assemblage of brackish ostracods. They probably came to Poland from the area of FRG, where *U. posterus* (Deffner et Fraas) is common and the ostracods much more differentiated specifically and they appear earlier than in Poland.

The connections between the Central European and Mediterranean basins are evidenced by the presence of bivalve *Rhaetavicula contorta* (Portlock) in the German Triassic. In the extra-Carpathian Poland, records of this species are still disputable as they are based on fragmentary finding in the Carpathian Fore-deep. That site is situated within the area of seaway connecting the basins so its presence would not be surprising. However, the state of preservation of the specimen precludes any more detailed identification (A. Tokarski, 1962; J. Kopik, 1973) so the species cannot be treated as a proof of contact between the basins until better preserved material is gathered. (HS)

GUIDE AND CHARACTERISTIC SPECIES

FAUNA — INVERTEBRATES

TYPE PROTISTA

Class RETICULAREA Lankester, 1885

Order Foraminiferida Eichwald, 1830¹

General characteristics. (OS, AG). Foraminifer assemblage of the Triassic in extra-Carpathian Poland is characterized by predominance of genera and species with fairly wide geographic distribution (Table 2). Here are found foraminifers known from the Alpine zone, especially those of the „*Globigerina*-like“ group: *Kollmannita* and *Oberhauserella*. The microfaunal assemblage mainly comprises benthic foraminifers with calcareous and agglutinated tests and it is characterized by predominance of representatives of the family Nodosariidae: *Nodosaria*, *Geinitzinita*, *Pachyphloides*, *Astacolus*, *Dentalina*, *Fronicularia*, *Marginulina*, *Marginulinopsis*, *Pseudonodosaria* and *Vaginulinopsis*, as well as those of Astrorhizidae, Ammodiscidae, Lituolidae, Fischerinidae, Nubeculariidae, Polymorphinidae and Spirillinidae.

Carbonate rocks of the Lower Buntsandstein were found to yield a single agglutinated foraminifer species only: *Hyperammina proneptis* Schleipfer. This species has been recorded in north-eastern Poland (Podlasie), where it is also present in carbonate-sandy rocks of the Middle Buntsandstein.

Carbonate and marly-dolomitic rocks of the Rhöt in south-western Poland and at the margin of the Góry Świętokrzyskie Mts were found to yield innumerable foraminifers: *Dentalina* and *Ammodiscus*.

The optimum in development of microfauna has taken place in the Lower Muschelkalk, in times of the maximum transgression of the Alpine sea in Poland. The richest microfauna was found in mudstone-marly Lower Muschelkalk rocks at the margin of the Góry Świętokrzyskie and Silesian-Cracow Upland (A. Gaździcki *et al.*, 1975).

Foraminifers are fairly common in the Lower Muschelkalk of the above regions. The Middle Muschelkalk of the Góry Świętokrzyskie Mts yields no foraminifers because of unfavourable facies conditions (J. Trammer, 1975) and in this region they do not reappear before the Upper Muschelkalk. In the Opole Silesia, foraminifers are still common in lower Middle Muschelkalk, missing in higher parts of the section. Foraminifers described by A. Gaździcki *et al.* (1975) mainly represent Ammodiscidae and Fischerinidae as well as some Nodosariidae, Duostominidae and Involutinidae. Representatives of the family Involutinidae: *Aulotortus pragsoides* (Oberhauser), *A. praegaschei* (Koehn-Za-

¹ The systematics after A. R. Loeblich and H. Tappan (*in*: Treatise..., 1964), supplemented.

Table 2
Stratigraphic ranges of major foraminifer species in the Triassic in the extra-Carpathian Poland
(O. Styk, A. Gaździcki)

Species	Triassic					
	Lower			Middle		
	Buntsandstein			Muschelkalk		
	Lower	Middle	Upper	Lower	Middle	Upper
PROTOZOA						
Foraminiferida						
<i>Hyperamina pronoptis</i> Schleipher	—	—	—	—
<i>Ammodiscus inaequalis</i> Styk	—	—	—	—
<i>Spirillina oberhauseri</i> Styk	—	—	—	—	—	—
<i>Dentalina transmontana</i> Gumbel	—	—	—	—	—	—
<i>Lituolula indistincta</i> /Trifonova/	—	—	—	—	—	—
<i>Dentalina garkei</i> Styk	—	—	—	—	—	—
<i>?Meandropira deformata</i> Salaj	—	—	—	—	—	—
<i>Glomospira densa</i> /Pantić/	—	—	—	—	—	—
<i>Dentalina vadassi</i> Oberhauser	—	—	—	—
<i>Dentalina caosiana</i> Gumbel	—	—	—	—	—	—
<i>Ramulina subcylindrica</i> Styk	—	—	—	—	..	—
<i>Nodosaria subprimitiva</i> Gerke	—	—	—	—	—	—
<i>Dentalina gladioides gladioides</i> Gerke	—	—	—	—	..	—
<i>Nodosaria raiblicana</i> Gumbel	—	—	—	—	—	—
<i>Pachyphloides triangularis</i> Styk	—	—	—	—
<i>Pachyphloides kiebelsbergi</i> /Oberhauser/	—	—	—	—
<i>Trochamminaoides antis</i> Styk	—	—	—	—	—	—
<i>Pseudonodosaria obconica</i> /Reuss/	—	—	—	—	—	—
<i>Pseudonodosaria bieleskiae</i> Styk	—	—	—	—	—	—
<i>Astacolus velum</i> Kristan-Tollmann	—	—	—	—	—	—
<i>Dentalina hoi</i> Trifonova	—	—	—	—	—	—
<i>Dentalina excelens</i> Styk	—	—	—	—	—	—
<i>Pseudonodosaria polyarthra</i> /Kristan-Tollmann/	—	—	—	—	—	—
<i>Aulotertius praegaschkei</i> Koehn-Zaninetti	—	—	—	—	—	—
<i>Aulotertius pragsoides</i> /Oberhauser/	—	—	—	—	—
<i>Astacolus dobrowiensis</i> Styk	—	—	—	—	—	—
<i>Vaginulinopsis eocoma</i> Kristan-Tollmann	—	—	—	—	—	—
<i>Marginulinopsis pozaryskii</i> Styk	—	—	—	—	—	—
<i>Orthovertella flemosa</i> Styk	—	—	—	—	—	—
<i>Geinitzinita oberhauseri</i> Seillier de Civrieux et Dessauvage	—	—	—	—	—	—
<i>Agathammina judicariensis</i> Premoli-Silva	—	—	—	—	—	—
<i>Meandropira dinarica</i> Kochansky-Devidé and Pantić	—	—	—	—	—	—
<i>Ophthalmidium okalingohiangense</i> /Ho/	—	—	—	—	—	—
<i>Trochammina aintalensis</i> Koehn-Zaninetti	—	—	—	—	..	—
<i>Glomospirella grandis</i> /Salaj/	—	—	—	—
<i>Endothyraella wirsi</i> /Koehn-Zaninetti/	—	—	—	..	—	—
<i>Mesodiscus eomesozoicus praecursor</i> Gaździcki	—	—	—	..	—	—
<i>Endothyra salaji</i> Gaździcki	—	—	—	—	—	—
<i>Diplotremina astrofimbriata</i> Kristan-Tollmann	—	—	—	—	—	—

— common

..... single specimens

ninetti) and *Mesodiscus eomesozoicus praecursor* (Gaździcki) appear to be highly important from the point of view of stratigraphy and paleogeography.

In the Lower Anisian, there was differentiated the ?*M. deformata* Partial-range Zone. Moreover, definition of the *G. densa* Range Zone was modified, stating that its range should be extended from the uppermost Lower Anisian to Illyrian.

The Muschelkalk foraminifer assemblages of Poland do not differ from the contemporaneous ones of the Anisian in the Tethyan Realm in specific composition nor stratigraphic distribution of individual associations.

As it was stated above, the microfauna almost completely disappears in the Middle Muschelkalk. This seems to be due to an essential change in paleogeographic conditions. A break in connections with open sea, shrinkage of the basin and onset of evaporitic sedimentation resulted in extinction of foraminifers and ostracods. Microfauna reappears in the uppermost Middle Muschelkalk, where it is represented by not very numerous foraminifers and ostracods.

In Lower Rhaetic rocks of the Fore-Sudetic Monocline and Silesian-Cracow Upland there were found innumerable agglutinated foraminifers, often poorly preserved and with recrystallized tests: *Hyperammina*, *Variostoma*, *Diplotremina*, *Mesoendothyra* and *Rhizammina*.

The analysis of foraminifer assemblage of the Triassic of extra-Carpathian Poland showed that it mainly comprises genera characterized by wide geographic distribution, reported also from the Triassic of Alaska (H. Tappan 1951), Central-Siberian Upland (A. A. Gerke, 1961), Caucasus (N. A. Efimova, 1974), Bulgaria (E. Trifonova, 1962, 1967), Hungary (A. Oraveczné, 1965), Austria (W. Fuchs, 1967; R. Oberhauser, 1960; E. Kristan-Tollmann, 1964), Italy (C. W. Gumbel, 1869), Switzerland (L. Zaninetti, 1969) and China (Ho Yen, 1959).

Middle and Upper Triassic foraminifer assemblages (Table 3) were also found in the Tatra Mts (A. Gaździcki, 1970, 1974, 1977; A. Gaździcki, K. Zawidzka, 1973; Z. Belka, A. Gaździcki, 1976; S. W. Alexandrowicz, E. Szewczyk, 1978). The assemblage from Wielkie Koryciska (sub-tatric series, Hronicum), comprising *Ammobaculites* cf. *radstadtensis* Kristan-Tollmann, *Ophthalmidium chalingchiangense* (Ho), *Trochammina almtalensis* Koehn-Zaninetti and „*Turritella*” *mesotriassica* Koehn-Zaninetti, is indicative of the Upper Anisian (Illyrian) (A. Gaździcki, K. Zawidzka, 1973). The assemblage of Anisian foraminifers in the high-tatric series (Tatricum) of the Mt. Kominy Tyłkowe includes some species of stratigraphic importance: *Glomospira densa* (Pantić) and *Glomospirella grandis* (Salaj), indicative of the Lower Anisian through Lower Illyrian (Z. Belka, A. Gaździcki, 1976).

Foraminifers are also common in the Upper Triassic, especially the Rhaetic (A. Gaździcki, K. Zawidzka, 1973; A. Gaździcki, 1974, 1977). Sixty five foraminifer taxa have been recorded in strata of the Tatra and Norovica Formations in the Tatra Mts (A. Gaździcki *et al.*, 1979; A. Gaździcki, J. Michalik, 1980). The assemblage comprises representatives of the genera *Ammodiscus*, *Glomospira*, *Glomospirella*, *Tolypammina*, *Ammobaculites*, *Textularia*, *Trochammina*, *Alpinophragmium*, *Earlandia*, *Duotaxis*, *Tetrataxis*, *Endothyra*, *Agathammina*, *Planinivolva*, *Ophthalmidium*, *Galeanella*, *Miliolipora*, *Nodosaria*, „*Fronicularia*”, *Austrocolomia*, *Diplotremina*, *Variostoma*, *Aulotortus*, *Auloconus*, *Triasina*, ?*Seminivolva* and *Turrispirillina*.

Ammodiscidae and Involutinidae predominate in number of both species and individuals in the above foraminifer assemblages; being represented by 15 and 14 taxa, respectively. A special attention should be paid to numerous

Table 3

Stratigraphic ranges of major foraminifer species in the Triassic in the Tatra Mts (A. Gaździcki)

Species	Triassic						
	Middle			Upper			
	Anisian			Ladinian	Carnian	Norian	Rhaetian
	Lower	Pelsonian	Illyrian				
PROTISTA							
Foraminiferida							
<i>Glomospira densa</i> /Pantić/		~~~~~					
<i>Glomospirella grandis</i> /Salaj/		~~~~~					
" <i>Turrillella</i> " <i>mesotriastica</i> Koehn-Zaninetti							
<i>Trochammina almtalensis</i> Koehn-Zaninetti							
<i>Ophthalmidium ehalingschringense</i> /Ho/							
<i>Glomospirella friedli</i> Kristan-Tollmann							
<i>Glomospirella pokornyi</i> /Salaj/							
<i>Aipinophragmium perforatum</i> Flügel							
" <i>Tetrataxis</i> " <i>inflata</i> Kristan							
<i>Agathammina austroalpina</i> Kristan-Tollmann and Tollmann							
<i>Aulotortus commisus</i> /Kristan/							
<i>Aulotortus gascheri</i> /Koehn-Zaninetti and Brönnimann/							
<i>Aulotortus sinuosus</i> Weyschenk							
<i>Aulotortus tumidus</i> /Kristan-Tollmann/							
<i>Triasina hantkeni</i> Majzon							
<i>Aliconua parmodiscoides</i> /Oberhauser/							

~~~~~ high-tatric series /Tatricum/

———— sub-tatric series /Fatricum and Bronicum/

associations of foraminifers *Glomospirella friedli* Kristan-Tollmann, *G. pokornyi* (Salaj), *Tolypammmina gregaria* Wendt, *Aulotortus sinuosus* Weyschenk and *Triasina hantkeni* Majzon which are locally of rock-forming importance. A special stratigraphic and paleogeographic importance is attributed to the family Involutinidae. Evolution of representatives of that family became accelerated in the Late Triassic, resulting in increase of their value as index fossils. In the uppermost Triassic of the West Carpathians, a sequence of two foraminifer zones is recognized: the *T. oberhauseri* Partial-range Zone (Norian) and the *G. friedli* and *T. hantkeni* Assemblage Zone (Rhaetian). This subdivision has been correlated with the standard ammonoid and conodont zonations A. Gaździcki, H. Kozur, R. Mock, 1979).

Family *Astrorhizidae* Brady, 1881Genus *Hyperammmina* Brady, 1878*Hyperammmina proneptis* Schleipher, 1960

Plate I, Figs. 1, 2

1961 *Hyperammmina proneptis* Schleipher sp. nov. in Gerke; A. A. Gerke, pp. 99, 100, pl. 6, figs. 1—5.1975 *Hyperammmina proneptis* Schleipher; O. Styk, pp. 506, 507, pl. 35, figs. 1, 2.1979 *Hyperammmina proneptis* Schleipher; O. Styk (in: Atlas...), p. 18, pl. 1, figs. 1, 2.

Collection. — Museum of Geological Institute, Warsaw, Rakowiecka 4 (MUZ IG) 6219/73/F.

Occurrence. — Extra-Carpathian Poland (Lower and Middle Buntsandstein).  
(OS)

Family *Ammodiscidae* Reuss, 1862

Genus *Ammodiscus* Reuss, 1862  
*Ammodiscus inaequabilis* Styk, 1975

Plate I, Fig. 3

1975 *Ammodiscus inaequabilis* sp. n.; O. Styk, p. 507, pl. 35, fig. 3 (holotype), fig. 4.  
1979 *Ammodiscus inaequabilis* Styk; O. Styk (in: Atlas...), p. 19, pl. 1, fig. 3.

Collection. — MUZ IG 6222/73/F (holotype).

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk).  
(OS)

Genus *Glomospira* Rzehak, 1885  
*Glomospira densa* (Pantić, 1965)

Plate II, Fig. 1

1965 *Pilamina densa* n. sp.; S. Pantić, p. 191, pl. 1, figs. 1, 2; pl. 2, figs. 1—9.  
1973 *Glomospira densa* (Pantić); J. Głazek, J. Trammer, K. Zawidzka, p. 470, pl. 1, figs. 1, 3a, 5, 6a, 7a; pl. 3, figs. 1—6.  
1976 *Glomospira densa* (Pantić); L. Zaninetti, p. 89, pl. 2, figs. 17, 21.

Collection. — Institute of Geology, Warsaw University, Al. Żwirki i Wigury 93, Warsaw (IGP UW), A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia, central Poland — borehole Radziątków 5 and Tatra Mts (Lower and Middle Muschelkalk, Lower Anisian—Illyrian). (AG)

Genus *Glomospirella* Plummer, 1945  
*Glomospirella friedli* Kristan-Tollmann, 1962 emend. Brönnimann et Zaninetti, 1970

Plate II, Fig. 13

1962 *Glomospirella friedli* n. sp.; E. Kristan-Tollmann, p. 229, pl. 1, figs. 1—9, 12—17.  
1974 *Glomospirella friedli* Kristan-Tollmann; A. Gaździcki, p. 49, pl. 36, figs. 1, 2; pl. 37, figs. 1—6.  
1976 *Glomospirella friedli* Kristan-Tollmann; L. Zaninetti, p. 96, pl. 8, figs. 1—5.

Collection. — IGP UW, A. Gaździcki coll.; Institute of Paleobiology, Polish Academy of Sciences, Warsaw, Al. Żwirki i Wigury 93 (ZPAL) F.XXVIII/18—49.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian).  
(AG)

*Glomospirella grandis* (Salaj, 1967)

Plate II, Fig. 2

1967 *Pilamina grandis* nov. sp.; J. Salaj (in: J. Salaj, A. Biely, J. Bystricky), p. 123, pl. 3, fig. 4.  
1975 *Glomospirella grandis* (Salaj); A. Gaździcki, J. Trammer, K. Zawidzka, pl. 2, figs. 1, 2.  
1976 *Glomospirella grandis* (Salaj); L. Zaninetti, p. 101, pl. 2, fig. 26.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia, central Poland — borehole Radziątków 5 and Tatra Mts, (Lower and Middle Muschelkalk, Lower Anisian—Illyrian). (AG)

*Glomospirella pokornyi* (Salaj, 1967)

Plate II, Fig. 9

1967 *Angulodiscus pokornyi* nov. sp.; J. Salaj (in: J. Salaj, A. Biely, J. Bystricky), p. 128, pl. 6, figs. 4a—b.

1974 *Glomospirella? pokornyi* (Salaj); A. Gaździcki, p. 51, pl. 34, figs. 1—3, pl. 35, figs. 1—9. non 1978 *Aulotortus pokornyi* (Salaj); W. Piller, p. 61, pl. 11, figs. 1—7.

Collection. — IGP UW, A. Gaździcki coll.; ZPAL F.XXVIII/26—14.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian). (AG)

Genus *Turritellella* Rhumbler, 1904„*Turritellella*” *mesotriasica* Koehn-Zaninetti, 1969

Plate II, Fig. 3

1969 *Turritellella mesotriasica* n. sp.; L. Koehn-Zaninetti, p. 32, pl. 3, figs. f—g, text-fig. 4.

1973 *Turritellella mesotriasica* Koehn-Zaninetti; A. Gaździcki, K. Zawidzka, pl. 1, fig. 11.

1976 „*Turritellella*” *mesotriasica* Koehn-Zaninetti; L. Zaninetti, p. 105, pl. 4, fig. 1; pl. 8, figs. 13—19.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Tatra Mts (Illyrian). (AG)

Genus *Lituotuba* Rhumbler, 1895*Lituotuba indistincta* (Trifonova, 1962)

Plate I, Figs. 4—6

1962 *Tolypammina? indistincta* n. sp., E. Trifonova, p. 148, pl. 2, figs. 3—8.

1975 *Lituotuba indistincta* (Trifonova); O. Styk, p. 508, pl. 35, figs. 9—13.

1979 *Lituotuba indistincta* (Trifonova); O. Styk (in: Atlas...), p. 19, pl. 1, figs. 4—6.

Collection. — MUZ IG 6226 (73) F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

## Family Lituolidae Blainville, 1825

Genus *Trochamminoides* Cushman, 1910*Trochamminoides antis* Styk, 1972

Plate I, Figs. 7, 8

1972 *Trochamminoides antis* n. sp.; O. Styk, p. 868, pl. 1, figs. 1a—c (holotype), figs. 2, 3.

1975 *Trochamminoides antis* Styk; O. Styk, p. 508, pl. 35, figs. 5—8.

1979 *Trochamminoides antis* Styk; O. Styk (in: Atlas...), p. 19, pl. 1, figs. 7, 8.

Collection. — MUZ IG 6201/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

## Family Trochamminidae Schwager, 1877

Genus *Trochammina* Parker et Jones, 1859*Trochammina almtalensis* Koehn-Zaninetti, 1969

Plate II, Fig. 4

1969 *Trochammina almtalensis* n. sp.; L. Koehn-Zaninetti, p. 38, pl. 5, figs. e, f, text-fig. 6a—p.

1973 *Trochammina almtalensis* Koehn-Zaninetti; A. Gaździcki, K. Zawidzka, pl. 1, figs. 5—7.

1976 *Trochammina almtalensis* Koehn-Zaninetti; L. Zaninetti, p. 113, pl. 14, figs. 1—9, pl. 23, fig. 8.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Tatra Mts, Upper Silesia (Lower and Middle Muschelkalk, Pelsonian — Illyrian). (AG)

Family *Endothyridae* Brady, 1884

Genus *Endothyra* Phillips, 1846  
*Endothyra salaji* Gaździcki, 1975

Plate II, Fig. 5

1975 *Endothyra salaji* sp. n.; A. Gaździcki (in: A. Gaździcki, J. Trammer, K. Zawidzka), p. 289, pl. 5, fig. 1 (holotype), figs. 2—6.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts (Upper Muschelkalk — *Ceratites* Beds, Fassanian). (AG)

Family *Fischerinidae* Millet, 1898

Genus *Agathammina* Neumayr, 1887  
*Agathammina judicariensis* Premoli Silva, 1971

Plate II, Fig. 6

1971 *Agathammina judicariensis* sp. n.; I. Premoli Silva, p. 343, pl. 29, figs. 1—6.

1975 *Agathammina judicariensis* Premoli Silva; A. Gaździcki, J. Trammer, K. Zawidzka, pl. 6, figs. 1, 2.

1976 *Agathammina judicariensis* Premoli Silva; L. Zaninetti, p. 132, pl. 5, figs. 8, 9a.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Upper Silesia (Lower Muschelkalk — Góraźdze Beds, Pelsonian). (AG)

Genus *Orthoverthella* Cushman et Waters, 1928  
*Orthoverthella flexuosa* Styk, 1972

Plate I, Fig. 9

1972 *Orthoverthella* ? *flexuosa* n. sp.; O. Styk, p. 868, pl. 1, fig. 4 (holotype), figs. 5—7.

1975 ?*Orthoverthella flexuosa* Styk; O. Styk, p. 509, pl. 35, figs. 14—16.

1979 *Orthoverthella flexuosa* Styk; O. Styk (in: Atlas...), p. 20, pl. 1, fig. 9.

Collection. — MUZ IG 6204/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Meandrosira* Loeblich et Tappan, 1946  
? *Meandrosira deformata* Salaj, 1967

Plate II, Fig. 7

1967 *Meandrosira deformata* nov. sp.; J. Salaj (in: J. Salaj, A. Biely, J. Bystrický), p. 122, pl. 2, figs. 3d (holotype), a—c.

1975 *Meandrosira* ? *deformata* J. Salaj; A. Gaździcki (in: A. Gaździcki, J. Trammer, K. Zawidzka), p. 290, pl. 7, figs. 9—16.

1976 "*Meandrosira*" *deformata* Salaj; L. Zaninetti, p. 138, pl. 1, figs. 20—22.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia (Lower Muschelkalk, Lower Anisian and Pelsonian). (AG)

*Meandrosira dinarica* Kochansky-Devidé et Pantić, 1966

Plate II, Fig. 8

- 1966 *Meandrosira dinarica* n. sp.; V. Kochansky-Devidé, S. Pantić, p. 21, pl. 3, figs. 9—11; pl. 4, figs. 1—10.  
 1975 *Meandrosira dinarica* Kochansky-Devidé and Pantić; A. Gaździcki, J. Trammer, K. Zawadzka, pl. 9, figs. 5—9.  
 1976 *Meandrosira dinarica* Kochansky-Devidé and Pantić; L. Zaninetti, p. 133, pl. 1, figs. 12—14.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Upper Silesia (Lower Muschelkalk — Górażdże Beds, Pelsonian). (AG)

Family *Nodosariidae* Ehrenberg, 1838Genus *Nodosaria* Lamarck, 1812  
*Nodosaria raibliana* Gümbel, 1869

Plate I, Fig. 10

- 1869 *Nodosaria raibliana* n. sp.; C. W. Gümbel, p. 181, pl. 6, fig. 28.  
 1975 *Nodosaria raibliana* Gümbel; O. Styk, pp. 510, 511, pl. 35, fig. 17.  
 1979 *Nodosaria raibliana* Gümbel; O. Styk (*in: Atlas...*), p. 20, pl. 1, fig. 10.

Collection. — MUZ IG 6208/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Nodosaria subprimitiva* Gerke, 1961

Plate I, Fig. 11

- 1961 *Nodosaria subprimitiva* sp. nov. Gerke; A. A. Gerke, pp. 173—175, pl. 20, figs. 10, 11.  
 1975 *Nodosaria subprimitiva* Gerke; O. Styk, p. 511, pl. 35, fig. 19.  
 1979 *Nodosaria subprimitiva* Gerke; O. Styk (*in: Atlas...*), p. 20, pl. 1, fig. 11.

Collection. — MUZ IG 6233/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Geinitzinita* Sellier de Civrieux et Dessauvagine, 1965  
*Geinitzinita oberhauseri* Sellier de Civrieux et Dessauvagine, 1965

Plate I, Fig. 12

- 1960 *Fronicularia tenera tenera* (Bornemann); R. Oberhauser, p. 31, pl. 1, figs. 47—51.  
 1975 *Geinitzinita oberhauseri* Sellier de Civrieux et Dessauvagine; O. Styk, p. 511, 512, pl. 35, fig. 24, 25.  
 1979 *Geinitzinita oberhauseri* Sellier de Civrieux et Dessauvagine; O. Styk (*in: Atlas...*), p. 21, pl. 1, fig. 12.

Collection. — MUZ IG 6236/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Pachyphloides* Sellier de Civrieux et Dessauvagine, 1965  
*Pachyphloides klebelsbergi* (Oberhauser, 1960)

Plate I, Fig. 13

- 1960 *Lingulina klebelsbergi* nov. sp.; R. Oberhauser, p. 34, figs. 8—20, 22.  
 1975 *Pachyphloides klebelsbergi* (Oberhauser); O. Styk, p. 512, 513, pl. 35, figs. 22, 23.  
 1979 *Pachyphloides klebelsbergi* (Oberhauser); O. Styk (*in: Atlas...*), p. 21, pl. 1, fig. 13.

Collection. — MUZ IG 6238/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Pachyphloides triangularis* Styk, 1972

Plate I, Fig. 14

1972 *Pachyphloides triangularis* n. sp.; O. Styk, p. 870, pl. 1, figs. 11, 12 (holotype).

1979 *Pachyphloides triangularis* Styk; O. Styk (*in: Atlas...*), p. 21, pl. 1, fig. 14.

Collection. — MUZ IG 6211/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Astacolus* Montfort, 1808

*Astacolus dobroviensis* Styk, 1972

Plate I, Fig. 15

1972 *Astacolus dobroviensis* n. sp.; O. Styk, p. 869, 870, pl. 1, fig. 10 (holotype).

1975 *Astacolus dobroviensis* Styk; O. Styk, pp. 513, 514, pl. 36, figs. 1, 2.

1979 *Astacolus dobroviensis* Styk; O. Styk (*in: Atlas...*), p. 22, pl. 1, fig. 15.

Collection. — MUZ IG 6210/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Astacolus kopiki* Styk, 1975

Plate I, Fig. 16

1975 *Astacolus kopiki* sp. n.; O. Styk, pp. 514, 515, pl. 36, figs. 3 (holotype), 4 (paratype).

1979 *Astacolus kopiki* Styk; O. Styk (*in: Atlas...*), p. 22, pl. 1, fig. 16.

Collection. — MUZ IG 6241/73/F (holotype), 6241a/73/F (paratyp).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Astacolus velum* Kristan-Tollmann, 1964

Plate I, Fig. 17

1964 *Lenticulina (Astacolus) velum* n. sp.; E. Kristan-Tollmann, pp. 121, 122, pl. 29, figs. 5, 9.

1975 *Astacolus velum* Kristan-Tollmann; O. Styk, p. 515, pl. 36, fig. 5.

1979 *Astacolus velum* Kristan-Tollman, O. Styk; (*in: Atlas...*), p. 22, pl. 1, fig. 17.

Collection. — MUZ IG 6244/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Dentalina* Risso, 1826

*Dentalina cassiana* Gümbel, 1869

Plate I, Fig. 18

1869 *Dentalina Cassiana* n. sp.; C. W. Gümbel, p. 177, pl. 5, fig. 16.

1975 *Dentalina cassiana* Gümbel; O. Styk, pp. 514, 515, pl. 36, figs. 6—8.

1979 *Dentalina cassiana* Gümbel; O. Styk (*in: Atlas...*), p. 23, pl. 1, fig. 18.

Collection. — MUZ IG 6247/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Dentalina excelens* Styk, 1975

Plate I, Fig. 19

1975 *Dentalina excelens* sp. n.; O. Styk, pp. 516, 517, pl. 36, fig. 10 (holotype).

1979 *Dentalina excelens* Styk; O. Styk (*in: Atlas...*), p. 23, pl. 1, fig. 19.

Collection. — MUZ IG 6253/73/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Dentalina gerkei* Styk, 1972

Plate I, Fig. 20

1972 *Dentalina gerkei* n. sp.; O. Styk, pp. 870, 871, pl. 1, fig. 13 (holotype).

1979 *Dentalina gerkei* Styk; O. Styk (in: Atlas...), p. 23, pl. 1, fig. 20.

Collection. — MUZ IG 6213/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Dentalina gladioides gladioides* Gerke, 1961

Plate I, Fig. 21

1961 *Dentalina gladioides* var. *gladioides* sp. et var. nov.; A. A. Gerke, pp. 241, 242, pl. 41, figs. 4, 5.

1975 *Dentalina gladioides gladioides* Gerke; O. Styk, p. 518, pl. 36, figs. 12, 13.

1979 *Dentalina gladioides gladioides* Gerke; O. Styk (in: Atlas...), p. 23, pl. 1, fig. 21.

Collection. — MUZ IG 6258/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Dentalina hoi* Trifonova, 1967

Plate I, Fig. 22

1967 *Dentalina hoi* sp. nov.; E. Trifonova, p. 7, pl. 2, figs. 3—9.

1975 *Dentalina hoi* Trifonova; O. Styk, pp. 518, 519, pl. 36, fig. 14.

1979 *Dentalina hoi* Trifonova; O. Styk (in: Atlas...), p. 24, pl. 1, fig. 22.

Collection. — MUZ IG 6261/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Dentalina transmontana* Gumbel, 1869

Plate I, Fig. 23

1869 *Dentalina transmontana* n. sp.; C. W. Gumbel, p. 177, pl. 5, fig. 17.

1975 *Dentalina transmontana* Gumbel; O. Styk, p. 519, pl. 36, fig. 15.

1979 *Dentalina transmontana* Gumbel; O. Styk (in: Atlas...), p. 24, pl. 1, fig. 23.

Collection. — MUZ IG 6264/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk).

*Dentalina vadaszi* Oberhauser, 1960

Plate I, Fig. 24

1960 *Dentalina vadaszi* nov. sp.; R. Oberhauser, pp. 23, 24, pl. 3, figs. 11, 17; pl. 4, fig. 34.

1975 *Dentalina vadaszi* Oberhauser; O. Styk, pp. 519, 520, pl. 36, fig. 16.

1979 *Dentalina vadaszi* Oberhauser; O. Styk (in: Atlas...), p. 24, pl. 1, fig. 24.

Collection. — MUZ IG 6267/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Marginulina* d'Orbigny, 1826

*Marginulina grazynae* Styk, 1975

Plate I, Fig. 25

1975 *Marginulina grazynae* sp. n.; O. Styk, pp. 520, 521, pl. 36, figs. 18 (holotype), 19.

1979 *Marginulina grazynae* Styk; O. Styk (in: Atlas...), p. 25, pl. 1, fig. 25.

Collection. — MUZ IG 6270/73/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Marginulinopsis* Silvestri, 1904

*Marginulinopsis pozaryskii* Styk, 1975

Plate I, Fig. 26

1975 *Marginulinopsis pozaryskii* sp. n.; O. Styk, pp. 521, 522, pl. 36, figs. 20 (holotype), 21.

1979 *Marginulinopsis pozaryskii* Styk; O. Styk (in: Atlas...), p. 25, pl. 1, fig. 26.

Collection. — MUZ IG 6273/73/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Pseudonodosaria* Boomgaard, 1949

*Pseudonodosaria bieleckae* Styk, 1975

Plate I, Fig. 27

1975 *Pseudonodosaria bieleckae* sp. n.; O. Styk, pp. 522, 523, pl. 37, figs. 1 (holotype), 2.

1979 *Pseudonodosaria bieleckae* Styk; O. Styk (in: Atlas...), p. 25, pl. 1, fig. 27.

Collection. — MUZ IG 6279/73/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Pseudonodosaria levifracta* (Kristan-Tollmann, 1964)

Plate I, Fig. 28

1964 *Nodosaria levifracta* n. sp.; E. Kristan-Tollman, pp. 69, 70, pl. 10, figs. 10, 11.

1975 *Pseudonodosaria levifracta* (Kristan-Tollman); O. Styk, p. 532, pl. 37, fig. 3.

1979 *Pseudonodosaria levifracta* (Kristan-Tollman); O. Styk (in: Atlas...), p. 26, pl. 1, fig. 28.

Collection. — MUZ IG 6282/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Pseudonodosaria obconica* (Reuss, 1868)

Plate I, Fig. 29

1868 *Glandulina obconica* Reuss; A. E. Reuss, p. 104, pl. 57, fig. 1, *fide* B. F. Ellis, A. R. Messina (1940).

1975 *Pseudonodosaria obconica* (Reuss); O. Styk, pp. 523, 524, pl. 37, fig. 4.

1979 *Pseudonodosaria obconica* (Reuss); O. Styk (in: Atlas...), p. 26, pl. 1, fig. 29.

Collection. — MUZ IG 6285/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Pseudonodosaria polyarthra* (Kristan-Tollmann, 1964)

Plate I, Fig. 30

1964 *Rectoglandulina polyarthra* n. sp.; E. Kristan-Tollmann, p. 86, pl. 13, fig. 7.

1975 *Pseudonodosaria polyarthra* (Kristan-Tollman); O. Styk; p. 524, pl. 37, fig. 5.

1979 *Pseudonodosaria polyarthra* (Kristan-Tollman); O. Styk (in: Atlas...), p. 26, pl. 1, fig. 30.

Collection. — MUZ IG 6288/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Vaginulinopsis* Silvestri, 1904  
*Vaginulinopsis eocomma* Kristan-Tollmann, 1964

Plate I, Fig. 31

1964 *Lenticulina* (*Vaginulinopsis*) *eocomma* n. sp.; E. Kristan-Tollmann, pp. 122, 123, pl. 27, fig. 13.

1975 *Vaginulinopsis eocomma* Kristan-Tollman; O. Styk, pp. 524, 525, pl. 37, fig. 6.

1979 *Vaginulinopsis eocomma* Kristan-Tollmann; O. Styk (*in*: Atlas...), p. 27, pl. 1, fig. 31.

Collection. — MUZ IG 6276/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family **Polymorphinidae** d'Orbigny 1839

Genus *Ramulina* Jones, 1875  
*Ramulina subcylindrica* Styk, 1972

Plate I, Fig. 32

1972 *Ramulina subcylindrica* n. sp.; O. Styk, p. 871, pl. 1, figs. 14 (holotype), 15, 16.

1979 *Ramulina subcylindrica* Styk; O. Styk (*in*: Atlas...), p. 27, pl. 1, fig. 32.

Collection. — MUZ IG 6214/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family **Spirillinidae** Reuss, 1862

Genus *Spirillina* Ehrenberg, 1843  
*Spirillina oberhauseri* Styk, 1972

Plate I, Fig. 33

1972 *Spirillina oberhauseri* n. sp.; O. Styk, pp. 871, 872, pl. 2, figs. 17, 18 (holotype).

1979 *Spirillina oberhauseri* Styk; O. Styk (*in*: Atlas...), p. 27, pl. 1, fig. 33.

Collection. — MUZ IG 6217/72/F (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Kollmannita* Fuchs, 1967  
*Kollmannita cf. ladinica* (Oberhauser, 1960)

Plate I, Fig. 35

1975 *Kollmannita cf. ladinica* (Oberhauser); O. Styk, p. 527, pl. 37, figs. 15, 16.

1979 *Kollmannita cf. ladinica* (Oberhauser); O. Styk (*in*: Atlas...), p. 28, pl. 1, fig. 35.

Collection. — MUZ IG 6297/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Genus *Oberhauserella* Fuchs, 1967  
*Oberhauserella cf. mesotriassica* (Oberhauser, 1960)

Plate I, Fig. 34

1975 *Oberhauserella cf. mesotriassica* (Oberhauser); O. Styk, p. 527, 528, pl. 37, figs. 13, 14.

1979 *Oberhauserella cf. mesotriassica* (Oberhauser); O. Styk (*in*: Atlas...), p. 28, pl. 1, fig. 34.

Collection. — MUZ IG 6350/73/F.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family *Involutinidae* Bütschli, 1880Genus *Mesodiscus* Piller, 1978*Mesodiscus eomesozoicus praecursor* (Gaździcki, 1975)

Plate II, Fig. 10

- 1975 *Involutina eomesozoica praecursor* ssp. n.; A. Gaździcki (in: A. Gaździcki, J. Trammer, K. Zawidzka), p. 291, pl. 10, figs. 2 (holotype), 1, 3.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts (Lower Muschelkalk — Łukowa Beds, Pelsonian). (AG)

Genus *Aulotortus* Weynschenk, 1956*Aulotortus gaschei* (Koehn-Zaninetti et Brönnimann, 1968)

Plate II, Fig. 14

- 1968 *Angulodiscus? gaschei* n. sp.; L. Koehn-Zaninetti, P. Brönnimann, p. 74, pl. 1, figs. a—f; pl. 2, figs. a—f.  
 1974 *Involutina gaschei* (Koehn-Zaninetti and Brönnimann); A. Gaździcki, p. 64, pl. 45, figs. 4—9.  
 1976 *Involutina gaschei* (Koehn-Zaninetti and Brönnimann); L. Zaninetti, p. 159, pl. 9, figs. 13—15.

Collection. — IGP UW, A. Gaździcki coll., ZPAL F.XXVIII/18—38.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian). (AG)

*Aulotortus pragsoides* (Oberhauser, 1964)

Plate II, Fig. 11

- 1964 *Permodiscus pragsoides* nov. sp.; R. Oberhauser, p. 200, pl. 1, figs. 10, 12—14; pl. 2, figs. 2, 3, 16, 23; pl. 4, figs. 8, 9.  
 1975 *Involutina sinuosa pragsoides* (Oberhauser); A. Gaździcki, J. Trammer, K. Zawidzka, pl. 10, fig. 9.  
 1976 *Involutina sinuosa pragsoides* (Oberhauser); L. Zaninetti, p. 165, pl. 12, figs. 1—3.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia (Lower Muschelkalk, Łukowa and Górażdże Beds, Lower Anisian — Pelsonian). (AG)

*Aulotortus sinuosus* Weynschenk, 1956

Plate II, Fig. 16

- 1956 *Aulotortus sinuosus* n. sp.; R. Weynschenk, p. 27, pl. 6, figs. 1, 3.  
 1974 *Involutina sinuosa sinuosa* (Weynschenk); A. Gaździcki, p. 63, pl. 47, figs. 1—3.  
 1976 *Involutina sinuosa sinuosa* (Weynschenk); L. Zaninetti, p. 167, pl. 9, fig. 18.

Collection. — IGP UW, A. Gaździcki coll., ZPAL F.XXVIII/26—II—5.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian, Kopieniec Formation — Hettangian—?Sinemurian). (AG)

Genus *Triasina* Majzon, 1954*Triasina hantkeni* Majzon, 1954

Plate II, Fig. 15

- 1954 *Triasina hantkeni* nov. sp.; L. Majzon, p. 245, pl. 1, figs. 1, 2; pl. 2, figs. 3—5; pl. 3, fig. 6.  
 1954 *Triasina hantkeni* nov. sp. var. *eliptica*; L. Majzon, p. 245, pl. 3, fig. 7.  
 1974 *Triasina hantkeni* Majzon; A. Gaździcki, p. 67, pl. 48, figs. 1, 2; pl. 49, figs. 1—6.

Collection. — IGP UW, A. Gaździcki coll., ZPAL F.XXVIII/26–5a.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian).  
(AG)

Genus *Auloconus* Piller, 1978

*Auloconus permodiscoides* (Oberhauser, 1964)

Plate II, Fig. 12

1964 *Trocholina permodiscoides* nov. sp.; R. Oberhauser, p. 207, pl. 2, figs. 13–15, 18, 20, 22; pl. 3, fig. 1.

1974 *Trocholina permodiscoides* Oberhauser; A. Gaździcki, p. 66, pl. 46, figs. 4, 5, 7, 8.

1978 *Auloconus permodiscoides* (Oberhauser); W. Piller, p. 74, pl. 20, figs. 1–8.

Collection. — IGP UW, A. Gaździcki coll., ZPAL F.XXVIII/26–II–5.

Occurrence. — Tatra Mts (Fatra and Norovica Formations — Rhaetian).  
(AG)

### TYPE PORIFERA<sup>3</sup>

**General characteristics.** (HS, ZK). Siliceous sponges have been found in the Upper and Lower Silesia and Góry Świętokrzyskie Mts. Sponges from the Upper Silesia were assigned to *Tremadictyon roemeri* (Eck). Those from the Lower Silesia (F. Noetling, 1880) were neither described nor figured and it is even unclear whether they were represented by complete specimens or some spicules only. In the Góry Świętokrzyskie Mts (southern margin), numerous spicules (triauxons) have been found.

The sponges appear related to upper part of the Lower Muschelkalk and *Diplopora* Dolomites of the Middle Muschelkalk (Table 4). In the Upper Silesia, they are known to occur from the Karchowice Beds to *Diplopora* Dolomites, inclusively. In the Lower Silesia, they were reported from the Foamy Beds, and in the Góry Świętokrzyskie Mts, they have been found in the *P. striatum* Beds.

Stratigraphic range of the sponges indicates that they appeared in times of best connections with the Alpine sea, when influx of oceanic water changed conditions in the epicontinental basin to close to normal marine ones.

The available data show that distribution of sponges was limited to southern Poland, *i.e.* to areas where influences of the open sea were the strongest, and that the sponges were living in zones of carbonate and marly sedimentation.

Sponges became extinct in the epicontinental sea by the end of sedimentation of the *Diplopora* Dolomites, when break in connections with the open sea resulted in increase in water salinity in the former.

Calcareous spicules, possibly belonging to sponges, are sometimes found in carbonate rocks of the Triassic in extra-Carpathian Poland. However, there is no firm evidence for presence of calcareous sponges in these rocks.

Calcareous sponges are known from the high-tatric Rhaetian (A. Radwański, 1968) and sub-tatric Lower Rhaetian (A. Gaździcki, 1974) in the Tatra Mts. They are identifiable in thin sections but the state of preservation precludes any more accurate identifications. Single spicules (monauxons and triactines) were also found. Sponges are also very numerous in Ladinian dolomites of Wetterstein, upper sub-tatric series, where they are of marked rock-forming importance.

<sup>3</sup> The systematics after M. W. Laubenfels (*in*: Treatise... 1955).

Table 4

Stratigraphic ranges of selected species of sponges, annelids and brachiopods in the Triassic in the extra-Carpathian Poland (H. Senkowiczowa, K. Zawidzka)

| Species                                      | Triassic      |        |       |             |   |   |             |       |   |   |        |       |         |   |
|----------------------------------------------|---------------|--------|-------|-------------|---|---|-------------|-------|---|---|--------|-------|---------|---|
|                                              | Lower         |        |       | Middle      |   |   |             |       |   |   | Upper  |       |         |   |
|                                              | Buntsandstein |        |       | Muschelkalk |   |   |             |       |   |   | Keuper |       | Rhaetic |   |
|                                              | Lower         | Middle | Upper | Lower       |   |   | Mid-<br>dle | Upper |   |   |        | Lower | Upper   |   |
|                                              |               |        |       | 1           | 2 | 3 |             | 4     | 5 | 6 | 7      |       | 8       | 9 |
| <b>PORIFERA</b>                              |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Tremadictyon roemeri</i> /Eck/            |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <b>ANNELIDA</b>                              |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Serpula simplex</i> Assmann               |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Serpula schimischowensis</i> Assmann      |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Salmacina incerta</i> Assmann             |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Elleriprion mamillatus</i> Zawidzka       |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Elleriprion kozuri</i> Zawidzka           |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Delosites varidentatus</i> Kozur          |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Kielanoprion longidentatus</i> Zawidzka   |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Praelumbrinereis zawidzkae</i> Kozur      |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <b>BRACHIOPODA</b>                           |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Lingula tenuissima</i> Bronn              |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Discina discoides</i> /Schlotheim/        |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Mentzelia mentzeli</i> /Dunker/           |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Decurtella decurtata</i> /Girard/         |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Coenothyris vulgaris</i> /Schlotheim/     |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Zeilleria edlingeri</i> /Assmann/         |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Zeilleria ulrici</i> /Assmann/            |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Zeilleria subcircularis</i> /Assmann/     |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Paratospirella fragilis</i> /Schlotheim/  |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Hirsutella hirsuta</i> /Alberti/          |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Tetractinella trigonella</i> /Schlotheim/ |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>?Waldheimia angusta</i> /Schlotheim/      |               |        |       |             |   |   |             |       |   |   |        |       |         |   |
| <i>Waldheimia ladina</i> /Bittner/           |               |        |       |             |   |   |             |       |   |   |        |       |         |   |

----- a ----- b ..... c ----- d

Explanations to Tables 4, 7-10

Occurrence in area of: a — Upper Silesia (GŚ), b — Góry Świętokrzyskie Mts (GŚw), c — Sudety Mts, d — Polish Lowlands (NP); 1 — Lower Gogolin Beds (GŚ) = Wolica Beds (GŚw); 2 — Upper Gogolin Beds (GŚ) = Wavy Beds (GŚw); 3 — Góraźdże Beds (GŚ) = Łukowa Beds (GŚw); 4 = *Terebratula* Beds (GŚ); 5 = Karchowice Beds (GŚ); 4 and 5 = *P. striatum* Beds (GŚw); 6 — *Diplopora* Dolomites (GŚ); 7 — unsubdivided upper part of Middle Muschelkalk; 8 — Upper Tarnowice Beds (GŚ) = Glauconitic Beds (NP) = *E. discites* Beds (GŚ) = *Ceratites* Beds (NP, GŚ); 9 — Wilkowice Beds, 10 — Boruszowice Beds; 11 — Lower Gypsum Beds; 12 — Reed Sandstone; 13 — Upper Gypsum Beds

## Class HYALOSPONGEA Vosmaer, 1886

## Order Dictyida Zittel, 1877

## Family Staurodermatidae Zittel, 1877

Genus *Tremadictyon* Zittel, 1877*Tremadictyon roemeri* (Eck, 1865)

Plate III, Figs. 1—3

1865 *Scyphia roemeri* sp. n.; H. Eck, p. 85, 123, pl. 1, fig. 1 (holotype).1937 *Scyphia* (*Tremadictyon*?) *roemeri* Eck; H. Rauff, p. 10, pl. 2, figs. 1—7 (*vide* P. Assmann, 1937).1937 *Tremadictyon roemeri* n. sp.; H. Rauff, p. 7, pl. 1, figs. 1—12 (*vide* P. Assmann, 1937).1979 *Tremadictyon roemeri* (Eck); H. Senkowiczowa (*in*: Atlas...), p. 30, pl. 2, figs. 1—3.

Collection. — It is not known where the type specimen and those of H. Rauff are housed.

Occurrence. — Upper Silesia (upper part of Lower Muschelkalk and *Diplopora* Dolomites of Middle Muschelkalk). (HS)TYPE COELENTERATA<sup>3</sup>

## Class HYDROZOA Owen, 1843

**General characteristics.** (ZK). Hydrozoans are known from both the high-tatric (A. Radwański, 1968) and sub-tatric (A. Gaździcki, 1974) Rhaetian in the Tatra Mts. They formed small lichen-like colonies or were free-living. Forms resembling representatives of Upper Jurassic genera *Astroporina* or *Dehornella* occur in the high-tatric Rhaetian.

## Class ANTHOZOA Ehrenberg, 1834

**General characteristics.** (EM, ER). Relatively poor assemblage of corals was found in the Muschelkalk in the Upper Silesia (Table 5). Corals occur there in the Górazdze and Karchowice Beds and *Diplopora* Dolomites. Of the species recorded there, *Pamiroseris silesiaca* (Beyrich) is of special importance on account of its frequent occurrences and wide distribution.

Hexacoralla usually occur in cream-yellow, porous, organogenic and organodetrital limestones, locally forming bioherms up to a few meters in height (Ś. Dzułyński, A. Kubicz, 1971; E. Morycowa, 1974). Corals are also known from dolomitic, ore-bearing and *Diplopora* rocks. They represent reef-forming ecological type. The nature of assemblage of corals and accompanying organisms indicates sedimentation of Triassic carbonate rocks in shallow (not deeper than 40 m) and warm sea. Coral colonies in life position, uncrushed thin-shelled bivalves, numerous fairly long stems of crinoids and micritic nature of sediment indicate that the sea was relatively calm in some time intervals. In turn, detritic character of sediment and fragments of colonies show that water energy was locally high. In Muschelkalk sedimentary basin, corals were forming single, scattered colonies or, sometimes, small clusters below 40 cm in height. Colonies with thin plate outline predominate here. Such form of colonies usually represents a first stage

<sup>3</sup> The systematics after Treatise... (1956).

Table 5  
Stratigraphic ranges of corals in the Triassic in the Upper Silesia and Tatra Mts (E. Morycowa, E. Roniewicz)

| Species                                              | Upper Silesia |             |            |           |        | Tatra Mts. |   |
|------------------------------------------------------|---------------|-------------|------------|-----------|--------|------------|---|
|                                                      | Anisian       |             |            |           |        | Rhaetian   |   |
|                                                      | Hydaspi-      | Pelson-     | Illyr-     |           |        |            |   |
|                                                      | ian           | ian         | ian        |           |        |            |   |
|                                                      | Muschelkalk   |             |            |           |        |            |   |
|                                                      |               |             | Lower      |           | Mid-   |            |   |
| Cogolin                                              | Górażdże      | Terapanzula | Karchowice | Mid-      | High-  | Sub-       |   |
| Beds                                                 | Beds          | Beds        | Beds       | dolomites | tatic  | tatic      |   |
|                                                      |               |             |            |           | series | series     |   |
| Anthozoa                                             |               |             |            |           |        |            |   |
| <i>Coelocoenia assmanni</i> Weissermel               |               |             |            |           |        |            | + |
| <i>Coelocoenia exprorecta</i> Weissermel             |               |             |            |           |        |            | + |
| <i>Montlivaltia triasina</i> Dunker                  |               |             |            |           |        |            | + |
| <i>Montlivaltia chonocalyx</i> Weissermel            |               | +           |            |           |        |            | + |
| <i>Thecosmilia caespitosa</i> Reuss                  |               |             |            |           |        |            | + |
| <i>Thecosmilia compressa</i> Weissermel              |               |             |            |           |        |            | + |
| <i>Isastraea orisca</i> Weissermel                   |               |             |            |           |        |            | + |
| <i>Phyllocoeniella globosa</i> /Weissermel/          |               |             |            |           |        |            | + |
| <i>Pamiroseris silesiaca</i> /Beyrich/               |               | +           |            |           |        |            | + |
| <i>Thamnastraea silesiaca stichophila</i> Weissermel |               |             |            |           |        |            | + |
| <i>Cyathocoenia alpina</i> /Gümbel/                  |               |             |            |           |        |            | + |
| <i>Stylophyllum gracile</i> Roniewicz                |               |             |            |           |        |            | + |
| ? <i>Stylophyllum</i> sp.                            |               |             |            |           |        |            | + |
| <i>Phacelostylophyllum lejowae</i> /Roniewicz/       |               |             |            |           |        |            | + |
| <i>Phacelostylophyllum medium</i> Roniewicz          |               |             |            |           |        |            | + |
| <i>Phacelostylophyllum robustum</i> Roniewicz        |               |             |            |           |        |            | + |
| ? <i>Phacelostylophyllum</i> sp.                     |               |             |            |           |        |            | + |
| <i>Retiophyllia clathrata</i> /Emmrich/              |               |             |            |           |        |            | + |
| <i>Retiophyllia paraclathrata</i> Roniewicz          |               |             |            |           |        |            | + |
| <i>Retiophyllia sellae</i> /Stoppani/                |               |             |            |           |        |            | + |
| <i>Parathecosmilia</i> sp.                           |               |             |            |           |        |            | + |
| ? <i>Elysastraea</i> sp.                             |               |             |            |           |        |            | + |
| <i>Rhaetiastrea tatica</i> Roniewicz                 |               |             |            |           |        |            | + |
| <i>Astracomorpha crassisepta</i> Reuss               |               |             |            |           |        |            | + |
| <i>Pamiroseris rectilamellosa</i> /Hinkler/          |               |             |            |           |        |            | + |

in their development as it facilitates adjustment to configuration of bedrock. Settlement of corals in area of sedimentation of Muschelkalk rocks was presumably facilitated by crinoidal sand, occurring in large quantities in some places.

Middle Triassic coral assemblage of the Upper Silesia comprises *Pamiroseris silesiaca* (Beyrich), the species common with those from adjoining parts of the Central-European province (including those from the Lower Silesia, Silesian-Cracow Upland and GDR). In turn, *Montlivaltia triasina* Dunker and *Thecosmilia caespitosa* Reuss indicate connections with the Alpine province (Eastern Alps, Hungary).

In the Tatra Mts, 15 species of *Hexacoralla* have been identified (Table 5). The corals are fairly common in the Rhaetian of the sub-tatric Křižna and Choč series (W. Goetel, 1917; A. Gaździcki, 1974; E. Roniewicz, 1974), being also known from the Rhaetian in the high-tatric series (Z. Kotański, 1959; A. Radwański, 1968; E. Roniewicz, 1974). They occur in well-bedded, black zoogenic limestones with micritic cement, usually in life position, in loose groupings or, sometimes, continuous ones. Coral fragments are fairly rare in limestones detrital in character.

The character of colonies (predominance of bushy forms and presence of plate-like and hemispheric colonies) and composition of accompanying organisms indicate that Rhaetian corals belong to reef-forming, shallow-water type, living in waters with temperature of about 23—27°C and normal salinity. Relatively high specific differentiation (about 5 species are often recorded in a single locality) suggests that bathymetric conditions were close to the optimum for reef-forming corals, ranging from 0 to about 20 m. The corals were forming layered bushes. Layers are not more than 2 m high and contain no more than a few generations of colonies overgrowing one another.

Rhaetian coral fauna of the Tatra Mts displays connections with coeval ones of the Alps and Pamir Mts.

### Order Scleractinia Bourne, 1900

Family *Stylophyllidae* Volz, 1896 emend. Alloiteau, 1952

Genus *Stylophyllum* Reuss, 1854  
*Stylophyllum gracile* Roniewicz, 1974

Plate IV, Fig. 4

1974 *Stylophyllum gracile* sp. n.; E. Roniewicz, p. 104, pl. 2, fig. 2; text-fig. 4.  
1979 *Stylophyllum gracile* Roniewicz; E. Roniewicz (*in*: Atlas...), p. 32, pl. 3, fig. 4.

Collection. — ZPAL H.VI(137) (holotype).

Occurrence. — Tatra Mts — Chochołowska Valley (high-tatric series). (ER)

Genus *Phacelostylophyllum* Melnikova, 1972  
*Phacelostylophyllum lejowae* (Roniewicz, 1974)

Plate IV, Fig. 1

1974 ?*Pinacophyllum lejowae* sp. n.; E. Roniewicz, p. 101, pl. 2, figs. 1, 2; text-fig. 2.  
1979 *Phacelostylophyllum lejowae* (Roniewicz); E. Roniewicz (*in*: Atlas...), p. 33, pl. 3, fig. 1.

Collection. — ZPAL H.VI/121 (holotype).

Occurrence. — Tatra Mts — Lejowa Valley (sub-tatric Choč series). (ER).

*Phacelostylophyllum medium* Roniewicz, 1974

Plate V, Fig. 2

1974 *Phacelostylophyllum medium* sp. n.; E. Roniewicz, p. 106, pl. 3, fig. 5; text-figs. 5, 6.  
1979 *Phacelostylophyllum medium* Roniewicz; E. Roniewicz (*in*: Atlas...), p. 33, pl. 4, fig. 2.

Collection. — ZPAL H.VI/1 (holotype).

Occurrence. — Tatra Mts — Chochołowska Valley (high-tatric series). (ER)

*Phacelostylophyllum robustum* Roniewicz, 1974

Plate V, Fig. 1

1974 *Phacelostylophyllum robustum* sp. n.; E. Roniewicz, p. 105, pl. 3, fig. 3.

1979 *Phacelostylophyllum robustum* Roniewicz; E. Roniewicz (*in: Atlas...*), p. 33, pl. 4, fig. 1.

Collection. — ZPAL H.VI/129 (holotype).

Occurrence. — Tatra Mts — Chochołowska Valley (sub-tatric Choč series).  
(ER)

Family *Distichophyllidae* Cuif, 1976

Genus *Retiophyllia* Cuif, 1966  
*Retiophyllia clathrata* (Emmrich, 1853)

Plate IV, Fig. 3

1891 *Thecosmilia clathrata* Emmrich; F. Frech, p. 15, pl. 4, figs. 1—5, 7—11.

1974 *Retiophyllia clathrata* (Emmrich); E. Roniewicz, p. 108, pl. 4, fig. 1; pl. 5, fig. 3; text-fig. 7.

1979 *Retiophyllia clathrata* (Emmrich); E. Roniewicz (*in: Atlas...*), p. 34, pl. 3, fig. 3.

Collection. — ZPAL H.VI/140.

Occurrence. — Tatra Mts — Mt. Mała Świnica, Szeroka Przełęcz Bielska Pass (sub-tatric Křižna series). (ER)

*Retiophyllia paraclathrata* Roniewicz, 1974

Plate IV, Fig. 2

1891 *Thecosmilia clathrata* Emmrich; F. Frech, p. 15 (pars)

1974 *Retiophyllia paraclathrata* sp. n.; E. Roniewicz, p. 108, pl. 4, fig. 2; pl. 5, figs. 1, 2; text-fig. 8.

1979 *Retiophyllia paraclathrata* Roniewicz; E. Roniewicz (*in: Atlas...*), p. 34, pl. 3, fig. 2.

Collection. — ZPAL H.VI/123 (holotype).

Occurrence. — Tatra Mts (sub-tatric Křižna series throughout the area o its distribution). (ER)

*Retiophyllia sellae* (Stoppani, 1865)

Plate IV, Fig. 5

1891 *Thecosmilia sellae* Stoppani; F. Frech, p. 17, pl. 4, fig. 12.

1974 *Parathecosmilia sellae* (Stoppani); E. Roniewicz, p. 110, pl. 6, figs. 1—3; pl. 7, figs. 1, 2; text-figs. 9, 10.

1979 *Retiophyllia sellae* (Stoppani); E. Roniewicz (*in: Atlas...*), p. 34, pl. 3, fig. 5.

Collection. — ZPAL H.VI/57.

Occurrence. — Tatra Mts — Mt. Mała Świnica (sub-tatric Křižna series).  
(ER)

Family *Astraeomorphae* Frech, 1890

Genus *Astraeomorpha* Reuss, 1854  
*Astraeomorpha crassisepta* Reuss, 1854

Plate V, Fig. 3

1854 *Astraeomorpha crassisepta* n. sp., A. E. Reuss, p. 127, pl. 16, figs. 4—7.

1974 *Astraeomorpha crassisepta* Reuss; E. Roniewicz, p. 113, pl. 9, figs. 4, 5.

1979 *Astraeomorpha crassisepta* Reuss; E. Roniewicz (*in: Atlas...*), p. 35, pl. 4, fig. 3.

Collection. — ZPAL H.VI/96.

Occurrence. — Tatra Mts (sub-tatric series throughout the area of their distribution). (ER)

## Family incertae sedis

Genus *Rhaetiastraea* Roniewicz, 1974  
*Rhaetiastraea tatrca* Roniewicz, 1974

Plate V, Fig. 4

1974 *Rhaetiastraea tatrca* sp. n.; E. Roniewicz, p. 113, pl. 9, figs. 1—3; text-fig. 12.  
 1979 *Rhaetiastraea tatrca* Roniewicz; E. Roniewicz (*in: Atlas...*), p. 35, pl. 4, fig. 4.

Collection. — ZPAL H.VI/12 (holotype).

Occurrence. — Tatra Mts — Chochołowska Valley (high-tatric series). (ER)

Genus *Pamiroseris* Melnikova, 1971  
*Pamiroseris rectilamellosa* (Winkler, 1861)

Plate V, Fig. 5

1891 *Thamnastraea rectilamellosa* Winkler; F. Frech, p. 60, pl. 16; pl. 17, figs. 7, 8.  
 1974 *Pamiroseris rectilamellosa* (Winkler); E. Roniewicz, p. 114, pl. 8, fig. 3; pl. 10, figs. 1—3.  
 1979 *Pamiroseris rectilamellosa* (Winkler); E. Roniewicz (*in: Atlas...*), p. 35, pl. 4, fig. 5.

Collection. — ZPAL H.VI/51.

Occurrence. — Tatra Mts (sub-tatric series throughout the area of their distribution). (ER)

*Pamiroseris silesiaca* (Beyrich, 1852)

Plate VI

1852 *Thamnastraea Silesiaca* Beyrich; E. Beyrich, p. 217.  
 1937 *Thamnastraea silesiaca* Beyrich; P. Assmann, p. 15, pl. 3, fig. 1.  
 1979 *Pamiroseris silesiaca* (Beyrich); E. Morycowa (*in: Atlas...*), p. 35, pl. 5.

Collection. — Jagiellonian University, Cracow, 2a Oleandry Str. (UJ) 34P  
 1—6 (specimens); 7/1—6 (thin sections).

Occurrence. — Upper Silesia, Lower Silesia (Anisian). (EM).

## TYPE ANNELIDA

Class POLYCHAETIA Grube, 1850<sup>4</sup>

**General characteristics.** (KZ, ZK). In Triassic strata of Poland, polychaetes are represented by Sedentaria and Errantida (Table 4). The majority of species of sessile polychaetes (Sedentaria) belong to the families Serpulidae and Sabellidae (J. Samsonowicz, 1929; J. Czarnocki, 1931; P. Assmann, 1937; M. Książkiewicz, J. Samsonowicz, 1952; T. Peryt, 1975).

Free-living polychaetes (Errantida) are represented in Triassic rocks by isolated jaws and jaw apparatuses of the families: Atraktoprionidae, Glyceridae, Goniadidae, Kalloprionidae?, Lumbrinereidae, Lysaretidae, Mochryellidae and Muelleriprionidae (K. Zawadzka, 1971a, 1975b).

Sedentaria have been hitherto found in the Upper Silesia, Góry Świętokrzyskie Mts (not elaborated) and western Tatra Mts. The whole described material of Errantida comes from the Upper Silesia. Unpublished data from various parts of the country show that geographic distribution of the two groups of polychaetes is markedly wider.

<sup>4</sup> The general systematics after Treatise... (1966), supplemented.



Table 6 (continued)

| Species                                                | Triassic |           |                    |           |                   |          |         |        |          |
|--------------------------------------------------------|----------|-----------|--------------------|-----------|-------------------|----------|---------|--------|----------|
|                                                        | Lower    |           | Middle             |           |                   | Upper    |         |        |          |
|                                                        | Seisian  | Campilian | Anisian            |           |                   | Ladinian | Carnian | Norian | Rhaetian |
|                                                        |          |           | Hydaspian          | Pelsonian | Illyrian          |          |         |        |          |
| Crinoidea                                              |          |           |                    |           |                   |          |         |        |          |
| <i>Dadoerinus gruntheyi</i> Langenhan                  |          |           | ~~~~~              | ~~~~~     |                   |          |         |        |          |
| <i>Enerinus liliiformis</i> /Lamarck/                  |          |           |                    |           |                   |          |         |        |          |
| <i>Dadoerinus gracilis</i> /Buch/                      |          |           | ~~~~~              |           |                   |          |         |        |          |
| <i>Isocrinus bavaricus</i> Winkler                     |          |           |                    |           |                   |          |         | ~~~~~  |          |
| Holothurioidea                                         |          |           |                    |           |                   |          |         |        |          |
| <i>Acanthothaelia spiniperforata</i> Zawidzka          |          |           |                    |           |                   |          |         |        |          |
| <i>Achistrum ludwigi</i> /Croneis/                     |          |           |                    |           |                   |          |         |        |          |
| <i>Achistrum monochordata</i> Hodson, Harris et Lawson |          |           |                    |           |                   |          |         |        |          |
| <i>Calclamna germanica</i> Frizzel et Exline           |          |           |                    |           |                   |          |         |        |          |
| <i>Calclamnaidea canalicifera</i> Kristan-Tollman      |          |           |                    |           |                   |          |         |        |          |
| <i>Eocaudina subhezaqona</i> Gutschick, Canis et Brill |          |           |                    |           |                   |          |         |        |          |
| <i>Priscoopedatus anguliferus</i> Zankl                |          |           |                    |           |                   |          |         |        |          |
| <i>Priscoopedatus mostleri</i> Stefanov                |          |           |                    |           |                   |          |         |        |          |
| <i>Priscoopedatus normani</i> Schlumberger             |          |           |                    |           |                   |          |         |        |          |
| <i>Priscoopedatus triassicus</i> Mostler               |          |           |                    |           |                   |          |         |        |          |
| <i>Priscoopedatus elliptiferus</i> Zawidzka            |          |           |                    |           |                   |          |         |        |          |
| <i>Rhabdotites rectus</i> Frizzel et Exline            |          |           |                    |           |                   |          |         |        |          |
| <i>Stichopites mortensteini</i> Deflandre-Rigaud       |          |           |                    |           |                   |          |         |        |          |
| <i>Staurommites bartensteini</i> Deflandre-Rigaud      |          |           |                    |           |                   |          |         |        |          |
| <i>Theelia imesorbimnia</i> Mostler                    |          |           |                    |           |                   |          |         |        |          |
| <i>Theelia scota</i> Speckman                          |          |           |                    |           |                   |          |         |        |          |
| <i>Theelia subtriculata</i> Mostler                    |          |           |                    |           |                   |          |         |        |          |
| <i>Theelia undata</i> Mostler                          |          |           |                    |           |                   |          |         |        |          |
|                                                        |          |           | ~~~~~              | ~~~~~     |                   |          |         |        |          |
|                                                        |          |           | high-tatric series |           | sub-tatric series |          |         |        |          |

In the Triassic of extra-Carpathian Poland, polychaetes are mainly related to carbonate rocks but they also occur in areas where the share of terrigenous material is high or, sometimes, even dominant. Sedentarida occur in shallow-water sediments. They rather represent euryhaline organisms as they occur in sediments with features indicative of brackish character. Rich accumulations of Errantida remains are related to facies most pelagic in the Triassic section and also markedly enriched in pyrite and organic matter. They are as a rule missing in oolites, oncolites, cocquinas and biocalcirudites. Some species have been found in dolosparites of the Middle Muschelkalk in the Upper Silesia (K. Zawidzka, 1975a, b).

*Delosites raridentatus* Kozur and *Praelumbrinereis zawidzkae* Kozur seem to be of stratigraphic value as, up to the present, they have only been recorded in the Lower Muschelkalk (Lower Anisian—Illyrian) in Central Europe and Tethys (H. Kozur, 1972a—c).

A relatively rich assemblage of ichnotaxa related to polychaetes (borings, burrows and trails) was found in various facies of the Polish Triassic (A. Kleczkowski, 1953; H. Senkowiczowa, A. Ślącza, 1962; W. Karaszewski, 1966).

In the Tatra Mts, polychaetes were reported from the sub-tatric (W. Goetel, 1917; A. Gaździcki, 1974) and high-tatric (A. Radwański, 1968) Rhaetian: *Serpula* (*Cycloserpula*) *socialis* Goldfuss, *Serpula* sp. (Table 6).

Moreover, borings identified as *Potamilla reniformis* (Müller) are known from corallites (A. Radwański, 1968) and megalodon shells (A. Gaździcki, 1974) in the sub-tatric and high-tatric Rhaetian.

Order **Errantida** Audouin et Milne Edwards, 1832

Family **Muelleriprionidae** Kozur, 1967

Genus *Elleriprion* Kozur, 1970  
*Elleriprion kozuri* Zawidzka, 1975

Plate VII, Fig. 6

1975b *Elleriprion kozuri* n. sp.; K. Zawidzka, p. 264, pl. 7, fig. 1a, b (holotype).  
1979 *Elleriprion kozuri* Zawidzka; K. Zawidzka (in: Atlas...), p. 38, pl. 6, fig. 6.

Collection. — IGP UW 0165/57.

Occurrence. — Silesian-Cracow Upland (Pelsonian). (KZ)

*Elleriprion mamillatus* (Zawidzka, 1971)

Plate VII, Fig. 2

1971a "*Arabellites*" *mamillatus* n. sp.; K. Zawidzka, p. 368, pl. 3, fig. 12 (holotype).  
1975b *Elleriprion mamillatus* (Zawidzka); K. Zawidzka, pl. 2, fig. 2.  
1979 *Elleriprion mamillatus* (Zawidzka); K. Zawidzka (in: Atlas...), p. 39, pl. 6, fig. 2.

Collection. — IGP UW 137/71.

Occurrence. — Silesian-Cracow Upland (Lower Anisian, Pelsonian). (KZ)

Family **Lysaretidae** Kinberg, 1865 emend. Kozur, 1970

Genus *Delosites* Kozur, 1967 emend. Zawidzka, 1971  
*Delosites raridentatus* Kozur, 1967 emend. Zawidzka, 1971

Plate VII, Figs. 1, 3, 4

1967 *Delosites raridentatus* n. sp., H. Kozur, p. 857, pl. 2, fig. 10.  
1967 *Pahurites separatus* n. sp.; H. Kozur, p. 861, 862, pl. 3, figs. 19, 20.  
1971a *Delosites raridentatus* Kozur; K. Zawidzka, p. 365, pl. 1, figs. 1—4.  
1979 *Delosites raridentatus* Kozur; K. Zawidzka (in: Atlas...), p. 39, pl. 6, figs. 1, 3, 4.

Collection. — IGP UW, K. Zawidzka coll.

Occurrence. — Silesian-Cracow Upland (Lower Anisian, Pelsonian, Illyrian).  
(KZ)

Genus *Kielanoprion* Szaniawski, 1968  
*Kielanoprion longidentatus* Zawidzka, 1975

Plate VII, Fig. 7

1975b *Kielanoprion longidentatus* n. sp.; K. Zawidzka, p. 265, pl. 3, fig. 1 (holotype); pl. 4, fig. 5.  
1979 *Kielanoprion longidentatus* Zawidzka; K. Zawidzka (in: Atlas...), p. 40, pl. 6, fig. 7.

Collection. — IGP UW 32/71 (holotype).

Occurrence. — Silesian-Cracow Upland (Lower Anisian, Pelsonian, Illyrian).  
(KZ)

Family *Lumbrinereidae* Malmgren, 1867 emend. Kozur, 1970

Genus *Praelumbrinereis* Kozur, 1972 emend. Zawidzka, 1975  
*Praelumbrinereis zawidzkae* Kozur, 1972

Plate VII, Figs. 5, 8

1971a "*Nereidavus*" *nudus* Taugourdeau; K. Zawidzka, p. 370, pl. 2, figs. 2, 3.

1972d *Praelumbrinereis zawidzkae* Kozur; H. Kozur, pp. 763—765, fig. 1.

1975b *Praelumbrinereis zawidzkae* Kozur; K. Zawidzka, pp. 267, 268, pl. 7, figs. 2—7.

1979 *Praelumbrinereis zawidzkae* Kozur; K. Zawidzka (*in: Atlas...*), p. 40, pl. 6, figs. 5, 8.

Collection. — IGP UW 25/71.

Occurrence. — Silesian-Cracow Upland (Lower Anisian, Pelsonian, Illyrian).  
 (KZ)

### Order *Sedentarida* Lamarck, 1815

Family *Serpulidae* Savigny, 1818

Genus *Serpula* Linné, 1768

*Serpula schimischowensis* Assmann, 1937

Plate VIII, Figs. 1, 2

1937 *Serpula schimischowensis* n. sp.; P. Assmann, p. 25, pl. 6, figs. 3, 4.

1979 *Serpula schimischowensis* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 40, pl. 7, figs. 1, 2

Collection<sup>5</sup>. — The specimens were presumably passed to the Geologisches Landesmuseum in Berlin by the author; at present missing in the collections.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Serpula simplex* Assmann, 1937

Plate VIII, Figs. 3, 4

1937 *Serpula simplex* n. sp.; P. Assmann, p. 25, pl. 6, figs. 5, 6.

1979 *Serpula simplex* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 41, pl. 7, figs. 3, 4.

Collection. — Zentrales Geologisches Institut, Berlin, Invalidenstrasse (ZGI Berlin). X3313-14<sup>6</sup>.

Occurrence. — Upper Silesia (Karchowice Beds and Ore-bearing Dolomites).  
 (HS)

Genus *Salmacina* Claparedé, 1870

*Salmacina incerta* Assmann, 1937

Plate VIII, Fig. 5

1937 *Salmacina incerta* n. sp.; P. Assmann, p. 25, pl. 6, fig. 2 (holotype).

1979 *Salmacina incerta* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 41, pl. 7, fig. 5.

Collection. — ZGI Berlin X3310 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

<sup>5</sup> According to the remark made by P. Assmann (1937, p. 25).

<sup>6</sup> Numbers of holotypes described by P. Assmann, M. Meyer, H. Eck and R. Michael given according to the lists sent by the Central Geological Institute, Berlin.

## TYPE BRYOZOA

**General characteristics.** (ZK). Bryozoans have been found in the *Girvanella* layers in the high-tatric Rhaetian of the Tatra Mts (A. Radwański, 1968) only. They belong to branching forms of Cyclostomata, which may change shape into lichen-like when grow on other objects. They are known from outer or inner surfaces of *Girvanella* entangles.

TYPE BRACHIOPODA<sup>7</sup>

**General characteristics.** (HS, ZK). Inarticulata are here represented by the genera *Lingula* and *Discina* with a single species each (Table 4).

Lingulids are usually found in marly and clay rocks and often in masses whereas *Discina* occurs fairly rarely, mainly in limestones. Representatives of both genera are small in size. This suggests conditions not much favourable for their development in the basin as Inarticulata used to display trend to gigantism under optimum conditions (B. K. Licharev, V. P. Makridin, M. A. Ržonsnitskaja in: *Osnovy...*, 1960).

Both *Discina discoides* (Schlotheim) and *Lingula tenuissima* Bronn came from the Tethys where they are known from the Werfen upwards. In the epicontinental basin, *Lingula tenuissima* Bronn appeared for the first time in the Rhöt, and *Discina discoides* (Schlotheim) — in the Lower Muschelkalk. In the Tethyan basin, distribution of the latter was limited to the Alpine zone whereas the former is known in area from the Alps to the Ussuri region in Asia.

In the Triassic of extra-Carpathian Poland, Articulata are represented by *Decurtella*, *Punctospirella*, *Mentzelia*, *Hirsutella*, *Tetractinella*, *Zeilleria*, *Coenothyris* and ?*Waldheimia* (Table 4).

Of Triassic brachiopods, *Decurtella decurtata* (Girard) is of some stratigraphic value. In Poland (Upper Silesia), it is known to be limited to the Górażdże Beds — *Diplopora* Dolomites interval.

The other important species is *Coenothyris vulgaris* (Schlotheim), despite of its long stratigraphic range. It should be noted that its mass development has taken place twice in time of sedimentation of the Muschelkalk. For the first time it has happened towards the end of sedimentation of the Lower Muschelkalk. This resulted in origin of the *Terebratula* Beds in the Upper Silesia whereas mass occurrence of this species and bivalves *Plagiostoma* characterize the *P. striatum* Beds in the Góry Świętokrzyskie Mts, foreland of the Carpathians and along western margin of the East European Platform. The second mass occurrence of *Coenothyris vulgaris* (Schlotheim), from upper part of the Upper Muschelkalk, resulted in origin of the *Terebratula* Beds almost throughout the country, being also known from similar stratigraphic position in GDR and FRG.

Articulata lived only in marine reservoirs with normal salinity (35–37‰), in zones of sedimentation of calcareous and dolomitic muds and in rather shallow and warm water and at varying distance from shores. Sometimes they were living in masses in shallow near-shore zones. This may be the case of *Terebratula*

<sup>7</sup> The systematics after B. K. Licharev, V. P. Makridin and M. A. Ržonsnitskaja (in: *Osnovy...*, 1960) and A. S. Dągys (1974).

cocquinas in the uppermost Muschelkalk at Bliżyn near Skarżysko (Góry Świętokrzyskie Mts), clearly displaying cross-bedding.

The brachiopods required saline water but salinity somewhat higher than normal was resulting in their sudden extinction, as it happened close to the end of sedimentation of the Lower Muschelkalk and, in the Upper Silesia, the end of sedimentation of the *Diplopora* Dolomites. Freshening of water, which began throughout vast areas of Poland in the final phase of sedimentation of the Middle *Ceratites* Beds, Upper Muschelkalk, also resulted in mass mortality of these animals.

Triassic brachiopods were coming to the epicontinental basin from the Alpine province. The time and succession of immigration of these animals are fairly well known. *Coenothyris vulgaris* (Schlotheim) and *Waldheimia ladina* (Bittner) appeared as the first in the Lower Gogolin Beds. *Tetractinella trigonella* (Schlotheim) and *Mentzelia mentzeli* (Dunker) appeared after them, being present in lower part of the Gogolin Beds. Middle parts of these beds display *Punctospirella fragilis* (Schlotheim), and the upper — ?*Waldheimia angusta* (Schlotheim). *Decurtella decurtata* (Girard), guide fossil of the Pelsonian, is not known from strata older than the Góraźdze Beds in the Upper Silesia. *Mentzelia mentzeli* (Dunker) is most common in the Karchowice Beds, being generally more common in eastern part of the Upper Silesia than the western.

The Alpine brachiopods were reaching area of extra-Carpathian Poland mainly through the Moravian Gate. Therefore, they mainly inhabited the Upper Silesia. From that area they migrated to other parts of the basin, especially its eastern margins, i.e. the areas of the Góry Świętokrzyskie Mts and Podlasie. *Coenothyris vulgaris* (Schlotheim) reached the area of the Góry Świętokrzyskie Mts at the same time as the Upper Silesia whereas representatives of the genus *Punctospirella* did not leave the latter for quite long time, reaching the Góry Świętokrzyskie and Podlasie not before the end of the Early Muschelkalk.

Brachiopods (except for some questionable remains) were not found in the high-tatric Triassic of the Tatra Mts. They are represented by some findings in the Križna Triassic and important share of fauna in the Triassic of the middle and upper sub-tatric series (Table 6).

Brachiopods of the *D. decurtata* zone — *Tetractinella trigonella* (Schlotheim) and *Mentzelia mentzeli* (Dunker) — are of marked stratigraphic value and they are regarded as guide fossils of the Pelsonian. They are known from some partial Križna nappes in the Tatra Mts but mainly the Palenica nappe in the Tatry Bielskie Range, where they have been already found by V. Úhlig (1897).

Rocks of the upper sub-tatric series also yield fairly numerous brachiopods, including *Punctospirella* cf. *fragilis* (Schlotheim) and *Aulacothyris angustaeformis* (Boeckhling). The species have been found together with ammonites and daonellae in the uppermost Anisian—lowermost Ladinian junction beds (Z. Kotoński, 1973d).

*Coenothyris vulgaris* (Schlotheim) is characterized by wide stratigraphic range in the Križna series, being present in both the *D. decurtata* zone and the Middle Ladinian at Sywarowe, above Fassanian diplopores *Diplopora annulata* Schafhäutl (Z. Kotoński, 1965b). The zone may represent an equivalent of the *Terebratula* layers, widely distributed in the Upper Muschelkalk in the Polish Lowlands.

After a Keuper break, brachiopods reappear in masses in the Rhaetian, where they are characteristic components of the Carpathian facies of the Križna series. *Rhaetina gregaria* (Suess), of guide species importance, is accompanied

there by *R. pyriformis* (Suess), "*Spiriferina*" *uncinata* Schafhäutl and *Austrirhynchonella cornigera carpatica* (Zugmayer) (W. Goetel, 1917) as well as *Zugmayerella* cf. *koessenensis* (Winkler) (A. Gaździcki, 1974).

Mass occurrences of brachiopods were also reported from the Kessen facies of the Rhaetian in the Choč series. The facies is known from Hybie in Liptów (W. Goetel, 1917).

Brachiopods are almost completely missing in the high-tatric Rhaetian. Findings of *Rhaetina gregaria* (Suess) in these rocks are exceptional (Z. Kotański, 1959a, 1961). Thin section studies showed presence of some terebratulids and rhynchonellids (A. Radwański, 1968)

Class **ARTICULATA** Huxley, 1869  
Order **Rhynchonellida** Kuhn, 1949

Family **Rhynchonellidae** Gray, 1848

Genus *Decurtella* Gaetani, 1966  
*Decurtella decurtata* (Girard, 1843)

Plate IX, Fig. 11

- 1843 *Terebratulida decurtata* Girard; H. Girard, p. 474, pl. 2, figs. 4a—d.  
1937 *Rhynchonella decurtata* Girard; P. Assmann, p. 31, pl. 7, fig. 16.  
1966 *Decurtella decurtata* Girard; M. Gaetani, p. 343, pl. 16, figs. 1—7.  
1979 *Decurtella decurtata* (Girard); H. Senkowiczowa (*in: Atlas...*), p. 44, pl. 8, fig. 11.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Upper Silesia (Górazdze Beds — *Diplopora* Dolomites), Carpathian Foredeep (*P. striatum* Beds), Tatra Mts (Anisian, guide fossil of Pelsonian). (HS)

Order **Spiriferida** Waagen, 1883

Family **Spiriferinidae** Davidson, 1884

Genus *Punctospirella* Dagys, 1973  
*Punctospirella fragilis* (Schlotheim, 1814)

Plate IX, Fig. 1

- 1814 *Terebratulites fragilis* Schlotheim; F. Schlotheim, pl. 2, figs. 4, 5.  
1967 *Spiriferina fragilis* (Schlotheim); A. Speciale, p. 1088, pl. 79, figs. 5a—e.  
1974 *Punctospirella fragilis* (Schlotheim); A. S. Dagys, pp. 136, 137, text-fig. 91, pl. 39, figs. 2, 3.  
1979 *Punctospirella fragilis* (Schlotheim); H. Senkowiczowa (*in: Atlas...*), p. 44, pl. 8, fig. 1.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Upper Silesia (Lower and Upper Muschelkalk), Tatra Mts (Anisian—Ladinian). (HS)

Family **Martiniidae** Waagen, 1883

Genus *Mentzelia* Quenstedt, 1871  
*Mentzelia mentzeli* (Dunker, 1851)

Plate IX, Fig. 2

- 1851 *Spirifer mentzeli* Dunker; W. Dunker, p. 287, pl. 34, figs. 17—19.  
1937 *Spiriferina* (*Mentzelia*) *mentzeli* Dunker; P. Assmann, p. 30, pl. 6, figs. 10, 11.  
1974 *Mentzelia mentzeli* (Dunker); A. S. Dagys, pp. 138—140, text-figs. 93, pl. 40, fig. 1.  
1979 *Mentzelia mentzeli* (Dunker); H. Senkowiczowa (*in: Atlas...*), p. 45, pl. 8, fig. 2.

Collection. — ZGI Berlin X3010–12.

Occurrence. — Upper Silesia (Lower Muschelkalk), Tatra Mts (Pelsonian).  
(HS)

Family *Cyrtinidae* Frederiks, 1912

Genus *Hirsutella* Cooper et Muir-Wood, 1951

*Hirsutella hirsuta* (Alberti, 1864)

Plate IX, Fig. 3

1864 *Spirifer?* *hirsutus* n. sp.; F. Alberti, p. 156, pl. 6, fig. 2.

1934 *Hirsutina hirsuta* Alberti; H. Kirchner, p. 107, pl. 2, figs. 11–14.

1974 *Hirsutella hirsuta* (Alberti); A. S. Dagens, pp. 140, 141, text-fig. 95, pl. 39, figs. 6, 7.

1979 *Hirsutella hirsuta* (Alberti); H. Senkowiczowa (*in: Atlas...*), p. 45, pl. 8, fig. 3.

Collection. — MUZ IG 1362/II/1.

Occurrence. — Upper Silesia, Carpathian Foredeep, Góry Świętokrzyskie Mts, Podlasie (Lower Muschelkalk). (HS)

### Order *Terebratulida* Waagen, 1883

Family *Zeilleriidae* Rollier, 1915

Genus *Zeilleria* Bayle, 1878

*Zeilleria edlingeri* (Assmann, 1937)

Plate IX, Fig. 4

1937 *Waldheimia edlingeri* n. sp.; P. Assmann, p. 27, pl. 7, figs. 1–5 (holotype).

1979 *Zeilleria edlingeri* (Assmann); H. Senkowiczowa (*in: Atlas...*), p. 45, pl. 8, fig. 4.

Collection. — ZGI Berlin X3319 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Zeilleria ulrici* (Assmann, 1937)

Plate IX, Fig. 5

1937 *Waldheimia ulrici* n. sp.; P. Assmann, p. 28, pl. 7, figs. 9–12 (holotype).

1979 *Zeilleria ulrici* (Assmann); H. Senkowiczowa (*in: Atlas...*), p. 46, pl. 8, fig. 5.

Collection. — ZGI Berlin X3326 (holotype).

Occurrence. — Upper Silesia (Gogolin Beds, *Diplopora* Dolomites). (HS)

*Zeilleria subcircularis* (Assmann, 1937)

Plate IX, Fig. 6

1937 *Waldheimia subcircularis* n. sp.; P. Assmann, p. 29, pl. 7, fig. 13 (holotype).

1979 *Zeilleria subcircularis* (Assmann); H. Senkowiczowa (*in: Atlas...*), p. 46, pl. 8, fig. 6.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin, it is missing in the ZGI Berlin collections.

Occurrence. — Upper Silesia (Middle Muschelkalk). (HS)

Family *Dielasmatidae* Schuchert, 1913

Genus *Coenothyris* Douvillé, 1879

*Coenothyris vulgaris* (Schlotheim, 1820)

Plate IX, Figs. 7–10

- 1967 *Coenothyris vulgaris* (Schlotheim); A. Speciale, p. 1089, pl. 79, figs. 6—8; pl. 80, figs. 1—7; text-figs. 9—14.  
 1979 *Coenothyris vulgaris* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 46, pl. 8, figs. 7—10.

Collection. — MUZ IG 1362/II/27; 1362/II/46; 1362/II/45; ZPAL Bp. XXI.19/II/1.

Occurrence. — Extra-Carpathian Poland (Lower and Upper Muschelkalk), Tatra Mts (Ladinian). (HS)

## TYPE MOLLUSCA

Class BIVALVIA (Bonnani, 1681) Linné, 1758<sup>8</sup>

**General characteristics.** (HS, ZK, AG). Bivalves are common in Triassic rocks of extra-Carpathian Poland (Table 7). In the Middle Buntsandstein, there occurs *Gervillia purchisoni* Geinitz, known from similar stratigraphic position in GDR and FRG. On account of its wide distribution, the *Gervillia* Beds are differentiated in the Central European basin.

*Costatoria costata* (Zenker) is characteristic for the Upper Buntsandstein, Rhöt, and *Pleuromya rugosa* Ahlburg, hitherto found in the Upper Silesia and Góry Świętokrzyskie, is characteristic for the uppermost Rhöt.

*Myophoria pes anseris* (Schlotheim) occurs in the uppermost part of the Muschelkalk. Its appearance was presumably related to the onset of freshening in the Muschelkalk basin. The form seem to be short-living as it is missing in areas where that process started with some delay. *Myophoria vulgaris cornuta* Alberti also appears limited to the Upper Muschelkalk.

*Myophoria transversa dolomitica* Zeller, found in clay-sandy sediments formed in freshened basin, is characteristic for the Lower Keuper.

The species known from the Rhaetian include *Unionites posterus* (Deffner et Fraas) and *Rhaetavicula contorta* (Portlock). It should be noted that the record of the latter is questionable.

Triassic bivalves are mainly connected with marine sediments (limestones, marls and dolomites).

*Costatoria costata* (Zenker) was the animal characterized by exceptionally high capability to adjustment to different life conditions. It occurs in limestones, dolomites, marls and clay marls of marine origin, claystones and sandstones formed in brackish reservoirs and mudstone-clay intercalations in gypsum, that is sediments formed under conditions of increased salinity.

Some species such as *Modiola triquetra* Seebach, *Curionia gastrochaena* (Dunker) and *Costatoria goldfussi* (Alberti), lived in waters with normal salinity as well as in those of marginal parts of the basin, where salinity was reduced, and in freshened basins but they are completely missing in sediments formed in environments with salinity higher than normal.

*Gervillia purchisoni* Geinitz belongs to species living in strongly freshened waters only. It is exclusively known from clay-sandy sediments, usually red in colour. Sediments yielding mass accumulations of representatives of this species are usually highly impoverished in remains of any other organisms.

<sup>8</sup> The systematics after L. R. Cox *et al.* (in: Treatise..., 1969).

Table 7  
Stratigraphic ranges of selected bivalve species in the Triassic in the extra-Carpathian  
Poland (H. Senkiewiczowa)

| Species                                      | Triassic      |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
|----------------------------------------------|---------------|--------|-------|-------------|--------|-------|-------|-------|-------|--------|---|---------|----|----|----|--|--|
|                                              | Lower         |        |       | Middle      |        |       |       |       |       | Upper  |   |         |    |    |    |  |  |
|                                              | Buntsandstein |        |       | Muschelkalk |        |       |       |       |       | Keuper |   | Rhaetic |    |    |    |  |  |
|                                              | Lower         | Middle | Upper | Lower       | Middle | Upper | Lower | Upper | Lower | Upper  |   |         |    |    |    |  |  |
|                                              |               |        | 1     | 2           | 3      | 4     | 5     | 6     | 7     | 8      | 9 | 10      | 11 | 12 | 13 |  |  |
| <b>MOLLUSCA</b>                              |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <b>Bivalvia</b>                              |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Unionites albertii</i> /Assmann/          |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Unionites posterus</i> /Deffner et Fraas/ |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Unionites lettica</i> /Quenstedt/         |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Arca crassa</i> Assmann                 |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Pteria tenuilineata</i> /Assmann/       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Pteria nuda</i> /Assmann/               |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Aviculomyalina lata</i> Assmann           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Ctenodonta rugosa</i> Assmann           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Costatoria costata</i> /Zenker/           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Enantiostreon difforme</i> /Schlotheim/   |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Gervillia elegans</i> Assmann             |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Hoernesia socialis</i> /Schlotheim/       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Gervillia murhisoni</i> Geinitz           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Hoernesia socialis jenense</i> Passarge   |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Modiola triquetra</i> Seebach             |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Lima acuteostata</i> Assmann              |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Lima dunkeri</i> Assmann                  |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Plagiostoma angustestriatum</i> /Assmann/ |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Plagiostoma striatum</i> /Schlotheim/     |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Macrodonatella lamellosa</i> /Assmann/    |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Modiolus mathildis</i> Assmann            |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Curtonia gastrochaena</i> /Dunker/      |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Myoconcha beyrichi</i> Noetling           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Myoconcha bisostata</i> Assmann           |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Lyriamyophoria elegans</i> /Dunker/       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Myophoria vulgaris</i> /Schlotheim/       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Myophoria pes anseris</i> /Schlotheim/    |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| ? <i>Pecten albertii</i> /Goldfuss/          |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pecten erasmii</i> Assmann                |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleurometites laevigatus</i> Schlotheim   |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Entolium discites</i> /Schlotheim/        |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pecten michaeli</i> Assmann               |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pecten picardi</i> Assmann                |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya pulchra</i> Assmann             |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya brevis</i> Assmann              |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya elegans</i> Assmann             |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya rugosa</i> Ahlburg              |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya sencimstriata</i> Assmann       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Pleuromya pseudoelongata</i> Assmann      |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Neoschizodus laevigatus</i> /Ziethen/     |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Prospendylus ernesti</i> Assmann          |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Rhaetavicula contorta</i> /Portlock/      |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Schafhaeutlia rugosa</i> /Assmann/        |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Schafhaeutlia silesiaca</i> Assmann       |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |
| <i>Schafhaeutlia subovata</i> Assmann        |               |        |       |             |        |       |       |       |       |        |   |         |    |    |    |  |  |

For explanations see Table 4.

Middle Triassic rocks yield numerous marine bivalves. Of these, representatives of the genus *Plagiostoma* are of marked stratigraphic value on account of their mass occurrence in definite horizons and vast areas. The peak in their development is traceable in upper part of the Lower Muschelkalk and mass occurrences of representatives of that species are known in the Carpathian foreland, Góry Świętokrzyskie Mts and western Pomerania, and common occurrences — in the Upper Silesia. Studies carried out by A. Szyperko-Śliwczyńska (1967) showed that the bivalves did not live at all in north-eastern Poland, where the Muschelkalk basin was very shallow. The presence of these bivalves is related to limestones.

Sections of marine Triassic also display repeated mass occurrences of pectens. *Entolium discites* (Schlotheim) is very common in the lowermost Lower Muschelkalk in southern Poland and *Pleuronectites laevigatus* Schlotheim — highly common in upper part of the Lower Muschelkalk. The latter attains fairly large size in the Góry Świętokrzyskie sections, where it is accompanied by *Plagiostoma*. The commonness and large size of individuals suggests that the conditions were there most favourable for this species. Mass development of *Entolium discites* (Schlotheim) has taken place for the second time in the Upper Muschelkalk. The *P. discites* (= *E. discites*) Beds are known in southern Poland. In that area, pectens lived in waters with normal salinity, relatively clear and not muddy. Pectens are missing in central parts of the Upper Muschelkalk basin, where crinoids were blooming.

Some bivalve species found in the Rhöt and Muschelkalk in the Upper Silesia and Góry Świętokrzyskie Mts are hitherto unknown from other regions so they may be endemic. Such species are mainly known from the former region (Table 7).

Some Triassic bivalves occurring in the extra-Carpathian Poland are specific for the epicontinental basin whereas others are also known from the Alpine sea. The latter are most common in the Rhöt, *i.e.* strata formed in initial phase of contact between the epicontinental and Alpine basins.

Bivalves occurring in the Tatra Mts form a faunal group which makes possible reconstructions of influences of the Silesian sea in the high-tatric (and, on a smaller scale, Križna) zone in individual stages of the Triassic, on the basis of its differentiation (Table 6). Moreover, some species are guide or characteristic for both the high-tatric and Silesian basins, making possible direct stratigraphic correlations and comparisons of Triassic sections in the two zones.

The first ingress of the Alpine sea in the Polish Lowlands basin is defined by *Costatoria costata* (Zenker), known from both the high-tatric, Križna and Choč Campilian and the Rhöt in the epicontinental basin. The wormy limestones yield innumerable small bivalves, presumably representing equivalents of the fauna of the Briançonnais Triassic, described by F. Ellenberger (1958). According to that author, the species are mostly endemic and characteristic for a province with features intermediate between the Alpine and Silesian ones, comprising both the Briançonnais-high-tatric zone and the Upper Silesian sea.

The time of the strongest influences of the Silesian sea in the high-tatric zone — the Upper Hydaspien (Bithynian) — is determined by the appearance of *Entolium discites* (Schlotheim), *Gervillia mytiloides* Schlotheim and *Modiola triquetra* Seebach, discovered by F. Rabowski (1931). The above species, similarly those of *Lima*, are completely unknown in the Briançonnais series, which has been stressed by F. Ellenberger (1958). The importance of these species is related to the fact that they correlate the high-tatric and Upper Silesian Triassic, evidencing very close connections between their basins.

Small bivalves also occur as components of the *Diplopora* Dolomites in the high-tatric Pelsonian—Illyrian and the Fassanian with *Diplopora annulata* Schafhäütl (Z. Kotański, 1965b) of the Križna series. Stratigraphically higher units (Suchy Wierch nappe at Sywarowe) display the *Pecten* Limestone, in which pectens are accompanied by some other bivalves. In that section, the Middle Ladinian comprises limestones rich in *Lima*.

In the upper sub-tatric series, there occur bivalves highly characteristic but unknown from other series: *Daonella* (*Daonella*) *lommeli* (Wissmann), *D.* (*D.*) cf. *taramelli* (Mojsisovics), *D.* (*D.*) *tyrolensis parthanensis* (Schafhäütl) as well as *Mysidioptera* sp., *Pecten* sp. and other small bivalves. The representatives of the genus *Daonella* indicate dominantly Mediterranean nature of the sediments and they make possible dating of them at the turn of the Anisian and Ladinian (Z. Kotański, 1973b, c, d). Unidentifiable fragments of bivalves *Myophoria* are also known from Ladinian dolomite of Wetterstein (Z. Kotański, 1973b, d).

Bivalves are the major component of fauna in Swabian facies of the Križna Rhaetian. Bivalves typical of Carpathian facies of the Rhaetian display mixed Alpine–German features (W. Goetel, 1917) whereas megalodons (A. Gaździcki, 1974) and some other bivalves, for example *Cardita austriaca* (Hauer), *Lopha haidingeriana* Emmrich and *Ostrea koessenensis* Winkler, are mainly Alpine in character. The latter assemblage is especially characteristic of the Kessen facies of the Choč Rhaetian.

The megalodon assemblage of the Rhaetian in the Tatra Mts comprises *Conchodon infraliasicus* Stoppani, *C. goeteli* Gaździcki, *Rhaetomegalodon incisus* (Frech) and *R. tatricus* Gaździcki (W. Goetel, 1917; A. Gaździcki, 1974).

The megalodons are fairly common in Upper Triassic carbonate rocks of the Tethyan Realm. These pelecypods diversified into genera during the Carnian and Norian. The Rhaetian displays the peak in their development although the number of their genera decreased at that time.

In the Tatra Mts, megalodons are especially numerous in sections of the Mt. Mały Kopieniec, Mt. Mała Świnica, Lejowa Valley and Mt. Wołoszyn, where they locally form *Megalodon* limestones (A. Gaździcki, 1971). The limestones mainly yield representatives of *Conchodon infraliasicus* Stoppani, occurring there in groups. Groups comprising individuals at different stages of ontogenic development, are of the type of assemblages buried in life position (A. Gaździcki, 1971, 1974).

Numerous borings made by *Lithophaga* are known from the high-tatric Rhaetian (A. Radwański, 1968).

### Order Nuculoida Dall, 1889

Family Ctenodontidae Wöhrmann, 1893

Genus *Ctenodonta* Salter, 1852

?*Ctenodonta rugosa* Assmann, 1937

Plate X, Fig. 1

1937 *Ctenodonta* (?) *rugosa* n. sp.; P. Assmann, p. 32, pl. 7, fig. 18 (holotype).

1979 ?*Ctenodonta rugosa* Assmann; H. Senkowiczowa (in: Atlas...), p. 51, pl. 9, fig. 1.

Collection. — ZGI Berlin X3329 (holotype).

Occurrence. — Upper Silesia (Góraždze Beds). (HS)

**Order Arcoidea Stoliczka, 1871**Family **Arcidae** Lamarck, 1809Genus *Arca* Linné, 1758? *Arca crassa* Assmann, 1937

Plate X, Fig. 2

1937 *Arca crassa* n. sp.; P. Assmann, p. 33, pl. 8, figs. 3, 4 (holotype).1979 ?*Arca crassa* Assmann; H. Senkowiczowa (in: Atlas...), p. 51, pl. 9, fig. 2.

Collection. — The type specimen was housed in the Geologisches Landesmuseum, Berlin.

Occurrence. — Upper Silesia (Górażdże Beds, *Diplopora* Dolomites), Góry Świętokrzyskie Mts — Zajączkowo (Łukowa Beds). (HS)Family **Parallelodontidae** Dall, 1898Genus *Macrodontella* Assmann, 1915*Macrodontella lamellosa* Assmann, 1915

Plate X, Fig. 3

1915 *Macrodontella lamellosa* n. sp.; P. Assmann, p. 616, pl. 34, figs. 5 (holotype), 6.1937 *Macrodontella lamellosa* Assmann; P. Assmann, p. 33, pl. 8, figs. 5, 6.1979 *Macrodontella lamellosa* Assmann; H. Senkowiczowa (in: Atlas...), p. 51, pl. 9, fig. 3.

Collection. — ZGI Berlin X3093.

Occurrence. — Upper Silesia, Góry Świętokrzyskie Mts (Lower Muschelkalk). (HS)

**Order Mytiloidea Férussac, 1822**Family **Mytilidae** Rafinesque, 1815Genus *Modiolus* Lamarck, 1799*Modiolus mathildis* Assmann, 1915

Plate XI, Fig. 9

1915 *Modiola mathildis* n. sp.; P. Assmann, p. 614, pl. 33, figs. 22 (holotype), 23a, b.1937 *Modiola mathildis* Assmann; P. Assmann, p. 63, pl. 12, figs. 13, 14.1979 *Modiolus mathildis* Assmann; H. Senkowiczowa (in: Atlas...), p. 52, pl. 10, fig. 9.

Collection. — ZGI Berlin X3085.

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk). (HS)

**Order Pterioidea Newell, 1965**Family **Myalinidae** Frech, 1891Genus ?*Aviculomyalina* Assmann, 1915*Aviculomyalina lata* Assmann, 1915

Plate X, Fig. 6

1915 *Aviculomyalina lata* n. sp.; P. Assmann, p. 608, pl. 33, figs. 4 (holotype), 5.1937 *Aviculomyalina lata* Assmann; P. Assmann, p. 61, pl. 12, figs. 5, 6.1979 *Aviculomyalina lata* Assmann; H. Senkowiczowa (in: Atlas...), p. 52, pl. 9, fig. 6.

Collection. — ZGI Berlin X3067-68.

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk), Carpathian Foredeep (Lower Muschelkalk). (HS)

Family *Pteriidae* Gray, 1847 (1820)

Genus *Pteria* Scopoli, 1777  
 ?*Pteria tenuilineata* (Assmann, 1937)

Plate X, Fig. 4

1937 *Avicula tenuilineata* n. sp.; P. Assmann, p. 45, pl. 9, fig. 20 (holotype).  
 1979 ?*Pteria tenuilineata* (Assmann); H. Senkowiczowa (*in: Atlas...*), p. 52, pl. 9, fig. 4.

Collection. — ZGI Berlin X3348 (holotype).

Occurrence. — Upper Silesia — vicinities of Chrzanów (Upper Gogolin Beds), Fore-Sudetic Monocline (Lower and Upper Muschelkalk), western Pomerania (Lower Muschelkalk). (HS)

?*Pteria nuda* (Assmann, 1937)

Plate X, Fig. 5

1937 *Avicula* (?) *nuda* n. sp.; P. Assmann, p. 46, pl. 9, fig. 21 (holotype).  
 1979 ?*Pteria nuda* (Assmann); H. Senkowiczowa (*in: Atlas...*), p. 53, pl. 9, fig. 5.

Collection. — ZGI Berlin X3349 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds), north-eastern Poland (Lower Muschelkalk). (HS)

Family *Bakevellidae* King, 1850

Genus *Gervilleia* DeFrance, 1820  
*Gervilleia elegans* Assmann, 1915

Plate X, Fig. 7

1915 *Gervilleia elegans* n. sp.; P. Assmann, p. 606, pl. 32, fig. 21 (holotype).  
 1937 *Gervilleia elegans* Assmann; P. Assmann, p. 49, pl. 10, fig. 10.  
 1979 *Gervilleia elegans* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 53, pl. 9, fig. 7.

Collection. — ZGI Berlin X3061 (holotype).

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

*Gervilleia murchisoni* Geinitz, 1861

Plate X, Fig. 8

1861 *Gervilleia murchisoni* Geinitz; H. B. Geinitz, p. 79, pl. 14, fig. 26 (holotype).  
 1928 *Gervilleia murchisoni* Geinitz; M. Schmidt, p. 147, fig. 303.  
 1979 *Gervilleia murchisoni* Geinitz; H. Senkowiczowa (*in: Atlas...*), p. 53, pl. 9, fig. 8.

Collection. — MUZ IG 1433/II/2.

Occurrence. — Góry Świętokrzyskie Mts, north-eastern Poland, western Pomerania (Middle Buntsandstein). (HS)

Genus *Hoernesia* Laube, 1866  
*Hoernesia socialis* (Schlotheim, 1823)

Plate X, Fig. 9

1823 *Mytilus socialis* n. sp.; F. Schlotheim, p. 294, pl. 37, fig. 1.

1937 *Hoernesia socialis* Schlotheim; P. Assmann, p. 48.

1979 *Hoernesia socialis* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 54, pl. 9, fig. 9.

Collection. — MUZ IG 1368/II/68.

Occurrence. — Extra-Carpathian Poland (Lower and Upper Muschelkalk). (HS)

Family **Aviculopectinidae** Meek et Hayden, 1864

Genus *Pleuronectites* Schlotheim, 1820

*Pleuronectites laevigatus* Schlotheim, 1820

Plate X, Fig. 19

1820 *Pleuronectites laevigatus* Schlotheim; F. Schlotheim, p. 217.

1960 *Pecten* (*Pleuronectites*) cf. *laevigatus* (Schlotheim); A. Lerman, p. 39, pl. 4, figs. 11, 12.

1979 *Pleuronectites laevigatus* Schlotheim; H. Senkowiczowa (in: Atlas...), p. 54, pl. 9, fig. 19.

Collection. — MUZ IG 1209/II/25.

Occurrence. — Extra-Carpathian Poland (Rhöt and Muschelkalk), Tatra Mts (Lower Anisian). (HS)

Family **Posidoniidae** Frech, 1909

Genus *Daonella* Mojsisovics, 1874

*Daonella* (*Daonella*) *tyrolensis parthanensis* (Schafhäütl, 1863)

Plate XIII, Fig. 2

1863 *Posidonomya parthanensis* n. sp.; K. Schafhäütl, p. 367, pl. 69a, figs. 6, 7.

1895 *Halobia parthanensis* (= *tyrolensis* Mojs.); W. Salomon, p. 154, pl. 5, figs. 5-8.

1973a *Daonella* (*Daonella*) *tyrolensis* Mojs. var. *parthanensis* (Schafhäütl); Z. Kotański, p. 446, pl. 46, fig. 1a, b.

1979 *Daonella* (*Daonella*) *tyrolensis parthanensis* (Schafhäütl); Z. Kotański (in: Atlas...), p. 55, pl. 12, fig. 2.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts — Wielkie Koryciska in Chochołowska Valley (Partnach Beds, upper sub-tatric Stražov series — Anisian/Ladinian). (ZK)

*Daonella* (*Daonella*) *lommeli* (Wissmann, 1841)

Plate XIII, Fig. 1

1841 *Halobia lommeli* n. sp.; Wissmann in G. Münster, p. 22, pl. 16, fig. 11.

1874 *Daonella lommeli* (Wissmann); E. Mojsisovics, p. 19, pl. 11, figs. 13, 14.

1973a *Daonella* (*Daonella*) *lommeli* (Wissmann); Z. Kotański, p. 444, pl. 44, figs. 1, 2; pl. 45, figs. 1-3.

1979 *Daonella* (*Daonella*) *lommeli* (Wissmann); Z. Kotański (in: Atlas...), p. 55, pl. 12, fig. 1.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts — Wielkie Koryciska in Chochołowska Valley (Partnach Beds, upper sub-tatric Stražov series — Anisian/Ladinian). (ZK)

Family **Entolidae** Korobkov, 1960

Genus *Entolium* Meek, 1865

*Entolium discites* (Schlotheim, 1820)

Plate X, Fig. 18

1820 *Pleuronectites discites* Schlotheim; F. Schlotheim, p. 218, pl. 35, fig. 3.

- 1826—1844 *Pecten discites* Schlotheim; A. Goldfuss, p. 73, pl. 98, fig. 10.  
 1967 *Entolium discites* (Schlotheim); A. Speciale, p. 1099, pl. 81, figs. 3, 4,  
 1979 *Entolium discites* (Schlotheim); H. Senkowiczowa (*in*: Atlas...), p. 55, pl. 9, fig. 18.

Collection. — MUZ IG 1209/II/6.

Occurrence. — Extra-Carpathian Poland (Rhöt and Muschelkalk), Tatra Mts (Lower Anisian). (HS)

Family Pectinidae Rafinesque, 1815

Genus *Eopecten* Douvillé, 1897

?*Eopecten albertii* (Goldfuss, 1834—1840)

Plate X, Fig. 17

- 1834—1840 *Monotis albertii nobis*; A. Goldfuss, p. 138, pl. 120, fig. 6.  
 1967 *Eopecten* (?) *albertii* (Goldfuss); A. Speciale, p. 1098, pl. 81, fig. 2.  
 1979 ?*Eopecten albertii* (Goldfuss); H. Senkowiczowa (*in*: Atlas...), p. 56, pl. 9, fig. 17.

Collection. — MUZ IG 1209/II/21.

Occurrence. — Upper Silesia, Carpathian Foredeep, Góry Świętokrzyskie Mts (Rhöt, Lower and Upper Muschelkalk). (HS)

Genus *Pecten* Müller, 1776

*Pecten crameri* Assmann, 1937

Plate XI, Fig. 1

- 1937 *Pecten crameri* n. sp.; P. Assmann, p. 55, pl. 11, fig. 11 (holotype).  
 1979 *Pecten crameri* Assmann; H. Senkowiczowa (*in*: Atlas...), p. 56, pl. 10, fig. 1.

Collection. — ZGI Berlin X3365 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Pecten michaeli* Assmann, 1915

Plate XI, Fig. 2

- 1915 *Pseudomonotis* (?) *michaeli* n. sp.; P. Assmann, p. 596, pl. 31, fig. 10 (holotype).  
 1937 *Pecten michaeli* Assmann; P. Assmann, pl. 11, figs. 19, 20.  
 1979 *Pecten michaeli* Assmann; H. Senkowiczowa (*in*: Atlas...), p. 56, pl. 10, fig. 2.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of the Zentrales Geologisches Museum, Berlin.

Occurrence. — Upper Silesia (Rhöt, Lower Muschelkalk). (HS)

*Pecten picardi* Assmann, 1937

Plate XI, Fig. 3

- 1937 *Pecten picardi* n. sp.; P. Assmann, p. 57, pl. 11, fig. 21 (holotype).  
 1979 *Pecten picardi* Assmann; H. Senkowiczowa (*in*: Atlas...), p. 57, pl. 10, fig. 3.

Collection. — ZGI Berlin X3371/1—2 (holotype).

Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

Genus *Chlamys* Röding, 1798

*Chlamys favri tatrca* (Goetel, 1917)

Plate XIV, Fig. 2

- 1917 *Pecten* (*Chlamys*) *Favrii* Stopp. var. nov. *tatrca*; W. Goetel, p. 148, pl. 8, fig. 11.

Collection. — Institute of Geological Sciences, Polish Academy of Sciences, Cracow, 3, Senacka Str. (ING PAN Kraków), W. Goetel coll.

Occurrence. — Tatra Mts — Mt. Mały Kopieniec, Mt. Świnica, Mt. Nosal (Rhaetian). (LK)

*Chlamys winkleri swinicensis* (Goetel, 1917)

Plate XIV, Fig. 1

1917 *Pecten (Chlamys) Winkleri* Stopp. var. nov. *swinicensis*; W. Goetel, p. 145, pl. 8, fig. 9.

Collection. — ING PAN Kraków, W. Goetel coll.

Occurrence. — Tatra Mts — Mt. Mała Świnica (Rhaetian). (LK)

Family **Prospondylidae** Pécincev, 1960

Genus *Prospondylus* Zimmermann, 1885

*Prospondylus ernesti* Assmann, 1937

Plate XI, Fig. 4

1937 *Prospondylus ernesti* n. sp.; P. Assmann, p. 59, pl. 12, fig. 2 (holotype).

1979 *Prospondylus ernesti* Assmann; H. Senkowiczowa (in: Atlas...), p. 57, pl. 10, fig. 4.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

Family **Terquemiidae** Cox, 1964

Genus *Enantiostreon* Bittner, 1901

*Enantiostreon difformae* (Schlotheim, 1823)

Plate XI, Fig. 5

1823 *Ostracites crista-difformae* Schlotheim; F. Schlotheim, p. 245, pl. 36, fig. 2.

1960 *Enantiostreon difformae* (Schlotheim); A. Lerman, p. 29, pl. 3, fig. 1.

1979 *Enantiostreon difformae* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 57, pl. 10, fig. 5.

Collection. — MUZ IG 1209/II/56.

Occurrence. — Extra-Carpathian Poland (Rhöt—Upper Muschelkalk). (HS)

Genus *Placunopsis* Morris et Lycert, 1853

*Placunopsis kuźniari* Goetel, 1917

Plate XIV, Fig. 4

1917 *Placunopsis Kuźniari* n. sp.; W. Goetel, p. 167, pl. 9, fig. 3.

Collection. — ING PAN Kraków, W. Goetel coll.

Occurrence. — Tatra Mts — Rusinowa Jaworzyńska (Rhaetian). (LK)

Family **Limidae** Rafinesque, 1815

Genus *Lima* Bruguière, 1797

*Lima acutecostata* Assmann, 1937

Plate X, Fig. 10

1937 *Lima acutecostata* n. sp.; P. Assmann, p. 51, pl. 10, figs. 19 (holotype), 20.

1979 *Lima acutecostata* Assmann; H. Senkowiczowa (in: Atlas...), p. 58, pl. 9, fig. 10.

Collection. — ZGI Berlin X3355 (holotype).

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk). (HS)

*Lima dunkeri* Assmann, 1937

Plate X, Fig. 11

1937 *Lima dunkeri* n. sp.; P. Assmann, p. 52, pl. 11, figs. 1 (holotype), 2.

1979 *Lima dunkeri* Assmann; H. Senkowiczowa (in: Atlas...), p. 58, pl. 9, fig. 11.

Collection. — ZGI Berlin X3357 (holotype).

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

Genus *Plagiostoma* Sowerby, 1814

*Plagiostoma angustestriatum* (Assmann, 1937)

Plate X, Fig. 12

1937 *Lima angustestriata* n. sp.; P. Assmann, p. 50, pl. 10, fig. 15 (holotype).

1967 *Plagiostoma angustestriatum* (Assmann); A. Speciale, p. 1108.

1979 *Plagiostoma angustestriatum* (Assmann); H. Senkowiczowa (in: Atlas...), p. 58, pl. 9, fig. 12.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia, Carpathian Foredeep (Lower Muschelkalk). (HS)

*Plagiostoma striatum* (Schlotheim, 1823)

Plate X, Figs. 13–16

1823 *Chamites striatus* Schlotheim; F. Schlotheim, p. 210, pl. 34, fig. 1a–c.

1859 *Lima striata* Schlotheim; C. Schaubroth, p. 310, pl. 2, fig. 8.

1967 *Plagiostoma striatum* (Schlotheim); A. Speciale, p. 1109, pl. 82, fig. 7.

1979 *Plagiostoma striatum* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 58, pl. 9, figs. 13–16.

Collection. — MUZ IG 1209/II/33, 37, 44, 45.

Occurrence. — Upper and Lower Silesia, Góry Świętokrzyskie Mts, Carpathian Foredeep, Podlasie, western Pomerania (Rhöt—Upper Muschelkalk). (HS)

Order *Unionoida* Stoliczka, 1871

?Family *Pachycardiidae* Cox, 1961

Genus *Unionites* Wissmann, 1841

*Unionites albertii* (Assmann, 1915)

Plate XI, Fig. 16

1915 *Anoplophora albertii* n. sp.; P. Assmann, p. 617, pl. 34, figs. 8 (holotype), 12.

1937 *Anoplophora albertii* Assmann; P. Assmann, p. 33, pl. 8, figs. 7–12.

1979 *Unionites albertii* (Assmann); H. Senkowiczowa (in: Atlas...), p. 59, pl. 10, fig. 16.

Collection. — ZGI Berlin X3096, X3098–3100.

Occurrence. — Upper Silesia (Rhöt—Upper Muschelkalk). (HS)

*Unionites lettica* (Quenstedt, 1852)

Plate XII, Fig. 5

1852 *Anodonta lettica* Quenstedt; F. A. Quenstedt, pl. 44, fig. 16.

1964 *Unionites lettica* (Quenstedt); A. Allasinaz, p. 217, pl. 14, figs. 1—4.

1979 *Unionites lettica* (Quenstedt); H. Senkowiczowa (in: Atlas...), p. 59, pl. 11, fig. 5.

Collection. — MUZ IG 1368/II/190.

Occurrence. — Extra-Carpathian Poland (Keuper). (HS)

*Unionites posterus* (Deffner et Fraas, 1859)

Plate XII, Fig. 6

1859 *Anodonta postera*; C. Deffner, O. Fraas, pp. 9—10.

1963 *Unionites posterus* (Deffner et Fraas); R. Dadlez, J. Kopik, p. 139, pl. 2, figs. 11—13.

1979 *Unionites posterus* (Deffner et Fraas); H. Senkowiczowa (in: Atlas...), p. 60, pl. 11, fig. 6.

Collection. — MUZ IG 763/II/1.

Occurrence. — Fore-Sudetic Monocline, Silesian-Cracow Upland (Lower Rhaetic). (HS)

### Order Trigonioida Dall, 1889

Family Myophoriidae Bronn, 1849

Genus *Myophoria* Bronn in Alberti, 1834

*Myophoria vulgaris* (Schlotheim, 1823)

Plate XI, Fig. 10

1823 *Trigonellites vulgaris* Schlotheim; F. Schlotheim, pl. 36, fig. 5.

1967 *Myophoria vulgaris* (Schlotheim); A. Speciale, p. 1111, pl. 82, figs. 8, 9.

1979 *Myophoria vulgaris* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 60, pl. 10, fig. 10.

Collection. — MUZ IG 1209/II/115.

Occurrence. — Extra-Carpathian Poland (Lower and Upper Muschelkalk). (HS)

*Myophoria pes anseris* (Schlotheim, 1823)

Plate XI, Fig. 11

1823 *Trigonellites pes anseris* Schlotheim; F. Schlotheim, pl. 36, fig. 4.

1928 *Myophoria pes anseris* Schlotheim; M. Schmidt, p. 191, fig. 450.

1979 *Myophoria pes anseris* (Schlotheim); H. Senkowiczowa (in: Atlas...), p. 60, pl. 10, fig. 11.

Collection. — MUZ IG 1368/II/191.

Occurrence. — Fore-Sudetic Monocline, Silesian-Cracow Upland, Góry Świętokrzyskie Mts, western Pomerania (Upper Muschelkalk and Lower Keuper). (HS)

Genus *Lyriomyophoria* Kobayashi, 1954

*Lyriomyophoria elegans* (Dunker, 1851)

Plate XI, Figs. 12, 13

1851 *Lyriodon elegans* Dkr.; W. Dunker, p. 300, pl. 35, fig. 1 (holotype).

1915 *Myophoria elegans* Dunker; P. Assmann, p. 622, pl. 34, figs. 21 (neotype?), 22.

1964 *Myophoria elegans* Dunker; V. F. Vozin, V. V. Tikhomirova, p. 34, pl. 19, fig. 7.

1979 *Lyriomyophoria elegans* (Dunker); H. Senkowiczowa (in: Atlas...), p. 61, pl. 10, figs. 12, 13.

Collection. — ZGI Berlin X3109–10, MUZ IG 1209/II/112.

Occurrence. — Upper Silesia (Rhöt—Middle Muschelkalk), Lower Silesia (Lower Muschelkalk), Góry Świętokrzyskie Mts (Upper Muschelkalk). (HS)

Genus *Costatoria* Waagen, 1907  
*Costatoria costata* (Zenker, 1833)

Plate XI, Fig. 14

- 1833 *Donax costata* Zenker; J. Zenker, p. 55, pl. 6, figs. A, 1-9.  
 1928 *Myophoria costata* Zenker; M. Schmidt, p. 192, fig. 452.  
 1979 *Costatoria costata* (Zenker); H. Senkowiczowa (*in: Atlas...*), p. 61, pl. 10, fig. 14.

Collection. — MUZ IG 1368/II/192.

Occurrence. — Extra-Carpathian Poland (Rhöt), Tatra Mts (Campilian).  
 (HS)

Genus *Neoschizodus* Giebel, 1855  
*Neoschizodus laevigatus* (Ziethen, 1830)

Plate XI, Fig. 15

- 1830 *Trigonia laevigata* (Ziethen); C. H. Ziethen, p. 94, pl. 71, figs. 2, 6.  
 1895 *Myophoria laevigata* Ziethen; W. Salomon, p. 165, pl. 5, fig. 42.  
 1967 *Neoschizodus laevigatus* (Ziethen); A. Speciale, p. 1112, pl. 82, figs. 12, 13.  
 1979 *Neoschizodus laevigatus* (Ziethen); H. Senkowiczowa (*in: Atlas...*), p. 61, pl. 10, fig. 15.

Collection. — MUZ IG 1368/II/193.

Occurrence. — Extra-Carpathian Poland (Rhöt—Upper Muschelkalk). (HS)

Order *Veneroida* M. Adams et A. Adams, 1856

Family *Cardiidae* Lamarck, 1809

Genus *Protocardia* Beyrich, 1845  
*Protocardia rhaetica longistriata* Goetel, 1917

Plate XIV, Fig. 5

- 1917 *Protocardia rhaetica* Mer. var. nov. *longistriata*; W. Goetel, p. 193, pl. 9, fig. 7.

Collection. — ING PAN Kraków, W. Goetel coll.

Occurrence. — Tatra Mts — Mt. Mały Kopieniec (Rhaetian). (LK)

Family *Permophoridae* van de Poel, 1959

Genus *Curionia* Ronchetti et Allasinaz, 1965  
 ?*Curionia gastrochaena* (Dunker, 1851)

Plate XII, Fig. 1

- 1851 *Modiola gastrochaena* Dkr; W. Dunker, p. 296, pl. 35, fig. 12.  
 1937 *Myoconcha gastrochaena* Dunker; P. Assmann, p. 61.  
 1979 ?*Curionia gastrochaena* (Dunker); H. Senkowiczowa (*in: Atlas...*), p. 62, pl. 11, fig. 1.

Collection. — ZGI Berlin X3072—3073.

Occurrence. — Lower and Upper Silesia, Fore-Sudetic Monocline, Góry Świętokrzyskie Mts (Rhöt and Lower Muschelkalk). (HS)

Genus *Myoconcha* Sowerby, 1825  
*Myoconcha beyrichi* Noetling, 1880

Plate XI, Figs. 6, 7

- 1880 *Myoconcha beyrichi* sp. n.; F. Noetling, p. 328, pl. 14, figs. 6, 6a (holotype).  
 1915 *Myoconcha beyrichi* Noetling; P. Assman, p. 613, pl. 33, figs. 16, 17a, b.  
 1979 *Myoconcha beyrichi* Noetling; H. Senkowiczowa (*in: Atlas...*), p. 62, pl. 10, figs. 6, 7.

Collection. — ZGI Berlin X3079, X3080.

Occurrence. — Lower and Upper Silesia (Lower Muschelkalk). (HS)

*Myoconcha bicostata* Assmann, 1915

Plate XI, Fig. 8

1915 *Myoconcha bicostata* n. sp.; P. Assmann, p. 610, pl. 33, fig. 11 (holotype).

1937 *Myoconcha bicostata* Assmann; P. Assmann, p. 61, pl. 12, fig. 7.

1979 *Myoconcha bicostata* Assmann; H. Senkowiczowa (in: Atlas...), p. 62, pl. 10, fig. 8.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt and Lower Muschelkalk), Góry Świętokrzyskie Mts (Łukowa Beds). (HS)

Family **Fimbriidae** Nicol, 1950

Genus *Schafhaeutlia* Cossmann, 1897

*Schafhaeutlia rugosa* (Assmann, 1915)

Plate XII, Fig. 2

1915 *Gonodon* (?) *rugosum* n. sp.; P. Assmann, p. 626, pl. 35, fig. 13a—c (holotype), pl. 32, fig. 3.

1937 *Schafhäutlia rugosa* Assmann; P. Assmann, p. 38, pl. 8, fig. 24.

1979 *Schafhaeutlia rugosa* (Assmann); H. Senkowiczowa (in: Atlas...), p. 63, pl. 11, fig. 2.

Collection. — ZGI Berlin X3127.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Schafhaeutlia silesiaca* Assmann, 1937

Plate XII, Fig. 3

1937 *Schafhäutlia silesiaca* n. sp.; P. Assmann, p. 39, pl. 8, fig. 25; pl. 9, fig. 1 (holotype).

1979 *Schafhaeutlia silesiaca* Assmann; H. Senkowiczowa (in: Atlas...), p. 63, pl. 11, fig. 3.

Collection. — ZGI Berlin X3338 (holotype).

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk), Lower Silesia (Lower Muschelkalk). (HS)

*Schafhaeutlia subovata* Assmann, 1937

Plate XII, Fig. 4

1937 *Schafhäutlia subovata* n. sp.; P. Assmann, p. 39, pl. 9, figs. 3, 4, 5 (holotype).

1979 *Schafhaeutlia subovata* Assmann; H. Senkowiczowa (in: Atlas...), p. 63, pl. 11, fig. 4.

Collection. — ZGI Berlin X3342/1—2 (holotype).

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk). (HS)

Order **Præheterodonta** Douvillé, 1912<sup>9</sup>

Family **Megalodontidae** Morris et Lycett, 1853

Genus *Conchodon* Stoppani, 1865

*Conchodon goeteli* Gaździcki, 1974

Plate XIII, Fig. 4

<sup>9</sup> The systematics after J. Haffer (1959).

1974 *Conchodon goeteli* sp. n.; A. Gaździcki, p. 37, pl. 27, figs. 1a—c, 2a—c (holotype).

1979 *Conchodon goeteli* Gaździcki; L. Karczewski (in: Atlas...), p. 64, pl. 12, fig. 4.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Tatra Mts — Mt. Mały Kopieniec (Fatra Formation — Rhaetian). (LK)

### *Conchodon infraliasicus* Stoppani, 1865

Plate XIV, Fig. 6

1865 *Conchodon infraliasicus* Stoppani; A. Stoppani, p. 246, pl. 38, figs. 3—5; pl. 39, figs. 1—3; pl. 40, figs. 1—5.

1964 *Conchodus infraliasicus* Stoppani; H. Zapfe, p. 274, pl. 5, figs. a—b; pl. 6, figs. a—b; pl. 7, figs. a—f.

1974 *Conchodon infraliasicus* Stoppani; A. Gaździcki, p. 36, pl. 25, figs. 1—8.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Tatra Mts — Mt. Mały Kopieniec, Mt. Mała Świnica, Mt. Wołoszyn, Lejowa Valley (Fatra Formation — Rhaetian). (AG)

### Genus *Rhaetomegalodon* Vegh-Neubrandt, 1969

*Rhaetomegalodon tatricus* Gaździcki, 1974

Plate XIII, Fig. 3

1974 *Rhaetomegalodon tatricus* sp. n.; A. Gaździcki, p. 38, pl. 26, figs. 1a—c, 3a—c (holotype).

1979 *Rhaetomegalodon tatricus* Gaździcki; L. Karczewski (in: Atlas...), p. 64, pl. 12, fig. 3.

Collection. — IGP UW, A. Gaździcki coll.

Occurrence. — Tatra Mts — Mt. Mały Kopieniec (Fatra Formation — Rhaetian). (LK)

## Order *Pholadomyida* Newell, 1965

Family *Pleuromyidae* Dall, 1900

Genus *Pleuromya* Agassiz, 1842

*Pleuromya pulchra* Assmann, 1915

Plate XII, Fig. 7

1915 *Pleuromya pulchra* n. sp.; P. Assmann, p. 632, pl. 36, fig. 9 (holotype).

1937 *Pleuromya pulchra* Assmann; P. Assmann, p. 44, pl. 9, fig. 17.

1979 *Pleuromya pulchra* Assmann; H. Senkowiczowa (in: Atlas...), p. 64, pl. 11, fig. 7.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Middle Muschelkalk). (HS)

### *Pleuromya brevis* Assmann, 1915

Plate XII, Fig. 8

1915 *Pleuromya brevis* n. sp.; P. Assmann, p. 631, pl. 36, fig. 7a, b (holotype).

1937 *Pleuromya* (?) *brevis* Assmann; P. Assmann, p. 44, pl. 9, fig. 12.

1979 *Pleuromya brevis* Assmann; H. Senkowiczowa (in: Atlas...), p. 65, pl. 11, fig. 8.

Collection. — ZGI Berlin X3139 (holotype).

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

*Entalis* occurs in the Lower Muschelkalk in the Sudety Mts and Upper Silesia. *Entalis laevis* (Schlotheim) was found in lower part of the Lower Muschelkalk in the Sudety Mts (F. Noetling, 1880). *Entalis torquata* (Schlotheim) appears fairly common in the Wavy Limestones III of the Upper Gogolin Beds and marly limestones in the Upper Silesia (P. Assmann, 1937). As it was noted by P. Assmann (1937), specimens from the Wavy Limestones are smaller than those from marly limestones.

*Dentalium* was found in the Góry Świętokrzyskie Mts and Upper Silesia. The Góraźdże Beds in the latter area were found (P. Assmann, 1937) to yield

Table 8

Stratigraphic ranges of selected species of scaphopods and cephalopods in the Triassic in the extra-Carpathian Poland (H. Senkowiczowa)

| Species                                                                         | Triassic      |        |       |             |   |   |   |            |       |   |   |    |
|---------------------------------------------------------------------------------|---------------|--------|-------|-------------|---|---|---|------------|-------|---|---|----|
|                                                                                 | Lower         |        |       | Middle      |   |   |   |            |       |   |   |    |
|                                                                                 | Buntsandstein |        |       | Muschelkalk |   |   |   |            |       |   |   |    |
|                                                                                 | Lower         | Middle | Upper | Lower       |   |   |   | Mid<br>dle | Upper |   |   |    |
|                                                                                 |               |        | 1     | 2           | 3 | 4 | 5 | 6          | 7     | 8 | 9 | 10 |
| SCAPHOPODA                                                                      |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Entalis laevis</i> /Schlotheim/                                              |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Entalis torquata</i> /Schlotheim/                                            |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Dentalium regium</i> Assmann                                                 |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Dentalium quadrangulum</i> Assmann                                           |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Dentalium regulare</i> Ahlburg                                               |               |        |       |             |   |   |   |            |       |   |   |    |
| CEPHALOPODA                                                                     |               |        |       |             |   |   |   |            |       |   |   |    |
| Nautilida                                                                       |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Germanonutilus bidorsatus</i> /Schlotheim/                                   |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Nautilus goraszensis</i> Assmann                                             |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Nautilus pseudobrembanus</i> Assmann                                         |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Pleuromutilus</i> cf. <i>furcatus</i> Arthaber                               |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Pleuromutilus mosis</i> Mojsisovics                                          |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Pleuromutilus planki</i> Assmann                                             |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Pleuromutilus</i> cf. <i>seminodosus</i> Arthaber                            |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Temnocheilus dolomiticus</i> Quenstedt                                       |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Temnocheilus postdolomiticus</i> Assmann                                     |               |        |       |             |   |   |   |            |       |   |   |    |
| Ceratitina                                                                      |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Balatonites nobilis</i> Assmann                                              |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Balatonites quaternocatus</i> Rassmuss                                       |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Balatonites sinneri</i> Rassmuss                                             |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Balatonites zimmemanni</i> Rassmuss                                          |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites mirabilis</i> Assmann                                              |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites goraszensis</i> Assmann                                            |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites</i> / <i>Progonoceratites</i> / cf. <i>pulcher angustus</i> Wenger |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites</i> / <i>Acanthoceratites</i> / <i>compressus</i> Philippi         |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites</i> / <i>Acanthoceratites</i> / <i>evolutus</i> Philippi           |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Ceratites</i> / <i>Acanthoceratites</i> / <i>spinosis</i> Philippi           |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Silesiacrochordiaceras damesi</i> /Noetling/                                 |               |        |       |             |   |   |   |            |       |   |   |    |
| <i>Beneckeia buchi</i> /Alberti/                                                |               |        |       |             |   |   |   |            |       |   |   |    |

For explanations see Table 4.

*D. regium* Assmann and *D. quadrangulum* Assmann, and the Łukowa Beds in the Góry Świętokrzyskie Mts (H. Senkowiczowa, 1961) — unidentifiable representative of this genus. Moreover, *D. regulare* Ahlburg occurs in the *Diplopora* Dolomites in the Upper Silesia. Of the above species, only *Entalis torquata* (Schlothheim) is also known from the Alpine region, from the *Dadocrinus* Beds (Virgilorian — Anisian) of the Briançonnais series in the Vanoise Massif.

In the extra-Carpathian Poland, Triassic scaphopods were found in limestones with marine organic assemblages.

Family **Dentaliidae** Gray, 1834

Genus *Dentalium* Linné, 1758

*Dentalium quadrangulum* Assmann, 1937

Plate XV, Fig. 1

1937 *Dentalium quadrangulum* n. sp.; P. Assmann, p. 98, pl. 18, fig. 22 (holotype).

1979 *Dentalium quadrangulum* Assmann; H. Senkowiczowa (in: Atlas...), p. 67, pl. 13, fig. 1.

Collection. — ZGI Berlin X3421 (holotype).

Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Dentalium regium* Assmann, 1937

Plate XV, Figs. 2—4

1937 *Dentalium regium* n. sp.; P. Assmann, p. 97, pl. 19, figs. 19 (holotype), 20, 21.

1979 *Dentalium regium* Assmann; H. Senkowiczowa (in: Atlas...), p. 68, pl. 13, figs. 2—4.

Collection. — ZGI Berlin X3418/1—2 (holotype).

Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Dentalium regulare* Ahlburg, 1906

Plate XV, Fig. 5

1906 *Dentalium regulare* spec. nov.; J. Ahlburg, p. 86, pl. 3, fig. 2a, b (holotype).

1937 *Dentalium regulare* Ahlburg; P. Assmann, p. 98.

1979 *Dentalium regulare* Ahlburg; H. Senkowiczowa (in: Atlas...), p. 68, pl. 13, fig. 5.

Collection. — ZGI Berlin X3545.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Class GASTROPODA Cuvier, 1797<sup>11</sup>

**General characteristics.** (HS, ZK). *Amauropsis silesiaca* (Ahlburg), known from the Rhöt in the Upper Silesia (J. Ahlburg, 1906; P. Assmann, 1937) should be regarded as one of Polish gastropods more important from the point of view of stratigraphy. According to P. Assmann (1933), gastropods of that species preferred environment with increased content of magnesium so they are more common in dolomites than limestones.

In the extra-Carpathian Poland, gastropods are known from strata not older than upper part of the Rhöt (Table 9). The number of species is the highest

<sup>11</sup> The systematics after V.A. Vostokova and others (in: Osnovy..., 1960).



Tabela 9 (continued)

| Species                                     | Triassic        |        |       |             |   |   |         |       |   |   |   |    |
|---------------------------------------------|-----------------|--------|-------|-------------|---|---|---------|-------|---|---|---|----|
|                                             | Lower           |        |       | Middle      |   |   |         |       |   |   |   |    |
|                                             | Bunt-sand-stein |        |       | Muschelkalk |   |   |         |       |   |   |   |    |
|                                             | Lower           | Middle | Upper | Lower       |   |   | Mid-dle | Upper |   |   |   |    |
|                                             |                 |        | 1     | 2           | 3 | 4 | 5       | 6     | 7 | 8 | 9 | 10 |
| <i>Pustulifer acuticarinatus</i> Assmann/   |                 |        |       |             |   |   |         |       |   |   |   |    |
| ? <i>Provermicularia grundeji</i> Assmann   |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Protorecula brevis</i> Assmann           |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Promathildia paucicornata</i> Assmann    |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Promathildia tenuicarinata</i> Assmann   |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Promathildia pulchra</i> Assmann         |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Promathildia nympa</i> Assmann           |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Promathildia elegans</i> Assmann         |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Sourria tenuistriata</i> Assmann         |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Spirostylus extractus</i> Assmann        |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Tretospira fusiformis</i> Ahlburg        |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus altus</i> Assmann          |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus erectus</i> Assmann        |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus pseudoscalatus</i> Assmann |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus silesiacus</i> Assmann     |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus gracilis</i> Assmann       |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Trypanostylus modestus</i> Assmann       |                 |        |       |             |   |   |         |       |   |   |   |    |
| ? <i>Turbo toriniaciformis</i> Noetling     |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia depressa</i> Assmann           |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia brancoi</i> Ahlburg            |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia conica</i> Assmann             |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia eeki</i> Assmann               |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia excoelior</i> Assmann          |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia globosa</i> Ahlburg            |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia lata</i> Assmann               |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia michaeli</i> Ahlburg           |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia multiearinata</i> Assmann      |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia pisardi</i> Assmann            |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia pura</i> Assmann               |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia silesiaca</i> Ahlburg          |                 |        |       |             |   |   |         |       |   |   |   |    |
| <i>Worthenia tornquisti</i> Assmann         |                 |        |       |             |   |   |         |       |   |   |   |    |

For explanations see Table 4.

in the Lower and Middle Muschelkalk developed in the facies of *Diplopora Dolomites* (Upper Silesia).

Distribution of gastropods in the extra-Carpathian Poland in the Rhöt and Lower Muschelkalk shows that they were mainly inhabiting areas situated close to contact zones of the epicontinental and Alpine basins as they are mainly found in the Upper and Lower Silesia and Góry Świętokrzyskie Mts.

Gastropods occurring in the Rhöt are small-sized, usually not over about a dozen millimeters in height whereas those from the Lower Muschelkalk and the *Diplopora Dolomites* of the Middle Muschelkalk in the Upper Silesia range

from a millimeter to about a dozen cm in height. Large gastropods, up to 10 cm in height or higher, are known from the Upper Muschelkalk in the Góry Świętokrzyskie.

Plant-eating Archaeogastropoda are known in Poland from marine sediments. Mesogastropoda lived in various environments but species belonging to that suborder are known from marine sediments only.

Triassic gastropods recorded in the country comprise species also known from the Alpine basin.

In the Triassic of the Tatra Mts, gastropods are already found in the Campilian and *Naticella costata* Winkler (Table 6), known from the high-tatric series, is recognized as guide fossil for that stage.

Until recently, not much attention was paid to gastropods. The situation changed when special methods of selective dissolving have been introduced to extraction of gastropods from rocks of the Briançonnais and Prealpine series (F. Ellenberger, 1958; F. Botteron, 1961), making it possible to state that the gastropods are dominantly Upper Silesian in character. It appeared that gastropods occurring in the Middle Triassic in the Upper Silesia (P. Assmann, 1924) belong to the same zoogeographic province. The province displays features intermediate between those of the Alpine and German ones. Moreover, it is characterized by large share of endemic and dwarfish species.

The Lower "Hydaspien" (Aegean) of the high-tatric Triassic in the Tatra Mts was hitherto found to yield *Omphaloptycha* cf. *stotteri* Klipstein, *Omphaloptycha* sp., *Loxonema* sp. and *Naticopsis* sp. (J. Głazek, 1963; J. Piotrowski, 1965; Z. Kotański, 1967, 1973a) as well as a large individual of *Nucula* sp. (Z. Kotański, 1955). The assemblage is close to so-called first molluscan fauna of the Briançonnais Triassic. The so-called second molluscan fauna of the Briançonnais and Prealpine series undoubtedly exists in the Tatra Mts but it requires further studies. It is not excluded that the two above mentioned faunal horizons are still treated there as a single one. Nevertheless, it may be stated that the rich gastropod assemblage of the Briançonnais-Prealpine-high-tatric-Silesian province is typical of the Lower Anisian.

The *Diplopora* Limestones of the high-tatric Pelsonian-Illyrian and *Diplopora* Dolomites of the Križna Fassanian are fairly rich in small-sized gastropods, well visible in thin-sections. Further studies should make possible precise specific identifications of plant-eaters of the family Neritidae and other taxa, also fairly common in the *Diplopora* Dolomites in the Upper Silesia (P. Assmann, 1926; H. Senkowiczowa, 1972). Small-sized and smooth-shelled individuals have been also described from the *Diplopora* Beds by F. Ellenberger (1958) and F. Botteron (1961). From the same layers with *Physoporella*, F. Ellenberger (1958) also reported small-sized unidentifiable Pleurotomariidae.

According to F. Ellenberger, dwarfish nature of gastropods (and pelecypods) may be explained by their relation to environment of algal meadows. The sea was shallow, excellently oxidated and penetrated by light (which made possible development of green algae) and saturation with calcium carbonate was appropriate. In such environment, plant-eating gastropods were markedly predominating on pelecypods. The conditions were typical for environment with predominance of flora of the family Dasycladaceae in the Briançonnais zone and Upper Silesian Basin in the Late Anisian and Early Ladinian, the high-tatric zone in the Anisian, and the Križna zone mainly in the Early Ladinian. The dwarfishness was real, *i.e.* expressed by presence of small-sized mature individuals. However, it is not excluded that some number of small-sized individuals, found in thin sections

to be accompanied by *Diplopora*, actually represent immature forms, redeposited by agitated waters to somewhat deeper zones. Pseudo-dwarfish nature of the fauna may be also due to selective crushing of shells, *i.e.* connected with saving embryonal coils.

Gastropod assemblage from Wetterstein Dolomite, the upper sub-tatric series, appears entirely different from the above one (Z. Kotański, 1973b, d). It comprises large-sized gastropods of *Spirostylus extractus* Assmann and other taxa, clearly Alpine in character. This agrees with the fact that they are accompanied by Triassic ammonites, large green algae *Teutlopora herculea* Stoppani and *T. aequalis* Gümbel, and new species of *Chlypeina*.

Small gastropods, including *Zygopleura* sp., also occur in the high-tatric Rhaetian, where they seem to be ecologically related to algal meadows, described by A. Radwański (1968).

A dwarfish gastropod biofacies, almost identical as the Anisian assemblage (*Omphaloptycha*, *Loxonema* and *Worthenia*), was described from the Briançonnais Rhaetian by F. Ellenberger (1958). This makes a significant difference in relation to the Křižna Rhaetian, where gastropods, although rare, are similar to those of the sub-tatric Rhaetian. The latter yields representatives of *Zygopleura* as well as other small-sized gastropods (figured in plates in the work of A. Radwański, 1968).

### Order Prosobranchia Milne Edwards, 1848

Family Pleurotomariidae Swainson, 1840

Genus *Worthenia* Koninck, 1883

*Worthenia depressa* Assmann, 1924

Plate XVI, Fig. 1

1924 *Worthenia depressa* n. sp.; P. Assmann, p. 5, pl. 1, fig. 5 (holotype).

1937 *Worthenia depressa* Assmann; P. Assmann, p. 64, pl. 13, fig. 4.

1979 *Worthenia depressa* Assmann; H. Senkowiczowa (*in*: Atlas...), p. 72, pl. 14, fig. 1.

Collection. — ZGI Berlin X3153 (holotype).

Occurrence. — Upper Silesia (Gogolin and Góraźdże Beds). (HS)

*Worthenia brancoi* Ahlburg, 1906

Plate XVI, Fig. 2

1906 *Worthenia brancoi* sp. nov.; J. Ahlburg, p. 91, pl. 3, fig. 4 (holotype).

1937 *Worthenia brancoi* Ahlburg; P. Assmann, p. 65, pl. 13, figs. 7—9.

1979 *Worthenia brancoi* Ahlburg; H. Senkowiczowa (*in*: Atlas...), p. 72, pl. 14, fig. 2.

Collection. — ZGI Berlin X3157.

Occurrence. — Upper Silesia (Lower and Middle Muschelkalk). (HS)

*Worthenia conica* Assmann, 1937

Plate XVI, Fig. 3

1937 *Worthenia conica* n. sp.; P. Assmann, p. 65, pl. 13, figs. 10—12 (holotype).

1979 *Worthenia conica* Assmann; H. Senkowiczowa (*in*: Atlas...), p. 72, pl. 14, fig. 3.

Collection. — ZGI Berlin X3381 (holotype).

Occurrence. — Upper Silesia (Góraźdże Beds). (HS)

*Worthenia ecki* Assmann, 1924

Plate XVI, Fig. 4

- 1924 *Worthenia ecki* n. sp.; P. Assmann, p. 3, pl. 1, fig. 4 (holotype).  
 1937 *Worthenia ecki* Assmann; P. Assmann, p. 67, pl. 13, fig. 16.  
 1979 *Worthenia ecki* Assmann; H. Senkowiczowa (in: Atlas...), p. 73, pl. 14, fig. 4.

Collection. — ZGI Berlin X3152 (holotype).

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)*Worthenia excelsior* Assmann, 1924

Plate XVI, Fig. 5

- 1924 *Worthenia excelsior* n. sp.; P. Assmann, p. 8, pl. 1, figs. 17—19 (holotype).  
 1937 *Worthenia excelsior* Assmann; P. Assmann, p. 66, pl. 13, figs. 13—15.  
 1979 *Worthenia excelsior* Assmann; H. Senkowiczowa (in: Atlas...), p. 73, pl. 14, fig. 5.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt). (HS)

*Worthenia globosa* Ahlburg, 1906

Plate XVI, Fig. 6

- 1906 *Worthenia globosa* sp. nov.; J. Ahlburg, p. 31, pl. 1, fig. 8 (holotype).  
 1937 *Worthenia globosa* Ahlburg; P. Assmann, p. 67.  
 1979 *Worthenia globosa* Ahlburg; H. Senkowiczowa (in: Atlas...), p. 74, pl. 14, fig. 6.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt dolomites). (HS)

*Worthenia lata* Assmann, 1924

Plate XVI, Fig. 7

- 1924 *Worthenia lata* n. sp.; P. Assmann, p. 67, pl. 1, fig. 13 (holotype).  
 1937 *Worthenia lata* Assmann; P. Assmann, p. 67, pl. 13, figs. 19, 20.  
 1979 *Worthenia lata* Assmann; H. Senkowiczowa (in: Atlas...), p. 74, pl. 14, fig. 7.

Collection. — ZGI Berlin X3161.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)*Worthenia michaeli* Ahlburg, 1906

Plate XVI, Fig. 8

- 1906 *Worthenia michaeli* sp. nov.; J. Ahlburg, p. 30, pl. 1, fig. 6 (holotype).  
 1937 *Worthenia michaeli* Ahlburg; P. Assmann, p. 67.  
 1979 *Worthenia michaeli* Ahlburg; H. Senkowiczowa (in: Atlas...), p. 74, pl. 14, fig. 8.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt dolomites). (HS)

*Worthenia multica rinata* Assmann, 1924

Plate XVI, Fig. 9

1924 *Worthenia multica rinata* n. sp.; P. Assmann, p. 5, pl. 1, figs. 6, 7 (holotype).1937 *Worthenia multica rinata* Assmann; P. Assmann, p. 67, pl. 13, figs. 17, 18.1979 *Worthenia multica rinata* Assmann; H. Senkowiczowa (in: Atlas...), p. 74, pl. 14, fig. 9

Collection. — ZGI Berlin X3154, X3155.

Occurrence. — Upper Silesia (Lower Muschelkalk and *Diplopora* Dolomites). (HS)*Worthenia picardi* Assmann, 1937

Plate XVI, Fig. 10

1937 *Worthenia picardi* n. sp.; P. Assmann, p. 68, pl. 13, fig. 23; pl. 14, figs. 1 (holotype), 2.1979 *Worthenia picardi* Assmann; H. Senkowiczowa (in: Atlas...), p. 75, pl. 14, fig. 10.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Worthenia pura* Assmann, 1924

Plate XVI, Fig. 11

1924 *Worthenia pura* n. sp.; P. Assmann, p. 10, pl. 1, fig. 15 (holotype).1937 *Worthenia pura* Assmann; P. Assmann, p. 69, pl. 13, fig. 24.1979 *Worthenia pura* Assmann; H. Senkowiczowa (in: Atlas...), p. 75, pl. 14, fig. 11.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

*Worthenia silesiaca* Ahlburg, 1906

Plate XVI, Fig. 12

1906 *Worthenia silesiaca* sp. nov.; J. Ahlburg, p. 30, pl. 1, fig. 4 (holotype).1937 *Worthenia silesiaca* Ahlburg; P. Assmann, p. 66.1979 *Worthenia silesiaca* Ahlburg; H. Senkowiczowa (in: Atlas...), p. 76, pl. 14, fig. 12.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt dolomites). (HS)

*Worthenia tornquisti* Assmann, 1924

Plate XVI, Fig. 13

1924 *Worthenia superba* n. sp.; P. Assmann, p. 9, pl. 1, figs. 11, 12 (holotype).1937 *Worthenia tornquisti* nov. nom.; P. Assmann, p. 68, pl. 13, figs. 21, 22.1979 *Worthenia tornquisti* Assmann; H. Senkowiczowa (in: Atlas...), p. 76, pl. 14, fig. 13.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Family *Euomphalidae* Koninck, 1881Genus *Euomphalus* Sowerby, 1814*Euomphalus planus* Assmann, 1924

Plate XVI, Fig. 14

1924 *Euomphalus planus* n. sp.; P. Assmann, p. 12, pl. 1, figs. 22, 23 (holotype).1937 *Euomphalus planus* Assmann; P. Assmann, p. 69, pl. 14, figs. 5, 6.1979 *Euomphalus planus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 76, pl. 14, fig. 14.

Collection. — ZGI Berlin X3167 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Euomphalus granulatus* Assmann, 1924

Plate XVI, Fig. 15

1924 *Euomphalus granulatus* n. sp.; P. Assmann, p. 12, pl. 1, figs. 25—28 (holotype).1937 *Euomphalus granulatus* Assmann; P. Assmann, p. 70, pl. 14, figs. 7—10.1979 *Euomphalus granulatus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 77, pl. 14, fig. 15.

Collection. — ZGI Berlin X3169, X3170.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Euomphalus pulcher* Assmann, 1924

Plate XVI, Fig. 16

1924 *Euomphalus pulcher* n. sp.; P. Assmann, p. 13, pl. 1, fig. 24 (holotype).1937 *Euomphalus pulcher* Assmann; P. Assmann, p. 70, pl. 14, fig. 11.1979 *Euomphalus pulcher* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 77, pl. 14, fig. 16.

Collection. — ZGI Berlin X3168 (holotype).

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)*Euomphalus semiplanus* Assmann, 1937

Plate XVI, Fig. 17

1937 *Euomphalus semiplanus* n. sp.; P. Assmann, p. 70, pl. 14, figs. 12, 13, 14 (holotype), 15.1979 *Euomphalus semiplanus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 77, pl. 14, fig. 17.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Euomphalus lottneri* Eck, 1865

Plate XVI, Fig. 18

1865 *Euomphalus lottneri* sp. n.; H. Eck, p. 106, pl. 2, fig. 2 (holotype).1937 *Euomphalus lottneri* Eck; P. Assmann, p. 71.1979 *Euomphalus lottneri* Eck; H. Senkowiczowa (*in: Atlas...*), p. 78, pl. 14, fig. 18.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Upper Silesia (Lower Muschelkalk and *Diplopora* Dolomites). (HS)

Family **Omphalocirridae**

Genus *Coelocentrus* Zittel, 1882  
*Coelocentrus silesiacus* Ahlburg, 1906

Plate XVII, Figs. 1, 2

- 1906 *Coelocentrus silesiacus* sp. nov.; J. Ahlburg, p. 93, pl. 3, fig. 5 (holotype).  
1924 *Coelocentrus silesiacus* Ahlburg; P. Assmann, p. 14, pl. 1, fig. 30 (neotype).  
1937 *Coelocentrus silesiacus* Ahlburg; P. Assmann, p. 71, pl. 14, fig. 16.  
1979 *Coelocentrus silesiacus* Ahlburg; H. Senkowiczowa (*in: Atlas...*), p. 78, pl. 15, figs. 1, 2.

Collection. — The neotype was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

*Coelocentrus horridus* Assmann, 1924

Plate XVII, Fig. 3

- 1924 *Coelocentrus horridus* n. sp.; P. Assmann, p. 15, pl. 1, fig. 29 (holotype).  
1937 *Coelocentrus horridus* Assmann; P. Assmann, p. 71, pl. 14, fig. 17a, b.  
1979 *Coelocentrus horridus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 78, pl. 15, fig. 3.

Collection. — ZGI Berlin X3171 (holotype).

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

Family **Acmaeidae** Carpenter, 1857

Genus *Scurria* Gray, 1847  
*Scurria tenuistriata* Assmann, 1924

Plate XVII, Fig. 4

- 1924 *Scurria tenuistriata* n. sp.; P. Assmann, p. 3, pl. 1, figs. 1 (holotype), 2, 3.  
1937 *Scurria tenuistriata* Assmann; P. Assmann, p. 63, pl. 13, figs. 1—3.  
1979 *Scurria tenuistriata* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 79, pl. 15, fig. 4.

Collection. — ZGI Berlin X3150, X3151.

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

Family **Naticopsidae** Cossmann, 1896

Genus *Hologyra* Koken, 1892  
*Hologyra eyerichi* (Noetling, 1880)

Plate XVII, Fig. 5

- 1880 *Natica Eyerichi* sp. n.; F. Noetling, p. 330, pl. 14, fig. 9 (holotype).  
1928 *Hologyra eyerichi* Noetling; M. Schmidt, p. 227, fig. 567.  
1979 *Hologyra eyerichi* (Noetling); H. Senkowiczowa (*in: Atlas...*), p. 79, pl. 15, fig. 5.

Collection. — The type specimen is not present in the collections of ZGI Berlin.

Occurrence. — Lower Silesia — North-Sudetic Trough (upper part of Lower Muschelkalk). (HS)

*Hologyra alta* Ahlburg, 1906

Plate XVII, Fig. 6

- 1906 *Hologyra alta* sp. nov.; J. Ahlburg, p. 65, pl. 2, fig. 3 (holotype).

1937 *Hologyra alta* Ahlburg; P. Assmann, p. 72.

1979 *Hologyra alta* Ahlburg; H. Senkowiczowa (*in: Atlas...*), p. 79, pl. 15, fig. 6.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt). (HS)

Family *Neritidae* Rafinesque, 1815

Genus *Neritaria* Koken, 1892

*Neritaria lendzinensis* Ahlburg, 1906

Plate XVII, Fig. 7

1906 *Neritaria lendzinensis* sp. nov.; J. Ahlburg, p. 32, pl. 1, fig. 10a, b (holotype).

1937 *Neritaria lendzinensis* Ahlburg; P. Assmann, p. 75, pl. 15, figs. 2, 3.

1979 *Neritaria lendzinensis* Ahlburg; H. Senkowiczowa (*in: Atlas...*), p. 80, pl. 15, fig. 7.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt). (HS)

Genus *Fossariopsis* Laube, 1870

*Fossariopsis plana* Ahlburg, 1906

Plate XVII, Fig. 8

1906 *Fossariopsis plana* sp. nov.; J. Ahlburg, p. 101, pl. 3, fig. 12a—c (holotype).

1979 *Fossariopsis plana* Ahlburg; H. Senkowiczowa (*in: Atlas...*), p. 80, pl. 15, fig. 8.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

Family *Turbinidae* Alder, 1838

Genus *Turbo* Linné, 1785

?*Turbo toriniaeformis* Noetling, 1880

Plate XVII, Fig. 9

1880 *Turbo toriniaeformis* sp. n.; F. Noetling, p. 331, pl. 14, fig. 10 (holotype).

1928 *Turbo* (?) *toriniaeformis* Noetling; M. Schmidt, p. 220, fig. 546.

1979 ?*Turbo toriniaeformis* Noetling; H. Senkowiczowa (*in: Atlas...*), p. 80, pl. 15, fig. 9.

Collection. — The type specimen is missing in the collections of ZGI Berlin.

Occurrence. — Lower Silesia (upper part of Lower Muschelkalk). (HS)

Family *Murchisoniidae* Koken, 1896

Genus *Murchisonia* Archiac et Verneuil, 1841

*Murchisonia (Cheilotoma) silesiaca* (Eck, 1865)

Plate XVII, Fig. 10

1865 *Trochus silesiacus* sp. n.; H. Eck, p. 104, pl. 2, fig. 3.

1924 *Murchisonia (Cheilotoma) silesiaca* Eck; P. Assmann, p. 11, pl. 1, fig. 20 (holotype).

1937 *Murchisonia (Cheilotoma) silesiaca* Eck; P. Assmann, p. 69, pl. 14, fig. 3.

1979 *Murchisonia (Cheilotoma) silesiaca* (Eck); H. Senkowiczowa (*in: Atlas...*), p. 81, pl. 15, fig. 10.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*Murchisonia (Cheilotoma) graetzi* Assmann, 1924

Plate XVII, Fig. 11

1924 *Murchisonia (Cheilotoma) graetzi* n. sp.; P. Assmann, p. 11, pl. 1, fig. 21 (holotype).

1937 *Murchisonia (Cheilotoma) graetzi* Assmann; P. Assmann, p. 69, pl. 14, fig. 4.

1979 *Murchisonia (Cheilotoma) graetzi* Assmann; H. Senkowiczowa (in: Atlas...), p. 81, pl. 15, fig. 11

Collection. — ZGI Berlin X3166 (holotype).

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Family *Loxonematidae* Koken, 1889

Genus *Loxonema* Phillips, 1841

*Loxonema (Zygopleura) noduliferum* (Dunker, 1851)

Plate XVII, Fig. 12

1851 *Turbonilla nodulifera* Dkr.; W. Dunker, p. 306, pl. 35, fig. 22 (holotype).

1937 *Loxonema (Zygopleura) noduliferum* Dunker; P. Assmann, p. 78, pl. 15, figs. 18, 19.

1979 *Loxonema (Zygopleura) noduliferum* (Dunker); H. Senkowiczowa (in: Atlas...), p. 81, pl. 15, fig. 12.

Collection. — It is not known where the type specimen is housed whereas those of P. Assmann are kept in ZGI Berlin — X3197, X3198.

Occurrence. — Upper Silesia (Lower Muschelkalk and *Diplopora* Dolomites). (HS)

*Loxonema (Zygopleura) granietzense* Ahlburg, 1906

Plate XVII, Fig. 13

1906 *Loxonema granietzense* sp. nov.; J. Ahlburg, p. 105, pl. 4, fig. 2a, b (holotype).

1924 *Loxonema (Zygopleura) granietzense* Ahlburg; P. Assmann, p. 26, pl. 2, fig. 30.

1979 *Loxonema (Zygopleura) granietzense* Ahlburg; H. Senkowiczowa, (in: Atlas...), p. 82, pl. 15, fig. 13.

Collection. — The type specimen is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

*Loxonema (Zygopleura) planki* Assmann, 1937

Plate XVII, Fig. 14

1937 *Loxonema (Zygopleura) planki* n. sp.; P. Assmann, p. 79, pl. 15, fig. 21 (holotype).

1979 *Loxonema (Zygopleura) planki* Assmann; H. Senkowiczowa (in: Atlas...), p. 82, pl. 15, fig. 14.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górazdze Beds). (HS)

*Loxonema (Zygopleura) tenuicostatum* Assmann, 1924

Plate XVII, Fig. 15

1924 *Loxonema (Zygopleura) tenuicostatum* n. sp.; P. Assmann, p. 25, pl. 2, fig. 32 (holotype).

1937 *Loxonema (Zygopleura) tenuicostatum* Assmann; P. Assmann, p. 79, pl. 15, fig. 22.

1979 *Loxonema (Zygopleura) tenuicostatum* Assmann; H. Senkowiczowa (in: Atlas...), p. 82, pl. 15, fig. 15.

Collection — ZGI Berlin X3200 (holotype).

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

*Loxonema (Zygopleura) granulosum* Assmann, 1924

Plate XVII, Fig. 16

1924 *Loxonema (Zygopleura) granulosum* n. sp.; P. Assmann, p. 24, pl. 2, fig. 33 (holotype).

1937 *Loxonema (Zygopleura) granulosum* Assmann; P. Assmann, p. 79, pl. 15, fig. 23.

1979 *Loxonema (Zygopleura) granulosum* Assmann; H. Senkowiczowa (in: Atlas...), p. 83, pl. 15, fig. 16.

Collection. — ZGI Berlin X3201 (holotype).

Occurrence. — Upper Silesia (Gogolin Beds). (HS)

*Loxonema (Zygopleura) nitidum* Assmann, 1924

Plate XVII, Fig. 17

1924 *Loxonema (Zygopleura) nitidum* n. sp.; P. Assmann, p. 25, pl. 2, fig. 31 (holotype).

1937 *Loxonema (Zygopleura) nitidum* Assmann; P. Assmann, p. 80, pl. 15, fig. 24.

1979 *Loxonema (Zygopleura) nitidum* Assmann; H. Senkowiczowa (in: Atlas...), p. 83, pl. 15, fig. 17.

Collection. — ZGI Berlin X3199 (holotype).

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

*Loxonema (Zygopleura) sophie* Assmann, 1924

Plate XVII, Fig. 18

1924 *Loxonema sophie* n. sp.; P. Assmann, p. 26, pl. 2, fig. 34 (holotype).

1937 *Loxonema (Zygopleura) sophie* Assmann; P. Assmann, p. 80, pl. 15, fig. 25.

1979 *Loxonema (Zygopleura) sophie* Assmann; H. Senkowiczowa (in: Atlas...), p. 83, pl. 15, fig. 18.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

*Loxonema simplex* Assmann, 1937

Plate XVII, Fig. 19

1937 *Loxonema simplex* n. sp.; P. Assmann, p. 81, pl. 15, fig. 27 (holotype).

1979 *Loxonema simplex* Assmann; H. Senkowiczowa (in: Atlas...), p. 83, pl. 15, fig. 19.

Collection. — ZGI Berlin X3395 (holotype).

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Loxonema mestwerdti* Assmann, 1924

Plate XVII, Fig. 20

1924 *Loxonema mestwerdti* n. sp.; P. Assmann, p. 26, pl. 2, figs. 39, 40 (holotype).

1937 *Loxonema mestwerdti* Assmann; P. Assmann, p. 81, pl. 15, fig. 28.

1979 *Loxonema mestwerdti* Assmann; H. Senkowiczowa (in: Atlas...), p. 84, pl. 15, fig. 20.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

*?Loxonema peracutum* Assmann, 1937

Plate XVII, Fig. 21

- 1937 *Loxonema ? peracutum* n. sp.; P. Assmann, p. 81, pl. 15, fig. 29 (holotype), 30.  
 1979 *?Loxonema peracutum* Assmann; H. Senkowiczowa (in: Atlas...) p. 84, pl. 15, fig. 21.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

Genus *Katosira* Koken, 1829  
*?Katosira alta* Assmann, 1937

Plate XVII, Fig. 22

- 1937 *Katosira (?) alta* n. sp.; P. Assmann, p. 82, pl. 15, fig. 31 (holotype).  
 1979 *?Katosira alta* Assmann; H. Senkowiczowa (in: Atlas...), p. 84, pl. 15, fig. 22.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

Genus *Coelochrysalis* Kittl, 1894  
*?Coelochrysalis acuminata* Assmann, 1924

Plate XVII, Fig. 23

- 1924 *Coelochrysalis acuminata* n. sp.; P. Assmann, p. 37, pl. 3, fig. 47 (holotype).  
 1937 *Coelochrysalis (?) acuminata* Assmann; P. Assmann, p. 92, pl. 17, fig. 15.  
 1979 *?Coelochrysalis acuminata* Assmann; H. Senkowiczowa (in: Atlas...), p. 85, pl. 15, fig. 23.

Collection. — ZGI Berlin X3255 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

*?Coelochrysalis pyramidata* Assmann, 1924

Plate XVII, Fig. 24

- 1924 *Coelochrysalis ? pyramidata* n. sp.; P. Assmann, p. 37, pl. 3, fig. 45 (holotype), 46.  
 1937 *Coelochrysalis ? pyramidata* Assmann; P. Assmann, p. 92, pl. 17, figs. 16, 17.  
 1958 *Coelochrysalis* sp. (aff. *pyramidata* Assmann); F. Ellenberger, pl. 5, fig. 12.  
 1979 *?Coelochrysalis pyramidata* Assmann; H. Senkowiczowa (in: Atlas...), p. 85, pl. 15, fig. 24.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

Genus *Omphaloptycha* Ammon, 1892  
*Omphaloptycha ahlburgi* Assmann, 1924

Plate XVII, Fig. 25

- 1924 *Omphaloptycha ahlburgi*; P. Assmann, p. 33, pl. 3, figs. 31, 32 (holotype), 33.  
 1937 *Omphaloptycha ahlburgi* n. sp.; P. Assmann, p. 88, pl. 16, figs. 33—35.  
 1979 *Omphaloptycha ahlburgi* Assmann; H. Senkowiczowa (in: Atlas...), p. 85, pl. 15, fig. 15.

Collection. — ZGI Berlin X3241.

Occurrence. — Upper Silesia (Gogolin Beds and *Diplopora* Dolomites). (HS)

*Omphaloptycha schmidti* Assmann, 1924

Plate XVII, Fig. 26

- 1924 *Omphaloptycha schmidti* n. sp.; P. Assmann, p. 33, pl. 3, figs. 27 (holotype), 28.  
 1937 *Omphaloptycha schmidti* Assmann; P. Assmann, p. 88, pl. 16, figs. 28, 29.  
 1979 *Omphaloptycha schmidti* Assmann; H. Senkowiczowa (in: Atlas...), p. 86, pl. 15, fig. 26.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt). (HS)

*Omphaloptycha submersa* Assmann, 1924

Plate XVII, Fig. 27

- 1924 *Omphaloptycha submersa*; P. Assmann, p. 32, pl. 3, fig. 26 (holotype).  
 1958 *Omphaloptycha* cf. *submersa* Assmann; F. Ellenberger, pl. 7, figs. 6—9.  
 1979 *Omphaloptycha submersa* Assmann; H. Senkowiczowa (in: Atlas...), p. 86, pl. 15, fig. 27.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites).

*Omphaloptycha assmanni* Schmidt, 1928

Plate XVII, Figs. 28, 29

- 1906 *Coelostylina conica* Münster; J. Ahlburg, p. 112, pl. 2, fig. 9 (holotype).  
 1924 *Omphaloptycha ecki* Assmann; P. Assmann, p. 35, pl. 3, fig. 37.  
 1928 *Omphaloptycha assmanni* Schmidt; M. Schmidt, p. 270, fig. 732.  
 1937 *Omphaloptycha assmanni* Schmidt; P. Assmann, p. 89, pl. 17, fig. 4.  
 1979 *Omphaloptycha assmanni* Schmidt; H. Senkowiczowa (in: Atlas...), p. 86, pl. 15, figs. 28, 29.

Collection. — The holotype was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (upper part of Lower Muschelkalk). (HS)

*Omphaloptycha acuminata* Assmann, 1924

Plate XVII, Fig. 30

- 1924 *Omphaloptycha acuminata* n. sp.; P. Assmann, p. 34, pl. 3, figs. 33—36 (holotype).  
 1937 *Omphaloptycha acuminata* Assmann; P. Assmann, p. 89, pl. 17, figs. 1—3.  
 1979 *Omphaloptycha acuminata* Assmann; H. Senkowiczowa (in: Atlas...), p. 86, pl. 15, fig. 30.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

*Omphaloptycha hertae* Assmann, 1937

Plate XVIII, Fig. 1

- 1937 *Omphaloptycha hertae* n. sp.; P. Assmann, p. 89, pl. 17, fig. 7 (holotype).  
 1979 *Omphaloptycha hertae* Assmann; H. Senkowiczowa (in: Atlas...), p. 87, pl. 16, fig. 1.

Collection. — ZGI Berlin X3409/1—2 (holotype).

Occurrence. — Upper Silesia (Góraźdże Beds). (HS)

*Omphalopycha turriculata* Assmann, 1937

Plate XVIII, Fig. 2

- 1937 *Omphalopycha turriculata* n. sp.; P. Assmann, p. 91, pl. 17, fig. 10 (holotype).  
 1979 *Omphalopycha turriculata* Assmann; H. Senkowiczowa (in: Atlas...), p. 87, pl. 16, fig. 2.

Collection. — ZGI Berlin X3411/1—3 (holotype).  
 Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Omphalopycha kittli* Assmann, 1924

Plate XVIII, Fig. 3

- 1924 *Omphalopycha kittli* n. sp.; P. Assmann, p. 36, pl. 3, figs. 42 (holotype), 43.  
 1937 *Omphalopycha kittli* Assmann; P. Assmann, p. 91, pl. 17, figs. 11, 12.  
 1979 *Omphalopycha kittli* Assmann; H. Senkowiczowa (in: Atlas...), p. 87, pl. 16, fig. 3.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.  
 Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Genus *Trypanostylus* Cossmann, 1895*Trypanostylus altus* Assmann, 1937

Plate XVIII, Fig. 4

- 1937 *Trypanostylus altus* n. sp.; P. Assmann, p. 83, pl. 16, fig. 3 (holotype).  
 1979 *Trypanostylus altus* Assmann; H. Senkowiczowa (in: Atlas...), p. 88, pl. 16, fig. 4.

Collection. — ZGI Berlin X3403 (holotype)  
 Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Trypanostylus erectus* Assmann, 1924

Plate XVIII, Fig. 5

- 1924 *Trypanostylus erectum* n. sp.; P. Assmann, p. 29, pl. 3, fig. 13 (holotype).  
 1937 *Trypanostylus erectus* Assmann; P. Assmann, p. 83, pl. 15, figs. 32, 33; pl. 16, fig. 1.  
 1979 *Trypanostylus erectus* Assmann; H. Senkowiczowa (in: Atlas...), p. 88, pl. 16, fig. 5.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.  
 Occurrence. — Upper Silesia and Góry Świętokrzyskie Mts (Lower Muschelkalk). (HS)

*Trypanostylus pseudoscalatus* Assmann, 1924

Plate XVIII, Fig. 6

- 1924 *Trypanostylus pseudoscalatum* n. sp.; P. Assmann, p. 28, pl. 3, figs. 3, 7 (holotype), 8, 9.  
 1937 *Trypanostylus pseudoscalatus* Assmann; P. Assmann, p. 84, pl. 16, figs. 11—13.  
 1979 *Trypanostylus pseudoscalatus* Assmann; H. Senkowiczowa (in: Atlas...), p. 88, pl. 16, fig. 6.

Collection. — ZGI Berlin X3214, X3218—20.  
 Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk and *Diplopora* Dolomites). (HS)

*Trypanostylus silesiacus* Assmann, 1924

Plate XVIII, Fig. 7

- 1924 *Trypanostylus silesiacus* Assmann; P. Assmann, p. 29, pl. 3, fig. 12 (holotype).  
 1937 *Trypanostylus silesiacus* Assmann; P. Assmann, p. 85, pl. 16, fig. 15.  
 1979 *Trypanostylus silesiacus* Assmann; H. Senkowiczowa (in: Atlas...), p. 88, pl. 16, fig. 7.

Collection. — ZGI Berlin X3223 (holotype).

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

*Trypanostylus gracilis* Assmann, 1924

Plate XVIII, Fig. 8

- 1924 *Trypanostylus gracile* n. sp.; P. Assmann, p. 30, pl. 3, fig. 17 (holotype).  
 1937 *Trypanostylus gracilis* Assmann; P. Assmann, p. 85, pl. 16, fig. 17.  
 1979 *Trypanostylus gracilis* Assmann; H. Senkowiczowa (in: Atlas...), p. 89, pl. 16, fig. 8.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)*Trypanostylus modestus* Assmann, 1924

Plate XVIII, Fig. 9

- 1924 *Trypanostylus modestus* n. sp.; P. Assmann, p. 31, pl. 3, fig. 16 (holotype).  
 1937 *Trypanostylus modestus* Assmann; P. Assmann, p. 86, pl. 16, fig. 18.  
 1979 *Trypanostylus modestus* Assmann; H. Senkowiczowa (in: Atlas...), p. 89, pl. 16, fig. 9.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Karchowice Beds of Lower Muschelkalk). (HS)

Genus *Pustulifer* Cossmann, 1895*Pustulifer acuticarinatus* (Assmann, 1924)

Plate XVIII, Fig. 10

- 1906 *Undularia* sp. cf. *U. dux* Picard; J. Ahlburg, p. 109, pl. 4, fig. 1 (holotype).  
 1924 *Pustularia acuticarinata* n. sp.; P. Assmann, p. 40.  
 1937 *Pustularia acuticarinata* Assmann; P. Assmann, p. 93.  
 1979 *Pustulifer acuticarinatus* (Assmann); H. Senkowiczowa (in: Atlas...), p. 89, pl. 16, fig. 10.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)*Pustulifer silesiacus* (Assmann, 1924)

Plate XVIII, Fig. 11

- 1924 *Pustularia silesiaca* n. sp.; P. Assmann, p. 39, pl. 3, fig. 51 (holotype).  
 1937 *Pustularia silesiaca* Assmann; P. Assmann, p. 93, pl. 18, fig. 1.  
 1979 *Pustulifer silesiacus* (Assmann); H. Senkowiczowa (in: Atlas...), p. 90, pl. 16, fig. 11.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Middle Muschelkalk). (HS)

Genus *Protorcula* Kittl, 1894  
*Protorcula brevis* Assmann, 1924

Plate XVIII, Fig. 12

- 1924 *Protorcula brevis* n. sp.; P. Assmann, p. 39, pl. 3, fig. 58 (holotype).  
 1937 *Protorcula brevis* Assmann; P. Assmann, p. 95, pl. 18, fig. 8.  
 1979 *Protorcula brevis* Assmann; H. Senkowiczowa (in: Atlas...), p. 90, pl. 16, fig. 12.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

Family **Spirostylidae** Cossmann, 1909

Genus *Spirostylus* Kittl, 1894  
*Spirostylus extractus* Assmann, 1924

Plate XVIII, Fig. 13

- 1924 *Spirostylus extractus* n. sp.; P. Assmann, p. 27, pl. 2, figs. 35, 36 (holotype).  
 1937 *Spirostylus extractus* Assmann; P. Assmann, p. 86, pl. 16, figs. 19–21.  
 1979 *Spirostylus extractus* Assmann; H. Senkowiczowa (in: Atlas...), p. 90, pl. 16, fig. 13.

Collection — ZGI Berlin X3203, X3204.

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk), Tatra Mts (upper sub-tatric series — Ladinian). (HS)

Family **Purpurinidae** Zittel, 1895

Genus *Tretospira* Koken, 1892  
*Tretospira fusiformis* Ahlburg, 1906

Plate XVIII, Fig. 14

- 1906 *Tretospira fusiformis* sp. nov.; J. Ahlburg, p. 117, pl. 3, fig. 14 (holotype).  
 1937 *Tretospira fusiformis* Ahlburg; P. Assmann, p. 77.  
 1979 *Tretospira fusiformis* Ahlburg; H. Senkowiczowa (in: Atlas...), p. 91, pl. 16, fig. 14.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Family **Vermetidae** d'Orbigny, 1840

Genus *Provermicularia* Kittl, 1899  
 ?*Provermicularia grundeyi* Assmann, 1937

Plate XVIII, Fig. 15

- 1937 *Provermicularia grundeyi* n. sp.; P. Assmann, p. 94, pl. 18, figs. 6 (holotype), 7.  
 1979 ?*Provermicularia grundeyi* Assmann; H. Senkowiczowa (in: Atlas...), p. 91, pl. 16, fig. 15.

Collection. — ZGI Berlin X3415 (holotype).

Occurrence. — Upper Silesia (*Diplopora* Dolomites). (HS)

Family **Mathildidae** Cossmann, 1912

Genus *Promathildia* Andreae, 1887  
*Promathildia pauciornata* Assmann, 1937

Plate XVIII, Fig. 16

- 1937 *Promathildia pauciornata* n. sp.; P. Assmann, p. 95, pl. 18, fig. 9 (holotype).

1979 *Promathildia pauciornata* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 91, pl. 16, fig. 16.

Collection. — ZGI Berlin X3417 (holotype).

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Promathildia tenuicarinata* Assmann, 1924

Plate XVIII, Fig. 17

1924 *Promathildia tenuicarinata* n. sp.; P. Assmann, p. 41, pl. 3, figs. 52 (holotype), 53.

1937 *Promathildia tenuicarinata* Assmann; P. Assmann, p. 96, pl. 18, figs. 10, 11.

1979 *Promathildia tenuicarinata* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 92, pl. 16, fig. 17.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

*Promathildia pulchra* Assmann, 1924

Plate XVIII, Fig. 18

1924 *Promathildia pulchra* n. sp.; P. Assmann, p. 41, pl. 3, fig. 56 (holotype).

1937 *Promathildia pulchra* Assmann; P. Assmann, p. 96, pl. 18, fig. 12.

1979 *Promathildia pulchra* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 92, pl. 16, fig. 18.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

*Promathildia nympa* Assmann, 1924

Plate XVIII, Fig. 19

1924 *Promathildia nympa* n. sp.; P. Assmann, p. 41, pl. 3, fig. 54 (holotype).

1937 *Promathildia nympa* Assmann; P. Assmann, p. 96, pl. 18, fig. 13.

1979 *Promathildia nympa* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 92, pl. 16, fig. 19.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

*Promathildia elegans* Assmann, 1924

Plate XVIII, Fig. 20

1924 *Promathildia elegans* n. sp.; P. Assmann, p. 42, pl. 3, fig. 55 (holotype).

1937 *Promathildia elegans* Assmann; P. Assmann, p. 96, pl. 18, fig. 14.

1979 *Promathildia elegans* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 92, pl. 16, fig. 20.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (*Diplopora Dolomites*). (HS)

Family Naticidae Forbes, 1838

Genus *Natica* Scopoli, 1777

*Natica minima* Assmann, 1924

Plate XVIII, Figs. 21, 22

1924 *Natica minima* n. sp.; P. Assmann, p. 21, pl. 2, figs. 25, 26 (holotype), 27.

1937 *Natica minima* Assmann; P. Assmann, p. 77, pl. 15, figs. 6—8.

1979 *Natica minima* Assmann; H. Senkowiczowa (in: Atlas...), p. 93, pl. 16, figs. 21, 22.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Rhöt). (HS)

#### Genus *Naticella* Münster

##### ?*Naticella parva* (Assmann, 1924)

Plate XVIII, Fig. 23

1924 *Fritschia parva* n. sp.; P. Assmann, p. 16, pl. 2, fig. 2 (holotype).

1937 *Naticella parva* Assmann; P. Assmann, p. 72, pl. 14, fig. 19.

1979 ?*Naticella parva* (Assmann); H. Senkowiczowa (in: Atlas...), p. 93, pl. 16, fig. 23.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

#### Genus *Amauropsis* Mörch

##### *Amauropsis silesiaca* (Ahlburg, 1906)

Plate XVIII, Fig. 24

1906 *Ampullina silesiaca* sp. nov.; J. Ahlburg, p. 35, pl. 1, figs. 12 (holotype), 13.

1937 *Amauropsis silesiaca* Ahlburg; P. Assmann, p. 78, pl. 15, figs. 12—15.

1979 *Amauropsis silesiaca* (Ahlburg); H. Senkowiczowa (in: Atlas...), p. 93, pl. 16, fig. 24.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia, Góry Świętokrzyskie Mts (Rhöt). (HS)

#### Family Fusidae d'Orbigny, 1843

##### Genus *Fusus* Bruigniere, 1789

##### ?*Fusus praecursor* Assmann, 1924

Plate XVIII, Fig. 25

1924 *Fusus* (?) *praecursor* n. sp.; P. Assmann, p. 42, pl. 3, fig. 37 (holotype).

1937 *Fusus* (?) *praecursor* Assmann; P. Assmann, p. 97, pl. 18, fig. 15.

1979 ?*Fusus praecursor* Assmann; H. Senkowiczowa (in: Atlas...), p. 94, pl. 16, fig. 25.

Collection. — ZGI Berlin X3264 (holotype).

Occurrence. — Upper Silesia (Ore-bearing Dolomites of Lower Muschelkalk). (HS)

#### Order Opisthobranchia Milne Edwards, 1848

##### Family Actaeonidae Pécincev, 1960

##### Genus *Actaeonina* d'Orbigny, 1847

##### *Actaeonina gracilis* Assmann, 1924

Plate XVIII, Fig. 26

1924 *Actaeonina gracilis* n. sp.; P. Assmann, p. 42, pl. 3, figs. 59 (holotype), 60, 61.

1937 *Actaeonina gracilis* Assmann; P. Assmann, p. 97, pl. 18, figs. 16—18.

1979 *Actaeonina gracilis* Assmann; H. Senkowiczowa (in: Atlas...), p. 94, pl. 16, fig. 26.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.  
Occurrence. — Upper Silesia (Rhöt). (HS)

Class CEPHALOPODA Cuvier, 1797<sup>12</sup>

Order Nautilida Agassiz, 1847

**General characteristics.** (HS, ZK). Nautiloids are represented by *Nautilus*, *Temnocheilus* and *Pleuromutilus* (Table 8), known from limestones and marly limestones in the Upper Silesia and margins of the Góry Świętokrzyskie Mts only.

Occurrence of the nautiloids is limited to the Lower and Upper Muschelkalk. This is due to their stenohaline character as salinities of the Muschelkalk sea were the closest to normal in these time intervals only.

The nautiloids recorded in area of Poland include three species also occurring in Alpine sea in the Anisian: *Pleuromutilus mosis* Mojsisovics, *P. cf. seminodosus* Arthaber and *P. cf. furcatus* Arthaber. Geographic distribution of these species shows that the first of them, known from the area of the Góry Świętokrzyskie Mts only, presumably reached the epicontinental sea through the Eastern Carpathians Gate, and the other two — by the Moravian Gate, not migrating further to the north.

In the Tatra Mts, nautiloids have been recorded in the upper sub-tatric, *i.e.* Stražov series (Furkaska—Koryciska partial nappe) only. They are known from the Partnach Beds (Anisian—Ladinian junction beds). The only identified species, *Nautilus cf. tintoretti* Mojsisovics (Z. Kotoński, 1973b, c, d), is East- or even South-Alpine in character (Table 6).

Family **Tainoceratidae** Hyatt, 1883

Genus *Pleuromutilus* Mojsisovics, 1882

*Pleuromutilus planki* Assmann, 1937

Plate XIX, Fig. 1

- 1937 *Pleuromutilus planki* n. sp.; P. Assmann, p. 101, pl. 19, fig. 4 (holotype); pl. 20, figs. 1, 2.  
1979 *Pleuromutilus planki* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 95, pl. 17, fig. 1.  
1980 *Pleuromutilus planki* Assmann; R. Podstolski, p. 221, fig. 3.

Collection. — ZGI Berlin X3424/1—4 (holotype).

Occurrence. — Upper Silesia (Góraždze Beds). (HS)

Family **Koninckioceratidae** Hyatt in Zittel, 1900

Genus *Temnocheilus* M'Coy, 1884

*Temnocheilus postdolomiticus* Assmann, 1937

Plate XIX, Fig. 2

- 1937 *Temnocheilus postdolomiticus* n. sp.; P. Assmann, p. 100, pl. 19, fig. 3 (holotype).  
1979 *Temnocheilus postdolomiticus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 96, pl. 17, fig. 2.

Collection. — ZGI Berlin X3423 (holotype).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

<sup>12</sup> The systematics after W. J. Arkell, B. Kummel, C. W. Wright (*in: Treatise...*, 1957) and B. Kummel (*in: Treatise...*, 1964).

Family *Nautilidae* Blainville, 1825  
Genus *Nautilus* Linné, 1758  
*Nautilus goraszdzensis* Assmann, 1937

Plate XIX, Fig. 3

- 1937 *Nautilus goraszdzensis* n. sp.; P. Assmann, p. 99, pl. 19, fig. 1 (holotype).  
1979 *Nautilus goraszdzensis* Assmann; H. Senkowiczowa (in: Atlas...), p. 96, pl. 17, fig. 3.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Nautilus pseudobrebanus* Assmann, 1926

Plate XIX, Fig. 4

- 1926 *Nautilus pseudobrebanus* n. sp.; P. Assmann, p. 521, pl. 9, fig. 1 (holotype).  
1937 *Nautilus pseudobrebanus* Assmann; P. Assmann, p. 99, pl. 18, fig. 23.  
1979 *Nautilus pseudobrebanus* Assmann; H. Senkowiczowa (in: Atlas...), p. 96, pl. 17, fig. 4.

Collection. — ZGI Berlin X3277 (holotype).

Occurrence. — Upper Silesia (Gogolin Beds). (HS)

*Nautilus* cf. *tintoretti* Mojsisovics, 1869

Plate XIX, Fig. 5

- 1973a *Nautilus* cf. *tintoretti* Mojsisovics; Z. Kotański, p. 444, pl. 42, fig. 6.  
1979 *Nautilus* cf. *tintoretti* Mojsisovics; Z. Kotański (in: Atlas...), p. 96, pl. 17, fig. 5.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts — Wielkie Koryciska in Chochołowska Valley (Partnach Beds, upper sub-tatric, Stražov series, Upper Anisian). (ZK)

Order *Ammonitida* Zittel, 1884  
Suborder *Ceratitina* Hyatt, 1884

**General characteristics.** (HS, ZK). Triassic ceratitids are represented by *Beneckeia*, *Silesiacochordiceras*, *Ceratites* and *Balatonites* (Table 9).

The ceratitids occur in limestones, marly limestones and, sporadically, sandy sediments of the Boruszowice Beds. In the Rhöt and Muschelkalk, they are most common in the Upper Silesia (H. Eck, 1865; P. Assmann, 1937) and Lower Silesia (F. Noetling, 1880; H. Rassmuss, 1913), being only sporadically found in the Góry Świętokrzyskie Mts (B. Kowalczewski, 1926) and north-eastern Poland. In the Upper Muschelkalk, ceratitids have been distributed throughout the area of the epicontinental basin, except for north-eastern Poland.

The development and extinction of ceratitids have been closely related to changes in water chemistry in the basin. These animals were highly sensitive to both insufficiently high and too high salinities so they did not appear in the epicontinental basin until water salinity became close to normal, *i.e.* until the latest Rhöt. They were most numerous in time of sedimentation of upper Lower Muschelkalk, *i.e.* in time of best connections with the Alpine sea, to disappear at the Lower—Upper Muschelkalk boundary in result of increase in water

salinity. The decrease of salinity in time of sedimentation of the Upper Muschelkalk made possible their reappearance in the epicontinental basin.

In southern Poland, Lower and Upper Muschelkalk strata (Gogolin, Wilkowice and Boruszowice Beds) yield cephalopod hooks (K. Zawidzka, 1974). The hooks are varying in size and shape, being most similar to those of *Arites* and *Phragmotheutis* hooks, known from Anisian—Ladinian junction beds in Switzerland. Some of them display morphological features close to those of *Deimuncus*, *Urbanekuncus* and *Paraglyceratites*.

Ceratitids are completely absent in the high-tatric and Križna Triassic in the Tatra Mts. The knowledge of the Vepor Triassic in both Poland and Slovakia is too fragmentary for making any comments on that matter, and Lower and Middle Triassic members of the Choč Triassic, in which ammonites have been recorded in Slovakia, are missing in Poland. Identical Triassic without any record of ceratitids is known in the Alps (F. Ellenberger, 1958) where it comprises the Briançonnais, Subbriançonnais and Helvetic series as well as the Triassic series in the Prealps. The zone, undoubtedly extending further eastwards (Hochstegen and Radstädter Tauren in the High Taures window, Semmering, etc.), was connected with the high-tatric zone. Taking into account the lack of the ceratitid fauna, it may be stated that, it also comprised the Križna (lower sub-tatric) zone.

It is rather difficult to find fully satisfactory explanation of the complete lack of ceratitids in the above vast zone and to state which of numerous ecological factors has been responsible for that phenomenon. A very small share of clay material in carbonate Middle Triassic rocks was presumably of some importance here (F. Ellenberger, 1958), similarly as vivid development of calcareous organisms in very shallow sea. It seems that too high salinity, found in the case of the Middle Triassic in the West Carpathians (M. Mišik, 1968; J. Veizer, 1970), was also significant here. This would also explain the lack of ceratitids in clay-carbonate Werfen Beds of the high-tatric and Križna series as these fossils are common in these beds in the Choč series (Slovakia — D. Andrusov, 1959). In Poland, Choč and upper sub-tatric Werfen Beds are missing due to tectonic factors.

In the Tatra Mts, ceratitids occur in the upper sub-tatric nappe only (Z. Kortański, 1965a, 1967, 1971), being known from both the Partnach Beds and Wetterstein Dolomite (Z. Kortański, 1965a, 1967) (Table 6). This is the assemblage of the *P. trinodosus* zone (Upper Illyrian) and possibly *A. avisianus* (uppermost Illyrian) zone, dominantly Mediterranean in character. In the Wetterstein Dolomite, unidentifiable ammonites occur in the same layers as large specimens of *Teutloporella* (Fassanian).

The question of the lack of ammonites in the Briançonnais-high-tatric-Križna belt is further complicated by the fact that ceratitids and nautiloids are fairly common in areas stretching north of it, especially in the Upper Silesia but also Lower Silesia and Góry Świętokrzyskie Mts, where they are represented by endemic forms as well as some typical Alpine ones (H. Senkowiczowa, 1962).

According to F. Ellenberger (1958), for explanation of faunistic differences between the Alpine and German seas it is not necessary to assume the existence of the Vindelindian swell. The differences may be explained in terms of existence of a basin with some specific features and fauna partly endemic in character and partly mixed, due to overlap of influences of the two basins. The Vindelindian-Beskidny swell was not a continuous barrier but rather of the type of a series of isolated islands, allowing for free mixing of representatives of several faunal and floral groups. For explanation of the presence of Alpine cephalopods in the

German basin it is necessary to assume existence of gates acting as migration routes. In accordance with long-held views, the Moravian Gate was one of such migration routes, and the East-Carpathians Gate (H. Senkowiczowa, 1962; Z. Kotoński, 1959c) — the other one.

Family **Hedenstroemiidae** Waagen, 1895

Genus *Beneckeia* Mojsisovics, 1882

*Beneckeia buchi* (Alberti, 1834)

Plate XX, Fig. 3

1834 *Ammonites buchi* Alberti; F. Alberti, p. 52.

1937 *Beneckeia buchi* Alberti; P. Assmann, p. 107.

1956 *Beneckeia buchi* Alberti; H. Senkowiczowa, p. 98, fig. 6.

1979 *Beneckeia buchi* (Alberti); H. Senkowiczowa (*in: Atlas...*), p. 99, pl. 18, fig. 3.

Collection. — MUZ IG 1363/II/86.

Occurrence. — Lower and Upper Silesia, Góry Świętokrzyskie Mts (Lower Muschelkalk). (HS)

Family **Dinaritidae** Mojsisovics, 1882

Genus *Dinarites* Mojsisovics, 1882

*Dinarites (Ceratites) cf. hoerichi* (Salomon, 1895)

Plate XX, Fig. 6

1973c *Dinarites (Ceratites) cf. hoerichi* Salomon; Z. Kotoński, p. 442, pl. 42, figs. 1, 2.

1979 *Dinarites (Ceratites) cf. hoerichi* (Salomon); Z. Kotoński (*in: Atlas...*), p. 99, pl. 18, fig. 6.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts — Wielkie Koryciska in Chochołowska Valley (Partnach Beds, upper sub-tatric, Stražov series — Illyrian). (ZK)

Family **Acrochordiceratidae** Arthaber, 1911

Genus *Silesiacrochordiceras* Diener, 1916

*Silesiacrochordiceras damesi* (Noetling, 1880)

Plate XX, Fig. 1

1880 *Ammonites (Acrochordiceras) damesi* sp. n.; F. Noetling, p. 334, pl. 15, fig. 1 (holotype).

1928 *Acrochordiceras damesi* Noetling; M. Schmidt, p. 310, fig. 849.

1979 *Silesiacrochordiceras damesi* (Noetling); H. Senkowiczowa (*in: Atlas...*), p. 99, pl. 18, fig. 1.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Lower Silesia — North-Sudetic Trough (lower part of Lower Muschelkalk). (HS)

Family **Ceratitidae** Mojsisovics, 1879

Genus *Ceratites* de Haan, 1825

*Ceratites goraszensis* Assmann, 1937

Plate XXII, Fig. 3

1937 *Ceratites goraszensis* n. sp.; P. Assmann, p. 103, pl. 20, fig. 5; pl. 22, fig. 1 (holotype).

1979 *Ceratites goraszensis* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 100, pl. 20, fig. 3.

1980 *Ceratites goraszensis* Assmann; R. Podstolski, p. 220, fig. 4.

Collection. — ZGI Berlin X3431 (holotype).  
Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Ceratites mirabilis* Assmann, 1937

Plate XXIV, Fig. 1

1937 *Ceratites mirabilis* n. sp.; P. Assmann, p. 104, pl. 21, fig. 3 (holotype).  
1979 *Ceratites mirabilis* Assmann; H. Senkowiczowa (in: Atlas...), p. 100, pl. 22, fig. 1.

Collection. — ZGI Berlin X3430/1—3 (holotype).  
Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Ceratites (Progonoceratites) cf. pulcher angustus* Wenger, 1957

Plate XX, Fig. 2

1979 *Ceratites (Progonoceratites) cf. pulcher angustus* Wenger; H. Senkowiczowa (in: Atlas...), p. 100, pl. 18, fig. 2.

Collection. — MUZ IG 1363/II/17.  
Occurrence. — Góry Świętokrzyskie Mts (*Ceratites* Beds). (HS)

*Ceratites (Acanthoceratites) compressus* Philippi, 1901

Plate XXI, Fig. 1

1901 *Ceratites compressus* (Sandb.); E. Philippi, p. 54, pl. 38, fig. 1; pl. 37, fig. 27.  
1957 *Ceratites (Acanthoceratites) compressus compressus* Philippi; R. Wenger, p. 82.  
1979 *Ceratites (Acanthoceratites) compressus* Philippi; H. Senkowiczowa (in: Atlas...), p. 101, pl. 19, fig. 1.

Collection. — MUZ IG 1363/II/8.  
Occurrence. — Góry Świętokrzyskie Mts (*Ceratites* Beds), Upper Silesia (Wilkowice Beds). (HS)

*Ceratites (Acanthoceratites) evolutus* Philippi, 1901

Plate XXI, Figs. 2, 3

1901 *Ceratites evolutus* Philippi; E. Philippi, p. 61, pl. 41, fig. 1; pl. 43, fig. 1.  
1957 *Ceratites (Acanthoceratites) evolutus* Philippi; R. Wenger, p. 83.  
1979 *Ceratites (Acanthoceratites) evolutus* Philippi; H. Senkowiczowa (in: Atlas...), p. 101, pl. 19, figs. 2, 3.

Collection. — MUZ IG 1363/II/14, 1363/II/9.  
Occurrence. — Góry Świętokrzyskie Mts (*Ceratites* Beds), Upper Silesia (Wilkowice Beds). (HS)

*Ceratites (Acanthoceratites) spinosus* Philippi, 1901

Plate XXII, Figs. 1, 2

1901 *Ceratites spinosus* Philippi; E. Philippi, p. 60, pl. 41, fig. 1.  
1957 *Ceratites (Acanthoceratites) spinosus* Philippi; R. Wenger, p. 86.  
1979 *Ceratites (Acanthoceratites) spinosus* Philippi; H. Senkowiczowa (in: Atlas...), p. 101, pl. 20 figs. 1, 2.

Collection. — MUZ IG 1363/II/22, 1363/II/16.  
Occurrence. — Góry Świętokrzyskie Mts (*Ceratites* Beds), Upper Silesia (Wilkowice Beds). (HS)

Genus *Semiornites* Arthaber, 1912  
*Semiornites lennanus* (Mojsisovics, 1882)

Plate XX, Figs. 4, 5

- 1882 *Ceratites lennanus* Mojsisovics; E. Mojsisovics, p. 22, pl. 38, figs. 10—12; pl. 40, fig. 15.  
 1973c *Semiornites lennanus* (Mojsisovics); Z. Kotoński, p. 440, pl. 41, figs. 1, 2.  
 1979 *Semiornites lennanus* (Mojsisovics); Z. Kotoński (in: Atlas...), p. 102, pl. 18, figs. 4, 5.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts — Wielkie Koryciska in Chochołowska Valley (Partnach Beds, upper sub-tatric, Stražov series — Illyrian). (ZK)

Family *Balatonitidae* Spath, 1951

Genus *Balatonites* Mojsisovics, 1879  
*Balatonites nobilis* Assmann, 1937

Plate XXIII, Fig. 1

- 1937 *Balatonites nobilis* Assmann; P. Assmann, p. 108, pl. 22, fig. 5 (holotype).  
 1979 *Balatonites nobilis* Assmann; H. Senkowiczowa (in: Atlas...), p. 102, pl. 21, fig. 1.

Collection. — ZGI Berlin X3433 (holotype).

Occurrence. — Upper Silesia (Góraźdze Beds). (HS)

*Balatonites quaternotatus* Rassmuss, 1913

Plate XXIV, Fig. 2

- 1913 *Balatonites quaternotatus* nov. spec.; H. Rassmuss, p. 291, pl. 2, fig. 1 (holotype).  
 1979 *Balatonites quaternotatus* Rassmuss; H. Senkowiczowa (in: Atlas...), p. 102, pl. 22, fig. 2.

Collection. — The type specimen was housed in the collections of Bergakademie (H. Rassmuss, 1913).

Occurrence. — Lower Silesia — North-Sudetic Trough (lower part of Lower Muschelkalk). (HS)

*Balatonites zimmeri* Rassmuss, 1913

Plate XXIII, Fig. 3

- 1913 *Balatonites zimmeri* nov. spec.; H. Rassmuss, p. 292, pl. 3, figs. 1, 3.  
 1979 *Balatonites zimmeri* Rassmuss; H. Senkowiczowa (in: Atlas...), p. 103, pl. 21, fig. 3.

Collection. — ZGI Berlin X5640, X5642.

Occurrence. — Lower Silesia — North-Sudetic Trough (Lower Muschelkalk). (HS)

*Balatonites zimmermanni* Rassmuss, 1913

Plate XXIII, Fig. 2

- 1913 *Balatonites zimmermanni* nov. spec.; H. Rassmuss, p. 293, pl. 3, fig. 2.  
 1928 *Balatonites zimmermanni* Rassmuss; M. Schmidt, p. 291, fig. 805.  
 1979 *Balatonites zimmermanni* Rassmuss; H. Senkowiczowa (in: Atlas...), p. 103, pl. 21, fig. 2.

Collection. — ZGI Berlin X5641.

Occurrence. — Lower Silesia — North-Sudetic Trough (Lower Muschelkalk). (HS)

## TYPE ARTHROPODA

## Class BRANCHIOPODA Latreille, 1817

**General characteristics.** (HS). Phyllopods, sometimes found in Triassic rocks of Poland, still require detailed studies (Table 10). *Asmussia germari* (Beyrich), *Estheriella costata* Weiss and *Paleolimnadiopsis nizmaensis* Molin are known from the Lower Buntsandstein (A. Szyperko-Śliwczynska, 1979; S. Alexandrowicz, K. Ślupczyński, 1971), and *Isaura minuta* (Ziethen) and *I. minuta albertii* Voltz — from the Middle Buntsandstein. *Isaura minuta* (Ziethen) are also known from the Upper Muschelkalk in the Fore-Sudetic Monocline and the Rhaetian in the Upper Silesia (P. Assmann, 1937).

In the extra-Carpathian Poland, Triassic phyllopods usually occur in masses in clay and sandy sediments with plant remains (J. Czarnocki, 1931) which suggests that they lived in shallow lakes or brackish embayments. They sporadically occur in sediments formed in the near-shore zone in the sea. This is the case of esterids, found in Rhöt—Muschelkalk junction beds in the Upper Silesia.

Some of esterids found in the epicontinental Triassic of Poland are similar to those recorded in areas of the East-European Platform (Moscow and Kuzneck basins).

Class MALACOSTRACA Latreille, 1806<sup>13</sup>

## Order Decapoda Latreille, 1803

**General characteristics.** (HS). Decapods are very rare in Triassic rocks of the extra-Carpathian Poland, being represented by a few specimens hitherto found in the Lower Muschelkalk (Table 10). Remains of *Pemphix sueuri* Desmarest were found in the lowermost Muschelkalk in the Upper Silesia (P. Assmann, 1937), *P. silesiacus* Assmann and *Lissocardia silesiaca* Meyer — in the Karchowice Beds (H. Meyer, 1851; P. Assmann, 1927), and remains of *Aspidogaster limicola* (König) — in the uppermost Lower Muschelkalk in the East-European Platform (A. Szyperko-Śliwczynska, 1979).

No representatives of Decapoda occurring in the extra-Carpathian Poland were found in the Alpine basin.

Family Erymidae van Straelen, 1924

Genus *Lissocardia* Mayer, 1851

*Lissocardia silesiaca* Meyer, 1847

Plate XXV, Fig. 2

1847 *Lissocardia silesiaca* Meyer; H. Meyer, p. 575.

1851 *Lissocardia silesiaca* Meyer; H. Meyer, p. 254; pl. 32, figs. 34, 35, 37; (lectotype), 38, 39.

1967 *Lissocardia silesiaca* Meyer; H. Förster, p. 175, pl. 9, fig. 6. " "

1979 *Lissocardia silesiaca* Meyer; H. Senkowiczowa (in: Atlas...), p. 105, pl. 23, fig. 2.

Collection. — The type specimen is housed in collections of the Humboldt University in Berlin, no. k 82.

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

<sup>13</sup> The systematics after Treatise... (1969)

Table 10  
Stratigraphic ranges of selected species of arthropods and echinoderms in the  
Triassic in the extra-Carpathian Poland (H. Senkowiczowa)

| Species                                                    | Triassic       |        |       |             |   |   |        |       |    |  |
|------------------------------------------------------------|----------------|--------|-------|-------------|---|---|--------|-------|----|--|
|                                                            | Lower          |        |       | Middle      |   |   |        |       |    |  |
|                                                            | Bunt-sandstein |        |       | Muschelkalk |   |   |        |       |    |  |
|                                                            | Lower          | Middle | Upper | Lower       |   |   | Middle | Upper |    |  |
| 1                                                          | 2              | 3      | 4     | 5           | 6 | 7 | 8      | 9     | 10 |  |
| <b>ARTHROPODA</b>                                          |                |        |       |             |   |   |        |       |    |  |
| <b>Branchiopoda</b>                                        |                |        |       |             |   |   |        |       |    |  |
| <i>Aemussia germari</i> /Beyrich/                          | ...            |        |       |             |   |   |        |       |    |  |
| <i>Esteriella costata</i> Weiss                            |                |        |       |             |   |   |        |       |    |  |
| <i>Isaura minuta albertii</i> Voltz                        |                |        |       |             |   |   |        |       |    |  |
| <i>Isaura minuta minuta</i> /Ziethen/                      |                |        |       |             |   |   |        |       |    |  |
| <i>Paleolimnadiopsis nizcensis</i> Molin                   |                |        |       |             |   |   |        |       |    |  |
| <b>Malacostraca</b>                                        |                |        |       |             |   |   |        |       |    |  |
| <i>Lissocardia silesiaca</i> Meyer                         |                |        |       |             |   |   |        |       |    |  |
| <i>Aspidogaster limicola</i> /König/                       |                |        |       |             |   |   |        |       |    |  |
| <i>Pemphix silesiacus</i> Assmann                          |                |        |       |             |   |   |        |       |    |  |
| <i>Pemphix sucavi</i> Desmarest                            |                |        |       |             |   |   |        |       |    |  |
| <b>ECHINODERMATA</b>                                       |                |        |       |             |   |   |        |       |    |  |
| <b>Crinoidea</b>                                           |                |        |       |             |   |   |        |       |    |  |
| <i>Enerinus aculeatus</i> Meyer                            |                |        |       |             |   |   |        |       |    |  |
| <i>Enerinus robustus</i> Assmann                           |                |        |       |             |   |   |        |       |    |  |
| <i>Entrochus silesiacus</i> Beyrich                        |                |        |       |             |   |   |        |       |    |  |
| <i>Isadorinus gracilis</i> Buch                            |                |        |       |             |   |   |        |       |    |  |
| <i>Enerinus liliiformis</i> /Lamarck/                      |                |        |       |             |   |   |        |       |    |  |
| <i>Enerinus spinosus</i> Michael                           |                |        |       |             |   |   |        |       |    |  |
| <b>Holothurioidea</b>                                      |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatus kotlickii</i> Kozur et Mostler            |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatus quadratus</i> Kozur et Mostler            |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatoides protrusus</i> Kozur et Mostler         |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatus triassicus</i> Mostler                    |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatus turingensis</i> Kozur et Mostler          |                |        |       |             |   |   |        |       |    |  |
| <i>Priscopedatus</i> aff. <i>tyrolensis</i> Mostler        |                |        |       |             |   |   |        |       |    |  |
| <i>Achistron issleri</i> /Croneis/                         |                |        |       |             |   |   |        |       |    |  |
| <i>Unsinulina</i> aff. <i>angulata</i> Frizzel et Exline   |                |        |       |             |   |   |        |       |    |  |
| <i>Tetrawigra</i> aff. <i>germanica</i> Kozur              |                |        |       |             |   |   |        |       |    |  |
| <i>Tetrawigra</i> cf. <i>inperforata</i> Frizzel et Exline |                |        |       |             |   |   |        |       |    |  |
| <i>Tetrawigra multiradiata</i> Kozur                       |                |        |       |             |   |   |        |       |    |  |
| <i>Tetrawigra perforata</i> Mostler                        |                |        |       |             |   |   |        |       |    |  |
| <i>Tetrawigra subcirculata</i> Mostler                     |                |        |       |             |   |   |        |       |    |  |
| <i>Theelia zapfei</i> Kozur et Mostler                     |                |        |       |             |   |   |        |       |    |  |
| <b>Stelleroidea</b>                                        |                |        |       |             |   |   |        |       |    |  |
| <i>Aspidura similis</i> Eck                                |                |        |       |             |   |   |        |       |    |  |
| <b>Echinoidea</b>                                          |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris longispira</i> Assmann                          |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris ecki</i> Assmann                                |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris remifera</i> Assmann                            |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris transversa</i> Meyer                            |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris subnodosa</i> Meyer                             |                |        |       |             |   |   |        |       |    |  |
| <i>Cidaris grandaeva</i> Goldfuss                          |                |        |       |             |   |   |        |       |    |  |

For explanations see Table 4.

Family **Glypheidae** Winckler, 1883

Genus *Aspidogaster* Assmann, 1927  
*Aspidogaster limicola* (König, 1920)

Plate XXV, Fig. 3

1920 *Lithogaster limicola* König; H. König, p. 17, pl. 1, figs. 2—8.

1976 *Aspidogaster limicola* (König); A. Szyperko-Śliwczynska, p. 319, pl. 1, figs. 1, 2.

1979 *Aspidogaster limicola* (König); H. Senkowiczowa (*in: Atlas...*), p. 106, pl. 23, fig. 3.

Collection. — MUZ IG 1356/II/1.

Occurrence. — North-eastern Poland (Lower Muschelkalk). (HS)

Family **Pemphicidae** van Straelen, 1828

Genus *Pemphix* Meyer, 1840  
*Pemphix silesiacus* Assmann, 1927

Plate XXV, Fig. 1

1927 *Pemphix silesiacus* Assmann; P. Assmann, p. 346, pl. 10, figs. 2, 3 (holotype).

1967 *Pemphix silesiacus* Assmann; H. Förster, p. 173.

1979 *Pemphix silesiacus* Assmann; H. Senkowiczowa (*in: Atlas...*), p. 106, pl. 23, fig. 1.

Collection. — The type specimen is housed in collections of the Geologische Kommission in Berlin (H. Förster, 1967).

Occurrence. — Upper Silesia (Karchowice Beds). (HS)

Class OSTRACODA Latreille, 1806<sup>14</sup>

**General characteristics.** (OS). In the Triassic of the extra-Carpathian Poland, ostracods are known from both marine and brackish-marine rocks (Table 11).

Environmental conditions predominating in shallow inland sedimentary basin of the Lower Buntsandstein in the extra-Carpathian Poland were generally unfavourable for ostracods and the recorded genera are represented by rather innumerable species.

Ostracods are most numerous in the Lower Buntsandstein in north-eastern Poland (Peribaltic Syncline and Podlasie Depression): *Lutkevichinella*, *Darwinula* and ?*Clinocypris*. They are less numerous in north-western Poland and completely absent in the Fore-Sudetic Monocline and at margins of the Góry Świętokrzyskie Mts. The ostracods (except for *L. mazurensis* Styk) are also known from calcareous-sandy rocks of the Middle Buntsandstein, especially its lower part, whereas they appear to be missing in sandy-oolitic and dolomitic sediments of upper Middle Buntsandstein.

Marine transgression in central Europe, which gradually began in the earliest Rhöt, resulted in origin of mainly calcareous, marly and dolomitic sediments in the extra-Carpathian Poland (H. Senkowiczowa, 1970a, b). Calcareous-marly sediments yield ostracod assemblage different from that of lower parts of the Buntsandstein (Table 11): *Pulviella*, *Darwinula*, *Lutkevichinella*, *Glorianella* and *Cytherissinella*, known from the Rhöt in north-eastern Poland and at margins of the Góry Świętokrzyskie Mts. In the Fore-Sudetic Monocline, there were

<sup>14</sup> The systematics after R. H. Benson, J. M. Berdan and others (*in: Treatise...*, 1961).

Table 11  
Stratigraphic ranges of major ostracod species in the Triassic in the extra-Carpathian Poland  
(O. Styk)

| Species                                                | Triassic           |        |                     |             |        |       |                |                  |                         |              |  |
|--------------------------------------------------------|--------------------|--------|---------------------|-------------|--------|-------|----------------|------------------|-------------------------|--------------|--|
|                                                        | Lower              |        |                     | Middle      |        |       | Upper          |                  |                         | Rhaet-<br>IC |  |
|                                                        | Buntsand-<br>stein |        |                     | Muschelkalk |        |       | Keuper         |                  |                         |              |  |
|                                                        | Lower              | Middle | Upper<br>/Rht/<br>/ | Lower       | Middle | Upper | Upper          |                  |                         | Lower        |  |
| Lower                                                  |                    |        |                     |             |        |       | Gypsum<br>Beds | Red<br>Sandstone | Upper<br>Gypsum<br>Beds |              |  |
| <b>ARTHROPODA</b>                                      |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <b>Ostracoda</b>                                       |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Lutkevichinella mazurensis</i> Styk                 |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Clinocypris vasiljevi</i> Schleipfer              |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula goldapi</i> Styk                          |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula aducta</i> Lubimova                       |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula cf. regia</i> Mischina                    |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Darwinula cf. quadrata</i> Mischina               |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Pulvella ovalis</i> Schneider                       |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Darwinula kiptschakensis</i> Schleipfer             |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Darwinula infera</i> Schleipfer                     |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Darwinula acamytica</i> Schleipfer                  |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Cytherissinella crispata</i> /Schleipfer/           |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Pulvella aralsorica</i> Schleipfer                  |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Pulvella marinae</i> Starozhilova                   |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Glorianella culta</i> Starozhilova                  |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Hungarella gemma</i> Styk                           |                    |        | .....               |             |        |       |                |                  |                         |              |  |
| <i>Paracypris pusilla</i> /Kozur/                      |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Bythocypris aequalis</i> /Kozur/                    |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Cultella levis</i> Kozur                          |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Judahella iserfatia</i> Sohn                        |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Hungarella semitundata</i> Styk                     |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Cytherelloidica picardi</i> /Sohn/                  |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Monoceratina spinosa</i> /Kozur/                    |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Monoceratina kozuri</i> Styk                        |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Monoceratina paula</i> Styk                         |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Lutkevichinella pusilla</i> Diebel                |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Speluncella spinosa</i> Schneider                   |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Pulvella petersbergensis</i> /Diebel/               |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Glorianella thuringensis</i> /Beutler et Gründel/   |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Gemmanella schweyeri</i> Schneider                  |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Pulvella vulgaris</i> /Beutler et Gründel/          |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula liasica</i> /Brodie/                      |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Speluncella alata</i> /Beutler et Gründel/          |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Gemmanella ingerlebensis</i> /Beutler et Gründel/   |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Lutkevichinella rectagona</i> /Gründel/           |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Pulvella piriformis</i> /Beutler et Gründel/        |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Speluncella tumida</i> /Gründel/                    |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Bimsonella brotzenorum alpina</i> Bunza et Kozur    |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Lutkevichinella germanica</i> /Wienholz et Kozur/ |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Lutkevichinella simplex oblonga</i> Kozur         |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula wandae</i> Styk                           |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Pulvella silesia</i> /Styk/                         |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula globosa</i> /Duff/                        |                    |        |                     |             |        |       |                |                  |                         |              |  |
| ? <i>Darwinula dreyeri</i> Kozur                       |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Rhombocythere nodosa</i> Kozur                      |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Rhombocythere tenuistriata</i> /Kozur/              |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Tentriasevia rhaetica</i> /Anderson/                |                    |        |                     |             |        |       |                |                  |                         |              |  |
| <i>Darwinula /Paradarwinula/ spinosa</i> Kozur         |                    |        |                     |             |        |       |                |                  |                         |              |  |

———— common

..... single specimens

recorded innumerous representatives of *Lutkevichinella*, *Cytherissinella*, *Pulviella* and *Darwinula*, whereas no ostracods are known from north-western Poland.

The transgression became intensified in the Lower Muschelkalk, leading to opening of marine connection between the Carpathian sea and epicontinental basin (H. Senkowiczowa, 1961) and enrichment of ostracod assemblage. Mudstone-clay-marly and marly-calcareous rocks of north-eastern Poland yield *Paracypris*, *Bythocypris*, *Judahella*, ?*Cultella* (appearing in the Upper Rhöt) and *Monoceratina* and *Lutkevichinella*, and those of north-western Poland — *Paracypris*, *Judahella* and *Monoceratina*. The ostracod assemblage remained generally unchanged in the Fore-Sudetic Monocline and Silesian-Cracow Upland whereas in the Góry Świętokrzyskie Mts area the above mentioned genera are accompanied by *Triebelina*, *Monoceratina* and *Cytherelloidea*.

The connections between the central European sea and open Carpathian basin became broken in the Middle Muschelkalk. This resulted in increase of salinity as well as the onset of deposition of evaporites — gypsum and anhydrites — in the former (H. Senkowiczowa 1970a, b). The conditions turned into unfavourable for development of microfauna. That is why no ostracods except for single representatives of *Paracypris* and *Bythocypris* have been found in the Middle Muschelkalk.

The connections between the central European and Carpathian seas became reestablished in the Late Muschelkalk, resulting in origin of limestone-marly rocks and an essential change in composition of microfaunal assemblage. The assemblage does not comprise any species of foraminifers and ostracods known from the Lower Muschelkalk but new ones, including some guide species: *Pulviella petersbergensis* (Diebel), *Speluncella spinosa* Schneider, *Glorianella thuringensis* (Beutler et Gründel) and *Gemmanella schweyeri* Schneider. The two latter species pass to the Lower Keuper.

Ostracod assemblage of the Lower Keuper in the extra-Carpathian Poland indicates continuation of environmental conditions typical of the Upper Muschelkalk. Lower Keuper mudstone-clay rocks yield *Speluncella*, *Gemmanella* and *Lutkevichinella*.

A new marine regression, marked in the Lower Gypsum Series of the Upper Keuper, resulted in drastic impoverishment of microfauna, represented by brackish *Darwinula* only. Similar environmental conditions are also displayed by the uppermost Gypsum Keuper. Brackish conditions were predominating in times of sedimentation of the Reed Sandstone. The rocks yield highly characteristic *Simeonella* and *Lutkevichinella*.

In the Early Rhaetic, the epicontinental basin of the extra-Carpathian Poland was characterized by mainly brackish conditions. Representatives of *Darwinula* were found in claystones of the Lower Rhaetic in north-eastern Poland, and the above mentioned genera and *Rhombocythere* and *Timiriasevia* — in the Fore-Sudetic Monocline. *Pulviella silesia* (Styk) and *Darwinula wandae* Styk are found in the Lower Rhaetic in the Silesian-Cracow Upland. The above mentioned Rhaetic ostracods are often accompanied by fairly numerous megaspores and charophyte oogonia. This suggests that the basin of the extra-Carpathian Poland was moderately shallow and characterized by oscillating salinity but generally rather brackish in character.

The analysis of ostracod assemblage of the Polish Triassic showed that it comprises several species also known from the GDR (Thuringia), USSR (Caspian Depression), Hungary, Austria and Israel.

Order **Palaeocopida** Henningsmoen, 1953Family **Judahellidae** Sohn, 1968Genus *Judahella* Sohn, 1968*Judahella tsorfatia* Sohn, 1968

Plate XXVI, Figs. 1, 2

1968 *Judahella tsorfatia* Sohn n. sp.; I. G. Sohn, pp. 15, 16, pl. 3, figs. 6, 7, 11—16, 20, 21.1979 *Judahella tsorfatia* Sohn; O. Styk (*in: Atlas...*), p. 109, pl. 24, figs. 1, 2.

Collection. — MUZ IG 6038/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk).  
(OS)Order **Podocopida** Müller, 1894Family **Bairdiidae** Sars, 1888Genus *Bythocypris* Brady, 1880*Bythocypris aequalis* (Kozur, 1970)

Plate XXVI, Fig. 4

1970c *Aglaiocypris aequalis* n. sp.; H. Kozur, p. 445, pl. 4, figs. 1—3.1979 *Bythocypris aequalis* (Kozur); O. Styk (*in: Atlas...*), p. 110, pl. 24, fig. 4.

Collection. — MUZ IG 6300/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk).  
(OS)Family **Paracyprididae** Sars, 1923Genus *Paracypris* Sars, 1866*Paracypris pusilla* (Kozur, 1968)

Plate XXVI, Fig. 3

1968b *Macrocypris* ? *pusilla* n. sp.; H. Kozur, pp. 500, 501, pl. 2, figs. 14, 20—27.1979 *Paracypris pusilla* (Kozur); O. Styk (*in: Atlas...*), p. 110, pl. 24, fig. 3.

Collection. — MUZ IG 6061/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk). (OS)

Family **Pontocypridae** Müller, 1894Genus *Clinocypris* Mandelstam, 1956? *Clinocypris vasiljevi* Schleipher, 1966

Plate XXVI, Fig. 9

1966 *Clinocypris vasiljevi* Schleipher sp. n.; A. G. Schleipher, p. 129, pl. 3, figs. 12a, b, 13a, b.1979 ? *Clinocypris vasiljevi* Schleipher; O. Styk (*in: Atlas...*), p. 111, pl. 24, fig. 9.

Collection. — MUZ IG 6066/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Lower Buntsandstein — lower part of Middle Buntsandstein)

Family *Darwinulidae* Brady et Norman, 1889Genus *Darwinula* Brady et Robertson, 1885*Darwinula acmayica* Schleipher, 1966

Plate XXVI, Fig. 5

- 1966 *Darwinula acmayica* Schleipher sp. n.; A. G. Schleipher, pp. 125, 126, pl. 3, figs. 1—4.  
 1979 *Darwinula acmayica* Schleipher; O. Styk (*in: Atlas...*), p. 111, pl. 24, fig. 5.

Collection. — MUZ IG 6069/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Darwinula adducta* Lubimova, 1956

Plate XXVI, Fig. 11

- 1955 *Darwinula adducta* sp. n.; P. S. Lubimova, pp. 27, 28, pl. 1, fig. 7a, b.  
 1979 *Darwinula adducta* Lubimova; O. Styk (*in: Atlas...*), p. 111, pl. 24, fig. 11.

Collection. — MUZ IG 6072/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Lower Buntsandstein and lower part of Middle Buntsandstein). (OS)

*?Darwinula dreyeri* Kozur, 1968

Plate XXVI, Fig. 10

- 1968c *Darwinula dreyeri* n. sp.; H. Kozur, pp. 848, 849, pl. 4, figs. 9, 10.  
 1979 *?Darwinula dreyeri* Kozur; O. Styk (*in: Atlas...*), p. 112, pl. 24, fig. 10.

Collectin. — MUZ IG 6075/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

*Darwinula globosa* (Duff, 1842)

Plate XXVI, Fig. 6

- 1862 *Candona ? globosa* (Duff); T. R. Jones, pp. 126, 127, pl. 5, figs. 23, 24, *fide* B. F. Ellis, A. R. Messina, 1940.  
 1894 *Darwinula globosa* (Duff); T. R. Jones, pp. 163, 164, pl. 9, figs. 3, 4a, b.  
 1979 *Darwinula globosa* (Duff); O. Styk (*in: Atlas...*), p. 112, pl. 24, fig. 6.

Collection. — MUZ IG 6085/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

*Darwinula goldapi* Styk, 1972

Plate XXVI, Fig. 7

- 1972 *Darwinula goldapi* n. sp.; O. Styk, p. 874, pl. 2, figs. 1, 2a, b (holotype).  
 1979 *Darwinula goldapi* Styk; O. Styk (*in: Atlas...*), p. 112, pl. 24, fig. 7.

Collection. — MUZ IG 6007/72/O (holotype).

Occurrence. — Extra-Carpathian Poland (upper part of Lower Buntsandstein and Lower part of Middle Buntsandstein). (OS)

*Darwinula infera* Schleipher, 1966

Plate XXVI, fig. 8

1966 *Darwinula infera* Schleipher sp. n.; A. G. Schleipher, p. 124, pl. 3, figs. 7a, b.1979 *Darwinula infera* Schleipher; O. Styk (in: Atlas...), p. 112, pl. 24, fig. 8.

Collection. — MUZ IG 6090/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Darwinula kiptschakensis* Schleipher, 1966

Plate XXVII, Fig. 2

1966 *Darwinula kiptschakensis* Schleipher sp. n.; A. G. Schleipher, pp. 119, 120, pl. 1, figs. 4, 5.1979 *Darwinula kiptschakensis* Schleipher; O. Styk (in: Atlas...), p. 113, pl. 25, fig. 2.

Collection. — MUZ IG 6096/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Darwinula liassica* (Brodie, 1843)

Plate XXVII, Fig. 1

1894 *Darwinula liassica* (Brodie); T. R. Jones, pp. 162, 163, pl. 9, fig. 1a—c.1979 *Darwinula liassica* (Brodie); O. Styk (in: Atlas...), p. 113, pl. 25, fig. 1.

Collection. — MUZ IG 6099/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Upper Muschelkalk—Lower Rhaetic). (OS)

*?Darwinula* cf. *quadrata* Mischina, 1969

Plate XXVII, fig. 3

1979 *?Darwinula* cf. *quadrata* Mischina; O. Styk (in: Atlas...), p. 113, pl. 25, fig. 3.

Collection. — MUZ IG 6109/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Lower Buntsandstein and lower part of Middle Buntsandstein). (OS)

*Darwinula* cf. *regia* Mischina, 1969

Plate XXVII, Fig. 4

1979 *Darwinula* cf. *regia* Mischina; O. Styk (in: Atlas...), p. 114, pl. 25, figs. 4a, b.

Collection. — MUZ IG 6112/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Lower Buntsandstein and lower part of Middle Buntsandstein). (OS)

*Darwinula wandae* Styk, 1972

Plate XXVII, Fig. 6

1972 *Darwinula wandae* n. sp.; O. Styk, p. 873, pl. 3, figs. 6—8.1979 *Darwinula wandae* Styk; O. Styk (in: Atlas...), p. 114, pl. 25, fig. 6.

Collection. — MUZ IG 6004/72/O (holotype).

Occurrence. — Extra-Carpathian Poland (Reed Sandstone, Lower Rhaetic). (OS)

*Darwinula (Paradarwinula) spinosa* Kozur, 1970

Plate XXVII, Fig. 5

- 1970a *Darwinula (Paradarwinula) spinosa* n. subgen. n. sp.; H. Kozur, pp. 434, 435, pl. 2, figs. 2—4; text-fig. 1.  
 1979 *Darwinula (Paradarwinula) spinosa* Kozur; O. Styk (*in: Atlas...*), p. 114, pl. 25, fig. 5.

Collection. — MUZ IG 5555/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

Family ?*Brachycytheridae* Puri, 1954Genus *Rhombocythere* Anderson, 1964*Rhombocythere nodosa* Kozur, 1968

Plate XXVIII, Fig. 4

- 1968c *Gemmanella (Rhombocythere) nodosa* n. sp.; H. Kozur, pp. 852, 853, pl. 1, figs. 14, 15.  
 1979 *Rhombocythere nodosa* Kozur; O. Styk (*in: Atlas...*), p. 114, pl. 26, fig. 4.

Collection. — MUZ IG 6127/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

*Rhombocythere tenuistriata* (Kozur, 1968)

Plate XXVIII, Fig. 1

- 1968c *Speluncella tenuistriata* n. sp.; H. Kozur, p. 868, pl. 4, figs. 1a—d, 2—5.  
 1972 *Rhombocythere gorzoviensis* n. sp.; O. Styk, p. 876, pl. 3, figs. 6a—d, 7, 8.  
 1979 *Rhombocythere tenuistriata* (Kozur); O. Styk (*in: Atlas...*), p. 115, pl. 26, fig. 1.

Collection. — MUZ IG 6019/72/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

Family *Bythocytheridae* Sars, 1926Genus *Monoceratina* Roth, 1928*Monoceratina kozuri* Styk, 1972

Plate XXVIII, Fig. 2

- 1968b *Monoceratina gracilis* n. sp.; H. Kozur, pp. 505, 506, pl. 2, figs. 1—3, 6, 7, 11.  
 1972 *Monoceratina kozuri* n. nov.; O. Styk, p. 875, pl. 3, fig. 1a, b.  
 1979 *Monoceratina kozuri* Styk; O. Styk (*in: Atlas...*), p. 115, pl. 26, fig. 2.

Collection. — MUZ IG 6016/72/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Monoceratina paula* Styk, 1972

Plate XXVIII, Fig. 3

- 1972 *Monoceratina paula* n. sp.; O. Styk, pp. 875, 876, pl. 3, fig. 2a—c (holotype).  
 1979 *Monoceratina paula* Styk; O. Styk (*in: Atlas...*), p. 115, pl. 26, fig. 3.

Collection. — MUZ IG 6017/72/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

*Monoceratina spinosa* (Kozur, 1970)

Plate XXIX, Figs. 1, 2

- 1970c *Triassinella (Judahella) spinosa* n. sp.; H. Kozur, p. 18, pl. 1, figs. 7, 8.  
 1979 *Monoceratina spinosa* (Kozur); O. Styk (*in: Atlas...*), p. 116, pl. 27, figs. 1, 2.

Collection. — MUZ IG 6136/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family *Cytherissinellidae* Kashevarova, 1958

Genus *Cytherissinella* Schneider, 1956  
*Cytherissinella crispera* (Schleipher, 1966)

Plate XXIX, Figs. 3—5

- 1966 *Lutkevichinella ? crispera* Schleipher sp. n.; A. G. Schleipher, pp. 137, 138, pl. 5, figs. 8a, b, 9a, b, 10a, b.  
 1979 *Cytherissinella crispera* (Schleipher); O. Styk (*in: Atlas...*), p. 116, pl. 27, figs. 3—5.

Collection. — MUZ IG 6137/73/O, 6140(73)O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

Genus *Lutkevichinella* Schneider, 1956  
 ?*Lutkevichinella germanica* (Wienholz et Kozur, 1970)

Plate XXIX, Figs. 6—8

- 1970 *Karnocythere germanica* n. gen. n. sp.; E. Wienholz, H. Kozur, pp. 589, 590, pl. 1, figs. 1—3, 5; text-fig. p. 590.  
 1970c *Lutkevichinella germanica* (Wienholz et Kozur); H. Kozur, pp. 13, 14.  
 1979 ?*Lutkevichinella germanica* (Wienholz et Kozur); O. Styk (*in: Atlas...*), p. 117, pl. 27, figs. 6—8.

Collection. — MUZ IG 6118—6121/73/O.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (OS)

*Lutkevichinella mazurensis* Styk, 1972

Plate XXIX, Fig. 9

- 1972 *Lutkevichinella mazurensis* n. sp.; O. Styk, p. 877, pl. 2, figs. 9a, b (holotype), 10—12.  
 1979 *Lutkevichinella mazurensis* Styk; O. Styk (*in: Atlas...*), p. 117, pl. 27, fig. 9.

Collection. — MUZ IG 6020/72/O (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Buntsandstein). (OS)

? *Lutkevichinella pusilla* Diebel, 1965

Plate XXX, Figs. 1—3

- 1965 *Lutkevichinella ? pusilla* n. sp.; L. Diebel, pp. 238—242, pl. 28, figs. 11, 12.  
 1979 ?*Lutkevichinella pusilla* Diebel; O. Styk (*in: Atlas...*), p. 117, pl. 28, figs. 1—3.

Collection. — MUZ IG 6150—6152/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

? *Lutkevichinella rectagona* (Gründel, 1965)

Plate XXX, Figs. 4—6

- 1965 *Reversiocythere rectagona* n. gen. n. sp.; J. Gründel, pp. 237, 238, text-figs. 6—8, 10.

1970c *Lutkevichinella rectagona* (Gründel); H. Kozur, p. 13.

1979 ?*Lutkevichinella rectagona* (Gründel); O. Styk (*in: Atlas...*), p. 118, pl. 28, figs. 4—6.

Collection. — MUZ IG 6161/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (OS)

?*Lutkevichinella simplex oblonga* Kozur, 1971

Plate XXX, Figs. 7, 8

1971 *Lutkevichinella simplex oblonga* Kozur n. sp.; G. Bunza, H. Kozur, p. 37, pl. 4, fig. 7.

1979 ?*Lutkevichinella simplex oblonga* Kozur; O. Styk (*in: Atlas...*), p. 118, pl. 28, figs. 7, 8.

Collection. — MUZ IG 6159/73/O, 6160/73/O.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (OS)

Family Cytheruridae Müller, 1894

Genus *Simeonella* Sohn, 1968

*Simeonella brotzenorum alpina* Bunza et Kozur, 1971

Plate XXX, Figs. 9, 10

1971 *Simeonella brotzenorum alpina* n. subsp.; G. Bunza, H. Kozur, pp. 4, 5, pl. 1, figs. 5—7, 13.

1979 *Simeonella brotzenorum alpina* Bunza et Kozur; O. Styk (*in: Atlas...*), p. 119, pl. 28, figs. 9, 10.

Collection. — MUZ IG 6153/73/O, 6154/73/O.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (OS)

Family Ilyocyprididae Kaufmann, 1900

Genus *Cultella* Lubimova, 1959

?*Cultella levis* Kozur, 1968

Plate XXXI, Figs. 1, 2

1968b ?*Cultella levis* n. sp.; H. Kozur, p. 500, pl. 2, figs. 15, 16.

1979 ?*Cultella levis* Kozur; O. Styk (*in: Atlas...*), p. 119, pl. 29, figs. 1, 2.

Collection. — MUZ IG 6560/73/O, 6561/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk). (OS)

Family Timiriaseviidae Mandelstam, 1959

Genus *Timiriasevia* Mandelstam, 1947

*Timiriasevia rhaetica* (Anderson, 1964)

Plate XXXV, Figs. 7—9

1964 ?*Klieana rhaetica* sp. nov.; F. W. Anderson, p. 144, pl. 9, figs. 43, 44, 48, 49.

1979 *Timiriasevia rhaetica* (Anderson); O. Styk (*in: Atlas...*), p. 119, pl. 33, figs. 7—9.

Collection. — MUZ IG 6537—6539/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

Family Healdiidae Harlton, 1933

Genus *Hungarella* Mehes, 1911

*Hungarella gemma* Styk, 1972

Plate XXXVI, Figs. 1, 2

1972 *Hungarella gemma* n. sp.; O. Styk, pp. 877, 878, pl. 3, figs. 9a, b (holotype), 10a, b.

1979 *Hungarella gemma* Styk; O. Styk (*in: Atlas...*), p. 120, pl. 34, figs. 1, 2.

Collection. — MUZ IG 6025/72/O, 6026/72/O.

Occurrence. — Extra-Carpathian Poland (Rhöt—Lower Muschelkalk). (OS)

*Hungarella semirobundata* Styk, 1972

Plate XXXVI, Figs. 3, 4

1972 *Hungarella semirobundata* n. sp.; O. Styk, p. 878, pl. 3, fig. 11 (holotype).

1979 *Hungarella semirobundata* Styk; O. Styk (*in: Atlas...*), p. 120, pl. 34, figs. 3, 4.

Collection. — MUZ 6024/72/O, 6028/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family Cytherellidae Sars, 1866

Genus *Cytherelloidea* Aleksander, 1929

*Cytherelloidea picardi* (Sohn, 1968)

Plate XXXVI, Figs. 5—7

1968 *Reubanella picardi* Sohn n. sp.; I. G. Sohn, pp. 18, 19, pl. 1, figs. 27—32.

1979 *Cytherelloidea picardi* (Sohn); O. Styk (*in: Atlas...*), p. 120, pl. 34, figs. 5—7

Collection. — MUZ IG 6554—6556/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Muschelkalk). (OS)

Family incertae sedis

Genus *Gemmanella* Schneider, 1956

*Gemmanella ingerslebensis* (Beutler et Gründel, 1963)

Plate XXXI, Figs. 3—5

1963 *Mandelstamia (Palaeomandelstamia) ingerslebensis* n. subgen., n. p.; G. Beutler, J. Gründel, pp. 62, 63, pl. 4, figs. 5—12; pl. 5, figs. 1—4; pl. 8, figs. 6—8.

1968d *Gemmanella ingerslebensis* (Beutler et Gründel); H. Kozur, p. 849.

1979 *Gemmanella ingerslebensis* (Beutler et Gründel); O. Styk (*in: Atlas...*), p. 121, pl. 29, figs. 3—5.

Collection. — MUZ IG 6170—6172/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (OS)

*Gemmanella schweyeri* Schneider, 1956

Plate XXXI, Figs. 6—8

1956 *Gemmanella schweyeri* gen. et sp. nov.; G. F. Schneider *et al.*, pp. 123, 124, pl. 19, fig. 1.

1979 *Gemmanella schweyeri* Schneider; O. Styk (*in: Atlas...*), p. 121, pl. 29, figs. 6—8.

Collection. — MUZ IG 6186—6188/73/O.

Occurrence. — Extra-Carpathian Poland (upper part of Middle and Upper Muschelkalk—Lower Keuper). (OS)

Genus *Glorianella* Schneider, 1956

*Glorianella culta* Starozhilova, 1968

Plate XXXII, Figs. 1, 2

1968 *Glorianella culta* sp. nov.; V. V. Lipatova, N. N. Starozhilova, pp. 132, 133, pl. 13, figs. 6—7.

1979 *Glorianella culta* Starozhilova; O. Styk (*in: Atlas...*), p. 122, pl. 30, figs. 1, 2.

Collection. — MUZ IG 6192/73/O, 6193/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Glorianella thuringensis* (Beutler et Gründel, 1963)

Plate XXXII, Figs. 3—6

1963 *Letticoythere thuringensis* n. gen., n. sp.; G. Beutler, J. Gründel, pp. 65—67, pl. 5, figs. 9—11; pl. 6, figs. 1—8; pl. 9, figs. 3—6.

1970a *Glorianella thuringensis* (Beutler et Gründel); H. Kozur, p. 10.

1979 *Glorianella thuringensis* (Beutler et Gründel); O. Styk (*in: Atlas...*), p. 122, pl. 30, figs. 3—6.

Collection. — MUZ IG 6500—6504/73/O.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (OS)

Genus *Pulviella* Schneider, 1957  
*Pulviella aralsorica* Schleipher, 1966

Plate XXXIII, Fig. 3

1966 *Pulviella aralsorica* Schleipher sp. nov.; A. G. Schleipher, p. 130, pl. 4, figs. 1a, b, 2.

1979 *Pulviella aralsorica* Schleipher; O. Styk (*in: Atlas...*), p. 123, pl. 31, fig. 3.

Collection. — MUZ 6506/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Pulviella marinae* Starozhilova, 1968

Plate XXXIII, Figs. 1, 2

1968 *Pulviella marinae* Starozhilova sp. nov.; V. V. Lipatova, N. N. Starozhilova, pp. 113, 114, pl. 8, figs. 3a, b, w, 5a, b.

1979 *Pulviella marinae* Starozhilova; O. Styk (*in: Atlas...*), p. 123, pl. 31, figs. 1, 2.

Collection. — MUZ IG 6512/73/O, 6513/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Pulviella ovalis* Schneider, 1956

Plate XXXIII, Fig. 4

1956 *Pulviella ovalis* sp. nov.; G. F. Schneider *et al.*, p. 182, pl. 3, fig. 3.

1979 *Pulviella ovalis* Schneider; O. Styk (*in: Atlas...*), p. 123, pl. 31, fig. 4.

Collection. — MUZ IG 6515/73/O.

Occurrence. — Extra-Carpathian Poland (Rhöt). (OS)

*Pulviella petersbergensis* (Diebel, 1965)

Plate XXXIII, Figs. 5, 6; Plate XXXIV, Figs. 1, 2

1965 *Speluncella petersbergensis* sp. nov.; L. Diebel, p. 242, 243, pl. 19, figs. 1—6.

1979 *Pulviella petersbergensis* (Diebel); O. Styk (*in: Atlas...*), p. 123, pl. 31, figs. 5, 6; pl. 32, figs. 1, 2.

Collection. — MUZ IG 6521—6524/73/O.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk). (OS)

*Pulviella piriformis* (Beutler et Gründel, 1963)

Plate XXXIV, Fig. 3

- 1963 *Laevicythere piriformis* n. sp.; G. Beutler, J. Gründel, pp. 53, 54, pl. 1, figs. 1—10; pl. 2, fig. 1; pl. 7, figs. 6, 7.  
 1979 *Pulviella piriformis* (Beutler et Gründel); O. Styk (in: Atlas...), p. 124, pl. 32, fig. 3.

Collection. — MUZ IG 6527/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (OS)

*Pulviella silesia* (Styk, 1972)

Plate XXXIV, Fig. 5

- 1972 *Clinocypris ? silesia* n. sp.; O. Styk, p. 873, pl. 2, figs. 3a, b (holotype).  
 1979 *Pulviella silesia* (Styk); O. Styk (in: Atlas...), p. 124, pl. 32, fig. 5.

Collection. — MUZ IG 6903/72/O.

Occurrence. — Extra-Carpathian Poland (Lower Rhaetic). (OS)

*Pulviella vulgaris* (Beutler et Gründel, 1963)

Plate XXXIV, Fig. 4

- 1963 *Laevicythere vulgaris* n. sp.; G. Beutler, J. Gründel, pp. 54, 55, pl. 2, figs. 2—9; pl. 7, figs. 4, 5.  
 1979 *Pulviella vulgaris* (Beutler et Gründel); O. Styk (in: Atlas...), p. 124, pl. 32, fig. 4.

Collection. — MUZ IG 6530/73/O.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (OS)

Genus *Speluncella* Schneider, 1956*Speluncella alata* (Beutler et Gründel, 1963)

Platte XXXIV, Fig. 6; Platte XXXV, Figs. 1, 2

- 1963 *Christellocythere (Remocythere) alata* n. subgen. n. sp.; G. Beutler, J. Gründel, pp. 59, 60, pl. 3, figs. 10—14; pl. 4, figs. 1—4, pl. 8, figs. 3—5.  
 1968d *Speluncella alata levis* n. subsp.; H. Kozur, pp. 865, 866, pl. 1, figs. 8, 10, 11, 13.  
 1979 *Speluncella alata* (Beutler et Gründel); O. Styk (in: Atlas...), p. 125, pl. 32, fig. 6; pl. 33, figs. 1, 2.

Collection. — MUZ IG 6533—6535/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (OS)

*Speluncella spinosa* Schneider, 1956

Plate XXXV, Figs. 3—5

- 1956 *Speluncella spinosa* Schneider gen. et sp. nov.; G. F. Schneider et al., p. 121, pl. 19, fig. 3.  
 1968 *Speluncella spinosa* Schneider; V. V. Lipatova, N. N. Starozhilova, pp. 104—106, pl. 6, figs. 8—10.  
 1979 *Speluncella spinosa* Schneider; O. Styk (in: Atlas...), p. 125, pl. 33, figs. 3—5.

Collection. — MUZ IG 6543—6545/73/O.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk). (OS)

*Speluncella tumida* (Gründel, 1965)

Plate XXXV, Fig. 6

1965 *Christellocythere* (*Christellocythere*) *tumida* n. sp.; J. Gründel, pp. 234—236, text-figs. 1—5, 9a, b.1968c *Speluncella tumida* (Gründel); H. Kozur, p. 866.1979 *Speluncella tumida* (Gründel); O. Styk (*in: Atlas...*), p. 126, pl. 33, fig. 6.

Collection. — MUZ IG 6548/73/O.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (OS)

TYPE ECHINODERMATA<sup>15</sup>

## Class CRINOIDEA Miller, 1821

**General characteristics.** (HS, ZK). Crinoids are represented in the Triassic of extra-Carpathian Poland by *Entrochus*, *Encrinus*, *Dadocrinus* and *Pentacrinus* (Table 10).

Their occurrence is limited to the uppermost Rhöt (Góry Świętokrzyskie Mts) and the Lower and Upper Muschelkalk (H. Senkowiczowa, 1970b; P. Assmann, 1937; J. Lefeld, 1958). The record of crinoids in the Middle Muschelkalk is limited to *Diplopora* Dolomites sections in the Upper Silesia only. Crinoids are known from calcareous, marly and dolomitic rocks. They are mainly represented by dispersed stem fragments, often occurring in masses. Complete or fragmentarily preserved calyces are very scarce.

Of the taxa recorded in the epicontinental basin, *Dadocrinus gracilis* (Buch), *Entrochus silesiacus* Beyrich and *Encrinus liliiformis* (Lamarck) are regarded as of stratigraphic value.

Crinoids are missing in north-eastern Poland and western Pomerania, *i.e.* in areas where the basin could be more strongly freshened because of large distance from the contact zone with the open sea and proximity of land areas. A high share of clay sediments in the Lower Muschelkalk in that part of the country suggests that waters presumably yielded large amounts of suspended matter and, therefore, they were unfavourable for development of crinoids.

Crinoids belong to the most common fossils in the Tatra Triassic. *Dadocrinus*, forming crinoidal limestone layers a few centimetres in thickness, is of rock-forming importance and a guide fossil of the Lower Anisian. *Dadocrinus gracilis* (Buch) and *D. grundeyi* Langenhan are characteristic of the Lower Anisian in the high-tatric series (J. Lefeld, 1958; Z. Kotański, 1959a, b, c), similarly as in the Briançonnais series (F. Ellenberger, 1958). According to E. Kristan-Tollmann and A. Tollmann (1967), *D. gracilis* (Buch) may cooccur with *Encrinus liliiformis* (Lamarck), being then indicative of the Pelsonian. This species occurs neither in the Rhöt nor Upper Anisian *Diplopora* Limestones with *Physoporella praealpina* Pia and *Diplopora annulatissima* Pia. *Dadocrinus* is also characteristic for the lower sub-tatric (Křižna) series, where it is most often found in limestones of the Gutenstein type (Z. Kotański, 1963a, b, 1965b, 1971). Remains of these crinoids are usually redeposited and the detritus may even display

<sup>15</sup> The systematics after D. L. Frizzell, H. E. Exline, D. L. Dawson (*in: Treatise...*, 1966), J. A. Arendt, R. F. Hecker (*in: Osnovy...*, 1960), and O. V. Savtchinskaja (*in: Osnovy...*, 1964).

graded bedding. Complete specimens with calyces may be found in some places only, usually in proximity of areas where crinoids were growing in the form of "meadows".

*Encrinus liliiformis* (Lamarck) and *Entrochus* occur in the Middle and Upper Anisian. The former is also known from the Ladinian. It forms crinoidal limestone layers in the Upper Anisian of the sub-tatric Križna (W. Goetel, S. Sokołowski, 1930; Z. Kotański, 1963a, b; K. Guzik, 1963) and high-tatric series (Z. Kotański, 1959a, b; J. Piotrowski, 1965). "Crinoid meadows" were presumably generally developing in other areas than "*Diplopora* meadows" as representatives of these two groups very rarely cooccur.

Large fragments of crinoid stems occur in the Partnach Beds and the Wetterstein Dolomite in the upper sub-tatric nappe (Z. Kotański, 1965a, 1973b).

Some authors recently begin to regard Middle Triassic crinoids as of fairly high stratigraphic value (E. Kristan-Tollmann, A. Tollmann, 1967). In several sections, these fossils together with green algae Dasycladaceae make possible dating and reconstruction of stratigraphic position of strata.

The high-tatric Upper Keuper (Rzędy and Tomanowa series — Z. Kotański, 1961) displays crinoidal limestones with still unidentified crinoids, possibly of the Norian age.

Planktonic crinoids, possibly forming *Osteocrinus* facies (Carnian — Z. Kotański, 1973b, d) are sometimes found in the *Cardita* (?) Limestones, resting on the Wetterstein Dolomite in the upper sub-tatric nappe.

In the Križna and high-tatric Rhaetian, there occur *Pentacrinus* (W. Goetel, 1917; A. Radwański, 1968; A. Gaździcki, 1974) and *Isocrinus bavaricus* Winkler (A. Gaździcki, 1974).

#### Order *Cladida* Moore et Laudon, 1943

Family *Encrinidae* Bather, 1899

Genus *Encrinus* Schultze, 1760

*Encrinus aculeatus* Meyer, 1847

Plate XXXVII, Fig. 1

1847 *Encrinus aculeatus* n. sp.; H. Meyer, p. 576.

1851 *Encrinus aculeatus*; H. Meyer, p. 262, pl. 32, fig. 1 (holotype).

1937 *Encrinus aculeatus* Meyer; P. Assmann, p. 17, pl. 4, figs. 4a, b, 5—7.

1979 *Encrinus aculeatus* Meyer; H. Senkowiczowa (in: Atlas...), p. 128, pl. 35, fig. 1.

Collection. — It is not known where the type specimen is housed. The specimens collected by P. Assmann were presumably housed in the Geologisches Landesmuseum in Berlin.

Occurrence. — Upper Silesia (Gogolin Beds—*Diplopora* Dolomites). (HS)

*Encrinus robustus* Assmann, 1926

Plate XXXVII, Fig. 2

1926 *Encrinus robustus* n. sp.; P. Assmann, p. 508, pl. 8, figs. 5, 6 (holotype), 7, 8.

1937 *Encrinus robustus* Assmann; P. Assmann, p. 18, pl. 4, figs. 8a, b, 9, 10; pl. 5, fig. 1.

1979 *Encrinus robustus* Assmann; H. Senkowiczowa (in: Atlas...), p. 128, pl. 35, fig. 2.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin; at present it is missing in the collections of ZGI Berlin.

Occurrence. — Upper Silesia (Góraźdze and Karchowice Beds). (HS)

*Encrinus spinosus* Michael, 1893

Plate XXXVII, Fig. 3

1893 *Encrinus* sp.; R. Michael, p. 500, fig. 1.1893 *Encrinus spinosus* Michael; R. Michael, p. 23.1937 *Encrinus spinosus* Michael; P. Assmann, p. 17, pl. 4, fig. 3.1979 *Encrinus spinosus* Michael; H. Senkowiczowa (*in: Atlas...*), p. 129, pl. 35, fig. 3.

Collection. — R. Michael described specimen from the collections of the University in Wrocław. It is not known where the specimen is housed nowadays.  
 Occurrence. — Upper Silesia (Góraźdże Beds—*Diplopora Dolomites*). (HS)

Genus *Entrochus**Entrochus silesiacus* Beyrich, 1857

Plate XXXVII, Fig. 4

1857 *Entrochus silesiacus* Beyrich; E. Beyrich.1967 *Entrochus silesiacus* Beyrich; E. Kristan-Tollmann, A. Tollmann, p. 22, pl. 9, figs. 7—12.1979 *Entrochus silesiacus* Beyrich; H. Senkowiczowa (*in: Atlas...*), p. 129, pl. 35, fig. 4.

Collection. — It is not known where the type specimen is housed; MUZ IG 1364/II/1.

Occurrence. — Upper Silesia (Góraźdże and Karchowice Beds and lower part of Middle Muschelkalk), Góry Świętokrzyskie Mts (*P. striatum* Beds) (HS)

Order *Millericrinida* Sieverts-Doreck, 1953Family *Dadocrinidae* Lowestam, 1942]Genus *Dadocrinus* Meyer, 1847*Dadocrinus grundeyi* Langenhan, 1903

Plate XXXVII, Fig. 12

1903 *Dadocrinus grundeyi* Langenhan; A. Langenhan, p. 9, pl. 5, figs. 1—9.1958 *Dadocrinus grundeyi* Langenhan; J. Lefeld, p. 59, pl. 1, figs. 1, 2, pl. 2.1979 *Dadocrinus grundeyi* Langenhan; Z. Kotański (*in: Atlas...*), p. 129, pl. 35, fig. 12.

Collection. — Museum of Faculty of Geology, Warsaw University, Warsaw, Al. Żwirki i Wigury 93 (MWG UW), J. Lefeld coll.

Occurrence. — Tatra Mts — sub-tatric and high-tatric series ("Hydasopian"), Upper Silesia (Lower Wavy Limestones). (ZK)

## Class HOLOTHURIOIDEA Blainville, 1834

**General characteristics.** (HS, KZ). Holothurians are represented in the epicontinental Triassic of Poland by sclerites belonging to *Priscopodatoides*, *Calclammella*, *Achistrum*, *Eocaudina*, *Tetravigra*, *Uncinulina*, *Priscopodatus* and *Theelia* (Table 10).

The sclerites have been hitherto found in the uppermost Lower Muschelkalk, *Terebratula* Beds, in the Upper Silesia (H. Kozur, H. Mostler, 1970a), the Łukowa Beds at southern margin of the Góry Świętokrzyskie Mts (J. Trammer, 1975) and the *P. striatum* Beds in Podlasie (borehole Żebrak IG 1, H. Senkowiczowa, 1972).

The sclerite assemblage from the *Terebratula* Beds in the Upper Silesia is characterized by numerous *Theelia* and *Achistrum*, accompanied by *Tetravigra*, *Uncinulina*, *Priscopedatus* and *Priscopedatoides*.

Sclerites found in the Góry Świętokrzyskie Mts are very poorly preserved but it may be stated that the assemblage is characterized by predominance of *Theelia*, accompanied by sporadically present *Priscopedatus*, *Achistrum* and *Calclammella*.

Representatives of *Theelia* also predominate in Podlasie, where they are accompanied by less common *Eocaudina*, *Tetravigra*, *Uncinulina*, *Achistrum* and *Priscopedatus*. In that area, there were also found some species known from lower parts of the Muschelkalk in Thuringia (*Theelia* cf. *subcirculata* Mostler and *T. multiradiata* Kozur), unknown in the Upper Silesia.

Holothurian sclerites are also known from the Middle Triassic and Rhaetian in Polish part of the Tatra Mts (K. Zawidzka, 1971b; A. Gaździcki, 1974). All the species hitherto reported from the Tatra Mts have been found in limestone members of the Middle Triassic of the upper sub-tatric nappe (Table 6).

### Order Elaspipodida Théel, 1882

Family Theeliidae Frizzel et Exline, 1955

Genus *Acanthotheelia* Frizzel et Exline, 1955

*Acanthotheelia spiniperforata* Zawidzka, 1971

Plate XXXVII, Fig. 6

1971b *Acanthotheelia spiniperforata* n. sp.; K. Zawidzka, p. 440, pl. 3, fig. 6 (holotype).

1979 *Acanthotheelia spiniperforata* Zawidzka; K. Zawidzka (in: Atlas...), p. 130, pl. 35, fig. 6.

Collection. — IGP UWG THPc-5 (holotype).

Occurrence. — Western Tatra Mts (Illyrian?). (KZ)

Genus *Theelia* Schlumberger, 1890

*Theelia zapfei* Kozur et Mostler, 1970

Plate XXXVII, Fig. 7

1970a *Theelia zapfei* n. sp.; H. Kozur, H. Mostler, p. 382, pl. 4, figs. 8, 21 (holotype), 23, 25.

1972 *Theelia zapfei* Kozur et Mostler; H. Senkowiczowa, pl. 1, figs. 13a, b, 15a, b, 16—19, 20a, b; pl. 2, figs. 2a, b, 3—5.

1979 *Theelia zapfei* Kozur et Mostler; H. Senkowiczowa (in: Atlas...), p. 131, pl. 35, fig. 7.

Collection. — H. Kozur, H. Mostler, 116/1959.

Occurrence. — Upper Silesia (*Terebratula* Beds), Podlasie (*P. striatum* Beds). (HS)

### Order Dendrochirotida Grube, 1840

Family Priscopedatidae Frizzel et Exline, 1955

Genus *Priscopedatus* Schlumberger, 1890 emend. Frizzel et Exline, 1955

*Priscopedatus elliptiferus* Zawidzka, 1971

Plate XXXVII, Fig. 11

1971b *Priscopedatus elliptiferus* n. sp.; K. Zawidzka, p. 438, pl. 2, fig. 6a, b (holotype).

1979 *Priscopedatus elliptiferus* Zawidzka; K. Zawidzka (in: Atlas...), p. 131, pl. 35, fig. 11.

Collection. — IGP UW THO 3—1 (holotype).  
 Occurrence. — Western Tatra Mts (Illyrian?). (KZ)

*Priscopedatus kotlickii* Kozur et Mostler, 1970

Plate XXXVII, Fig. 10

- 1970a *Priscopedatus kotlickii* n. sp.; H. Kozur, H. Mostler, p. 370, pl. 4, fig. 15 (holotype).  
 1972 *Priscopedatus* aff. *kotlickii* Kozur et Mostler; H. Senkowiczowa, pl. 2, fig. 8.  
 1979 *Priscopedatus kotlickii* Kozur et Mostler; H. Senkowiczowa (*in: Atlas...*), p. 131, pl. 35, fig. 10.

Collection. — H. Kozur, H. Mostler, 116/1941.  
 Occurrence. — Upper Silesia, Podlasie (Lower Muschelkalk). (HS)

*Priscopedatus mostleri* Stefanov, 1970

Plate XXXVII, Fig. 5

- 1968 *Priscopedatus* sp. A.; H. Mostler, p. 20, pl. 6, fig. 16.  
 1970 *Priscopedatus mostleri* Stefanov; S. A. Stefanov, p. 44, pl. 1, figs. 7, 8.  
 1971b *Priscopedatus mostleri* n. sp.; K. Zawidzka, p. 437, pl. 4, fig. 5.  
 1979 *Priscopedatus mostleri* Stefanov; K. Zawidzka (*in: Atlas...*), p. 132, pl. 35, fig. 5.

Collection. — IGP UW THO 6—2 (holotype).  
 Occurrence. — Western Tatra Mts (?Illyrian). (KZ)

*Priscopedatus quadratus* Kozur et Mostler, 1970

Plate XXXVII, Fig. 9

- 1970a *Priscopedatus quadratus* n. sp.; H. Kozur, H. Mostler, p. 371, pl. 4, figs. 5—7, 11 (holotype).  
 1979 *Priscopedatus quadratus* Kozur et Mostler; H. Senkowiczowa (*in: Atlas...*), p. 132, pl. 35, fig. 9.

Collection. — H. Kozur, H. Mostler, 116/1953.  
 Occurrence. — Upper Silesia (*Terebratula* Beds), Podlasie (*P. striatum* Beds). (HS)

Genus *Priscopedatoides* Kozur et Mostler, 1970  
*Priscopedatoides protrusus* Kozur et Mostler, 1970

Plate XXXVII, Fig. 8

- 1970a *Priscopedatoides protrusus* n. sp.; H. Kozur, H. Mostler, p. 376, pl. 3, figs. 10 (holotype), 13.  
 1979 *Priscopedatoides protrusus* Kozur et Mostler; H. Senkowiczowa (*in: Atlas...*), p. 132, pl. 35, fig. 8.

Collection. — H. Kozur, H. Mostler, 116/1950.  
 Occurrence. — Upper Silesia (*Terebratula* Beds). (HS)

Class STELLEROIDEA Lamarck, 1816  
 Order **Ophiurida** Müller et Troschel, 1840

**General characteristics.** (HS, ZK, AP). Ophiuroids are fairly rare in Poland, being hitherto known from the Upper Silesia, Góry Świętokrzyskie Mts and Podlasie. Specimens sufficiently preserved for specific identifications have been found in the Upper Silesia only: *Aspidura similis* Eck, *Ophioderma hauchecorni* Eck and, known from mass occurrences, *O. squamosum* (Picard). All the

species are known from the Gogolin Beds and *O. squamosum* (Picard) — also from the Middle Muschelkalk (*Diplopora* Dolomites). The species *Aspidura similis* Eck is the first to appear in this region, being known from the Lower Gogolin Beds.

The recorded accumulations of representatives of *Ophioderma squamosum* (Picard) are related to their mass occurrences in the environment. However, the skeletons are placed with oral side of disc up and complete individuals are more or less fragmentary. This indicates short-distance post-mortem transportation. The unique state of preservation of complete individuals may be explained in terms of their rapid burial (not later than 15 hours after death).

In the Góry Świętokrzyskie Mts, poorly preserved specimens of *Aspidura* sp. occur in strata of the Łukowa Beds. Isolated fragments of ophiuroids were found in upper parts of the Lower Muschelkalk at southern margin of the Góry Świętokrzyskie Mts and in Podlasie (H. Senkowiczowa, 1972).

The above mentioned species are not known from the Alpine Triassic.

In the Tatra Mts, ophiuroids are known from the Rhaetian of the lower sub-tatric series (W. Goetel, 1917; J. Głazek, 1963; A. Gaździcki, 1974) and the high-tatric (A. Radwański, 1968). They were assigned to the species *Ophiolepis bertrandi* Lanquine. The ophiuroids are of some importance in microfacies studies as they may be also identified in thin sections (J. Głazek, A. Radwański, 1968).

Family **Ophiuridae** Lyman, 1865

Genus *Aspidura* Agassiz, 1835

*Aspidura similis* Eck, 1865

Plate XXXVIII, Fig. 6

1865 *Aspidura similis* Eck; H. Eck, p. 49, pl. 1, fig. 5 (holotype).

1937 *Aspidura similis* Eck; P. Assmann, p. 20.

1979 *Aspidura similis* Eck; H. Senkowiczowa (in: Atlas...), p. 133, pl. 36, fig. 6.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Upper Silesia (lower part of Lower Muschelkalk). (HS)

Family **Ophiodermatidae** Ljugman, 1867

Genus *Ophioderma* Müller et Troschel, 1840

*Ophioderma squamosum* (Picard, 1858)

Plate XXXIX, Figs. 1, 2

1858 *Aspidura squamosa* Picard; E. Picard, p. 431, pl. 9, figs. 1a, b.

1940 *Ophioderma squamosa* Picard; F. Kutscher, p. 15, pl. 1, fig. 2.

Collection. — Institute of Geology, Faculty of Earth Sciences, Silesian University, Sosnowiec, Mielczarskiego Str. (IG UŚ), J. Liszkowski coll.

Occurrence. — Upper Silesia (Gogolin Beds, *Diplopora* Dolomites). (AP)

Class **Echinoidea** Leske, 1778

Order **Cidaroida** Claus, 1880

**General characteristics.** (HS, ZK). In the extra-Carpathian Poland, echinoids are represented by *Cidaris* (Table 10). All the species hitherto identified come from the Upper Silesia only (P. Assmann, 1937), except for *Cidaris grandaeva*

Goldfuss, also recorded in the Lower Silesia. In the area of the Góry Świętokrzyskie Mts (H. Senkowiczowa, 1970b), there were found echinoid plates and spines only. Echinoids spines also occur in Lower Muschelkalk strata in Podlasie (H. Senkowiczowa, 1972).

In the extra-Carpathian Poland, Triassic echinoids occur in limestones, dolomites and marls formed in rather shallow, warm and usually clear water, in areas situated close to coast.

Of the species recorded in the extra-Carpathian Poland, only *Cidaris transversa* Meyer is also known from the Alpine basin.

Interambulacral plates with nods and spines of echinoids are known from the Parnach Beds (Upper Anisian) in the upper sub-tatric series in the Tatra Mts (Z. Kotański, 1965a, 1971). They belong to regular echinoids *Miocidaris* and *Cidaris* (Z. Kotański, 1973b, d) (Table 6). Similar forms are also known from the Upper Silesian Triassic. Unidentified spines of echinoids also occur in the high-tatric Rhaetian (A. Rawański, 1968).

Family *Cidaridae* Gray, 1825

Genus *Cidaris* Leske, 1778

*Cidaris longispira* Assmann, 1937

Plate XXXVIII, Fig. 4

1937 *Cidaris longispira* n. sp.; P. Assmann, p. 22, pl. 5, figs. 7—10.

1979 *Cidaris longispira* Assmann; H. Senkowiczowa (in: Atlas...), p. 134, pl. 36, fig. 4.

Collection. — The specimens were housed in the Geologisches Landesmuseum in Berlin. The author did not designate holotype.

Occurrence. — Upper Silesia (Karchowice Beds and the lowermost part of Middle Muschelkalk). (HS)

*Cidaris ecki* Assmann, 1926

Plate XXXVIII, Fig. 3

1926 *Cidaris ecki* n. sp.; P. Assmann, p. 517, pl. 9, figs. 7—10.

1937 *Cidaris ecki* Assmann; P. Assmann, p. 23, pl. 5, figs. 11—16.

1979 *Cidaris ecki* Assmann; H. Senkowiczowa (in: Atlas...), p. 135, pl. 36, fig. 3.

Collection. — It is not known where the type specimen is housed.

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

*Cidaris remifera* Assmann, 1937

Plate XXXVIII, Fig. 5

1937 *Cidaris remifera* n. sp.; P. Assmann, p. 23, pl. 5, fig. 17 (holotype).

1979 *Cidaris remifera* Assmann; H. Senkowiczowa (in: Atlas...), p. 135, pl. 36, fig. 5.

Collection. — The type specimen was housed in the Geologisches Landesmuseum in Berlin.

Occurrence. — Upper Silesia (Górażdże Beds). (HS)

*Cidaris subnodosa* Meyer, 1851

Plate XXXVIII, Fig. 2

1851 *Cidaris subnodosa* Myr.; H. Meyer, p. 275, pl. 32, fig. 27.

1937 *Cidaris subnodosa* Meyer; P. Assmann, p. 22.

1979 *Cidaris subnodosa* Meyer; H. Senkowiczowa (*in: Atlas...*), p. 135, pl. 36, fig. 2.

Collection. — The type specimen has been presumably lost — it was already unknown to P. Assmann (1937). No new material was gathered.

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

### *Cidaris transversa* Meyer, 1851

Plate XXXVIII, Fig. 1

1851 *Cidaris transversa* Myr.; H. Meyer, p. 276, pl. 32, figs. 28—32.

1937 *Cidaris transversa* Meyer; P. Assmann, p. 24.

1979 *Cidaris transversa* Meyer; H. Senkowiczowa (*in: Atlas...*), p. 136, pl. 36, fig. 1.

Collection. — The type specimen has been presumably lost — it was already unknown to P. Assmann (1937). No new material was gathered.

Occurrence. — Upper Silesia (Lower Muschelkalk). (HS)

## TYPE PROTOCHORDATA

### Class ENTEROPNEUSTA Gegenbaur, 1870

**General characteristics.** (HS). Enteropneusta are found in the Triassic in the Góry Świętokrzyskie Mts. Their presence was found on the basis of occurrence of U-shaped channels, sometimes with preserved moulds of snout (J. Kaźmierczak, A. Pszczółkowski, 1969; J. Trammer, 1975).

Enteropneusta channels are common in Lower Muschelkalk strata, especially the Łukowa Beds, at southern and western margins of the Góry Świętokrzyskie Mts. They are especially numerous in pelitic sediments. Their relation with these sediments is determined by the presence of organic matter, *i.e.* nutrition of these animals.

Channels similar to those recorded in the Lower Muschelkalk in the Góry Świętokrzyskie Mts have been described from coeval strata in Thuringia.

## TYPE INCERTAE SEDIS

### Class INCERTAE SEDIS

#### Order *Conodontophorida* Eichenberg, 1930<sup>16</sup>

**General characteristics.** Extra-Carpathian area. (JT). Conodonts do not occur in the Rhöt and the lowermost Muschelkalk in Poland, similarly as in the GDR and FRG (H. Kozur, 1971c, 1974). In the Góry Świętokrzyskie Mts, first representatives of that fauna appear in upper parts of the Wolica Beds (J. Trammer, 1971, 1975) and in the Silesia — in upper parts of the Lower Gogolin Beds (K. Zawidzka, 1975a).

In the Góry Świętokrzyskie Mts, the Lower Muschelkalk yields conodont assemblage indicative of the *G. aegaea* zone, corresponding to the Lower Anisian

<sup>16</sup> The general systematics after Treatise... (1962), supplemented.

in the Alpine subdivision (W. C. Sweet *et al.*, 1971; J. Trammer, 1972b; H. Kozur, H. Mostler, 1972a), and the assemblage of the *N. kockeli* zone, corresponding to the Pelsonian in that subdivision (H. Kozur, H. Mostler, 1972a; J. Trammer, 1972b, 1975; K. Budurov, S. Stefanov, 1972).

Attention should be paid to the stratigraphic position of *Neospathodus germanicus* Kozur, ancestor of *N. kockeli* (Tatge), in the Góry Świętokrzyskie Mts. In the GDR, FRG, and Upper Silesia, this conodont appears in upper part of the Lower Anisian (H. Kozur, 1972c, 1974; K. Zawidzka, 1975a), being used as guide fossil, whereas in the Góry Świętokrzyskie Mts it has not been found below the Pelsonian, appearing just below strata yielding *N. kockeli* (Tatge). It follows that we are dealing here with partial range of that form.

In the Middle Muschelkalk of the Góry Świętokrzyskie Mts, conodonts are completely absent. This is due to unfavourable conditions which also precluded development of macrofauna (H. Senkowiczowa, 1970b). Identical conditions were prevailing at that time in western part of the German basin (GDR, FRG) whereas continuous occurrence of conodonts is recorded in the Alpine province.

The Upper Muschelkalk yields conodonts of very high stratigraphic value. On the basis of the recorded evolutionary series *Gondolella mombergensis mombergensis* Tatge—*G. mombergensis media* Kozur—*G. haslachensis* Tatge—*Celsigondolella watznaueri praecursor* (Kozur)—*C. watznaueri watznaueri* Kozur, seven zones have been differentiated in this member in the GDR (H. Kozur, 1968a).

In the Góry Świętokrzyskie Mts (similarly as in other parts of Poland), the lowermost four conodont zones were differentiated. Three uppermost zones (5, 6 and 7) of the Upper Muschelkalk in the GDR and FRG are not present as bioprotostratigraphic zones *sensu* G. Henningsmoen (1961; see also J. Kutek, 1972) in Poland. This is due to the fact that continental facies of the Keuper, in which conodont could not occur because of ecological reasons, appeared in Poland earlier than in the GDR and FRG. Sedimentation of the Keuper was already continuing in Poland in times when upper *Ceratites* Beds (= conodont zones 5, 6 and 7) were still originating in Bavaria, Badenia and Saarland (complete section of the Muschelkalk) (see H. Kozur, 1971a, 1974; J. Trammer, 1972b, 1974b; K. Zawidzka, 1975a).

Table 12 shows stratigraphic ranges of guide conodonts. Correlation of conodont and ceratitid zonations was given by H. Kozur (1968a) and J. Trammer (1975).

The recorded conodonts made possible correlation of the Upper Muschelkalk of the Góry Świętokrzyskie Mts with the Alpine subdivision (Table 12).

In the Lower Muschelkalk of the Upper Silesia, there were differentiated three conodont units (K. Zawidzka, 1970, 1975a) (from the base upwards): the *N. germanicus* subzone of the *G. aegaea* zone, the *N. kockeli* zone and *G. excelsa* zone.

The data obtained in the Upper Silesia contribute to the correlation of the Muschelkalk of Poland with the Alpine (chronostratigraphic) subdivision. It became possible to delineate precisely the Pelsonian-Illyrian boundary in that area (K. Zawidzka, 1975a), which appeared not possible in the Góry Świętokrzyskie Mts.

Conodonts, although rare, are still present in the lowermost part of the Middle Muschelkalk in the Upper Silesia: *Gondolella navicula* Huckriede, *G. excelsa* (Mosher). This case is, however, exceptional as they are missing due to facies reasons in the Middle Muschelkalk throughout the rest of the German basin.

In higher parts of the Middle Muschelkalk section, conodont fauna also disappears in the Upper Silesia.

In the above area, conodonts reappear in the Upper Muschelkalk (Upper Tarnowice Beds). In the Upper Muschelkalk of the Upper Silesia, there were differentiated (K. Zawidzka, 1975a) all the four conodont zones, described above in detail in remarks on the Góry Świętokrzyskie Mts.

Table 12  
Stratigraphic ranges of guide conodont species in the Muschelkalk in the extra-Carpathian Poland (J. Trammer)

| Species                                              | Triassic       |             |   |   |        |    |   |       |   |   |
|------------------------------------------------------|----------------|-------------|---|---|--------|----|---|-------|---|---|
|                                                      | Lower          | Middle      |   |   |        |    |   |       |   |   |
|                                                      | Bunt-sandstein | Muschelkalk |   |   |        |    |   |       |   |   |
|                                                      | Upper          | Lower       |   |   | Middle |    |   | Upper |   |   |
|                                                      |                | 1           | 2 | 3 | 4      | 5  | 6 | 7     | 8 | 9 |
| A                                                    |                | B           | C | D | E      | F  | G |       |   |   |
| DA                                                   |                | P           |   | I |        | Fa |   |       |   |   |
| <i>Gondolella uegaca</i> /Bender/                    | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Neohindeodella nevadensis</i> /Müller/            | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Neospathodus germanicus</i> Kozur                 | -----          |             |   |   |        |    |   |       |   |   |
| <i>Neospathodus kockelli</i> /Tatge/                 | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Chirodella polonica</i> Kozur et Mostler          | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella exoelsa</i> /Mosher/                   | -----          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella navisula</i> Huckriede                 | -----          |             |   |   |        |    |   |       |   |   |
| <i>Chirodella dinodoidea</i> Tatge                   | -----          |             |   |   |        |    |   |       |   |   |
| <i>Cornudina pandodontata</i> /Budurov/              | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Diplododella meissneri</i> /Tatge/                | -----          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella momburgensis momburgensis</i> Tatge    | ~~~~~          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella momburgensis media</i> Kozur           | -----          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella haslachensis haslachensis</i> Tatge    | -----          |             |   |   |        |    |   |       |   |   |
| <i>Gondolella haslachensis brommeri</i> Kozur        | -----          |             |   |   |        |    |   |       |   |   |
| <i>Celsigondolella watznaueri praecursor</i> /Kozur/ | -----          |             |   |   |        |    |   |       |   |   |
| <i>Ozarkodina tortilis</i> Tatge                     | -----          |             |   |   |        |    |   |       |   |   |
| <i>Pollognathus germanicus</i> /Kozur/               | -----          |             |   |   |        |    |   |       |   |   |
| <i>Pollognathus nequens</i> /Kozur/                  | -----          |             |   |   |        |    |   |       |   |   |

--- Upper Silesia ~~~~~ Góry Świętokrzyskie Mts. ——— Polish Lowlands

Upper Silesia (lithostratigraphy after P. Assmann, 1944): 1 — Lower Gogolin Beds, 2 — Upper Gogolin Beds, 3 — Górażdże Beds, 4 — Terebratula Beds, 5 — Karchowice Beds, 6 — *Diplopora* Dolomites, 7 — unsplit upper part of Middle Muschelkalk, 8 — Upper Tarnowice Beds, 9 — Wilkowice conglomerate, 10 — Wilkowice Kolonia Beds + Boruszowice Beds; Góry Świętokrzyskie Mts (lithostratigraphy after H. Senkowiczowa, 1957): A — Wolica Beds, B — Wavy Beds, C — Łukowa Beds, D — *P. striatum* Beds, E — Middle Muschelkalk, F — *E. discites* Beds, G — *Ceratites* Beds; chronostratigraphy (Alpine substages): DA — Lower Anisian (Hydraspian), P — Pelsonian, I — Illyrian, Fa — Fasnianian

The published data on conodonts in the Muschelkalk in borehole columns in the Polish Lowlands, i.e. in areas beyond the Upper Silesia and Góry Świętokrzyskie Mts, are still very scarce. J. Głazek *et al.* (1973) found conodonts in the borehole column Radziątków 5 (central Poland) and H. Jurkiewicz (1974) reported their presence in coeval strata in the Nida Basin.

On the basis of geographic distribution of conodonts, H. Kozur and H. Mostler (1971, 1972a) differentiated conodont provinces in the Triassic.

In the Early Anisian (Wolica Beds, Wavy Series and lower part of the Łukowa

Beds in the Góry Świętokrzyskie Mts, and their equivalents in the Upper Silesia — lower part of the Gogolin Beds (except for their uppermost part), the area of Poland was situated in a transitional zone between the Asiatic and German provinces. The Asiatic province differed from the German in presence of conodonts of the genus *Gondolella* and natural assemblage *Gladigondolella tethydis*. *Gondolella* is present in the Lower Anisian of Poland whereas the *Gladigondolella tethydis* assemblage is missing. In the relevant part of the section in the Góry Świętokrzyskie Mts there was found Asiatic guide species *Gondolella aegaea* (Bender). In the Austro-Alpine and West-Mediterranean provinces (except for some areas in Bulgaria), conodonts are completely missing in the Lower Anisian because of unfavourable facies conditions.

In the Pelsonian and earliest Illyrian (upper part of the Lower Muschelkalk), the area of Poland belonged to the Austro-Alpine conodont province. This is shown by the records of conodonts of the genus *Gondolella*, especially Alpine species *G. excelsa* (Mosher) and *G. navicula* Huckriede, unknown in the German province.

In Poland, Muschelkalk strata of the Pelsonian — earliest Illyrian age yield, besides conodonts, also other groups of Alpine fauna and flora (cephalopods, foraminifers, algae), unknown in western parts of the German basin (GDR and FRG). Thus, it is possible to follow J. Samsonowicz (1929) and speak about Polish faunistic subprovince which was more closely connected with the Austro-Alpine province than the German in the Pelsonian and earliest Illyrian.

Biogeographic differentiation of the German basin in the Lower Muschelkalk into eastern (Polish) and western (GDR and FRG) parts does not mean the existence of morphological barrier of any kind between these parts. Any further migration of some Asiatic or Alpine elements from the area of Poland to the GDR was impeded by unfavourable facies conditions in western part of the basin. For example, gondolellae could not live in waters with salinity even slightly higher than normal marine and this was the case of the Lower Muschelkalk in the GDR and FRG (H. Kozur, 1971a, c; H. Kozur, H. Mostler, 1971). This did not preclude development of branching conodonts, less sensitive to increased salinity (H. Kozur, H. Mostler, 1971; L. Mosher, 1973).

Conodonts are missing in the Middle Muschelkalk of the Góry Świętokrzyskie Mts which makes it difficult to discuss provinciality questions in relation to that area. It may be only stated that the lack or impoverishment of fauna in the Middle and Late Illyrian (= Middle Muschelkalk) is typical of the German basin only. So, in that sense, that area belonged to the German province at that time.

A situation is more complex in the case of the Middle Muschelkalk in the Upper Silesia. In early Middle Illyrian (when were originating lower parts of that member), this area was still inhabited by conodonts, including Alpine *Gondolella excelsa* (Mosher) and *G. navicula* Huckriede. It follows that at that time the area still belonged to the Austro-Alpine conodont province. In upper parts of the Middle Muschelkalk, conodonts also disappeared in the Upper Silesia and that area became similar to other parts of the German basin.

In the Upper Muschelkalk, the area of Poland belonged to the German conodont province (J. Trammer, 1975).

Carpathian area. (AG, KZ). In the Tatra Mts, limestone members of the Middle and Upper Triassic yield both platform and branching conodonts. Conodont localities are situated at western slope of the Chochołowska Valley (northern slope of Furkaska, Wielkie Koryciska and footslope of Siwiańskie Turnie) (K. Zawadzka, 1972).

Middle Triassic conodont assemblage is fairly differentiated whereas the Upper Triassic comprises two taxa only (A. Gaździcki, 1978b). The major elements of Anisian–Ladinian conodont assemblage of Furkaska and Wielkie Koryciska include *Gondolella navicula* Huckriede and *G. excelsa* (Mosher). They are accompanied by *Neospathodus tatricus* Zawidzka, *Ozarkodina budurovi* Zawidzka and *Cornudina neospathoides* Zawidzka (K. Zawidzka, 1972).

Rhaetian conodonts are represented in the Tatra Mts by spathognathoid elements only. They belong to the species *Misikella posthernsteini* Kozur et Mock, 1974 and *Misikella* sp. *A* (A. Gaździcki, 1978a, b).

The species *Misikella posthernsteini* Kozur et Mock, 1974 presumably evolved from *M. hernsteini* (Mostler, 1967). The evolution might have been connected with reduction in number of denticles and the infolding of posterior margin (H. Kozur, R. Mock, 1974a, b; S. K. Skwarko *et al.*, 1976; H. Mostler *et al.*, 1978; A. Gaździcki, H. Kozur, R. Mock, 1979). It is highly probable that *Misikella* sp. *A* represents a member of evolutionary line *Misikella hernsteini* → *Misikella* sp. *A* → *Misikella posthernsteini*.

The detailed micropaleontological studies recently carried out on the classic sections of the Upper Triassic in the Alps and Carpathians (H. Mostler *et al.*, 1978; A. Gaździcki, H. Kozur, R. Mock, 1979) showed that *Misikella posthernsteini* Kozur et Mock appears in the uppermost Sevantian, where it occurs together with *M. hernsteini* (Mostler). The latter species disappears at the Norian/Rhaetian boundary whereas *M. posthernsteini* Kozur et Mock is present up to the upper boundary of the *Ch. marshi* Zone (in the Rhaetian ammonite subdivision — A. Gaździcki, H. Kozur, R. Mock, 1979). This makes it possible to differentiate the *M. posthernsteini* conodont Zone in the Rhaetian of the Alpine–Mediterranean region (H. Kozur, R. Mock, 1974b). Lower boundary of that zone would be defined by disappearance of *M. hernsteini* (Mostler) and the upper — by disappearance of *M. posthernsteini* Kozur et Mock (H. Kozur, R. Mock, 1974b; see also A. Gaździcki, H. Kozur, R. Mock, 1979).

The record of the assemblage of conodonts *Misikella posthernsteini* Kozur et Mock and *Misikella* sp. *A* in the Tatra Mts makes possible drawing some general conclusions. First of all, it gives further support to their stratigraphic value as well as wide geographic distribution within the Tethyan Realm (H. Kozur, R. Mock, 1974a, b; S. K. Skwarko *et al.*, 1976; H. Mostler *et al.*, 1978; A. Gaździcki, H. Kozur, R. Mock, 1979). At the same time, the lack of any other elements of conodont apparatus in the studied samples except for the spathognathoid ones suggests that it was the last element to remain in the apparatus of the conodontophorid animal. Scarcity and marked monotype of conodonts in the Rhaetian may also reflect evolutionary changes in this group, taking place just before its extinction in the end of the Triassic.

### Platform conodonts

Genus *Gondolella* Stauffer et Plummer, 1932

*Gondolella navicula* Huckriede, 1958

Plate XL, Fig. 17; Plate XLII, Fig. 6

- 1958 *Gondolella navicula* n. sp.; R. Huckriede, pp. 147, 148, pl. 11, figs. 1–4, 13–19, 27, 35; pl. 12 figs. 2–8, 10, 15–22, 24–27; pl. 14, figs. 28–31.  
 1975 *Gondolella navicula* Huckriede; J. Trammer, pl. 23, fig. 5; pl. 24, fig. 1.  
 1975a *Gondolella navicula* Huckriede; K. Zawidzka, pl. 37, fig. 14; pl. 40, figs. 4, 6; pl. 41, fig. 4; pl. 42, fig. 6; pl. 43, fig. 10.  
 1979 *Gondolella navicula* Huckriede; J. Trammer (*in: Atlas...*), p. 142, pl. 37, fig. 17.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Upper Silesia (Upper Gogolin Beds — lower part of *Diplopora* Dolomites), Góry Świętokrzyskie Mts (Łukowa and *P. striatum* Beds), central Poland — borehole Radziątków 5 (Lower Muschelkalk), Tatra Mts (Anisian—Ladinian). (JT)

*Gondolella excelsa* (Mosher, 1968)

Plate XL, Figs. 16, 18; Plate XLI, figs. 1, 2;  
Plate XLII, Figs. 2, 3

- 1968b *Paragondolella excelsa* n. sp.; L. Mosher, pp. 938, 939, pl. 118, figs. 1—8.  
1971 *Paragondolella excelsa* Mosher; J. Trammer, pl. 2, fig. 7.  
1975a *Gondolella excelsa* (Mosher); K. Zawadzka, pl. 37, figs. 17, 19, 22, 25; pl. 41, fig. 3.  
1979 *Gondolella excelsa* (Mosher); J. Trammer (*in: Atlas...*), p. 143, pl. 37, figs. 16, 18; pl. 38, figs. 1, 2.

Collection. — IGP UW, J. Trammer and K. Zawadzka coll.

Occurrence. — Upper Silesia (middle part of Góraźdże Beds—lower part of *Diplopora* Dolomites), Góry Świętokrzyskie (*P. striatum* Beds), Tatra Mts (Anisian—Ladinian) (JT)

*Gondolella aegaea* (Bender, 1967)

Plate XL, Figs. 7, 15

- 1967 *Neogondolella aegaea* n. sp.; H. Bender, pp. 516, 517, pl. 3, figs. 21—26; pl. 4, fig. 1.  
1970 *Neogondolella regale* n. sp.; L. Mosher, pp. 741, 742, pl. 110, figs. 1, 2, 4, 5.  
1972b *Gondolella regale* (Mosher); J. Trammer, pl. 2, figs. 2, 7.  
1979 *Gondolella aegaea* (Bender); J. Trammer (*in: Atlas...*), p. 143, pl. 37, figs. 7, 15.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (Wavy Beds and lower part of Łukowa Beds). (JT)

*Gondolella mombergensis mombergensis* Tatge, 1956

Plate XL, Fig. 14

- 1956 *Gondolella mombergensis* n. sp.; U. Tatge, p. 132, pl. 6, figs. 1, 2.  
1971 *Gondolella mombergensis mombergensis* Tatge; J. Trammer, pl. 2, fig. 5.  
1975a *Gondolella mombergensis mombergensis* Tatge; K. Zawadzka, pl. 41, figs. 1, 2; pl. 42, fig. 2; pl. 43, figs. 4, 7; pl. 44, fig. 5.  
1979 *Gondolella mombergensis mombergensis* Tatge; J. Trammer (*in: Atlas...*), p. 143, pl. 37, fig. 14.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Upper Silesia (Anisian and Lower Ladinian), Góry Świętokrzyskie Mts (Lower Muschelkalk and lower and middle parts of Upper Muschelkalk), Polish Lowlands (Upper Muschelkalk). (JT)

*Gondolella mombergensis media* Kozur, 1968

Plate XL, Fig. 13

- 1968c *Gondolella mombergensis media* n. subsp.; H. Kozur, p. 131, pl. 1, figs. 3, 4.  
1971 *Gondolella mombergensis media* Kozur; J. Trammer, pl. 2, fig. 4.  
1975a *Gondolella mombergensis media* Kozur; K. Zawadzka, pl. 43, figs. 3, 5, 6.  
1979 *Gondolella mombergensis media* Kozur; J. Trammer (*in: Atlas...*), p. 144, pl. 37, fig. 13.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (*C. compressus*, *C. evolutus* zones and lower part of *C. spinosus* zone), Upper Silesia (upper part of Wilkowice Beds), Polish Lowlands (Upper Muschelkalk). (JT)

*Gondolella haslachensis haslachensis* Tatge, 1956

Plate XL, Figs. 10, 11; Plate XLI, figs. 4, 6

1956 *Gondolella haslachensis* n. sp.; U. Tatge, pp. 131, 132, pl. 6, fig. 3.

1972b *Gondolella haslachensis* Tatge; J. Trammer, pl. 1, figs. 8—12.

1975a *Gondolella haslachensis* Tatge; K. Zawadzka, pl. 37, figs. 2, 5, 6, 10—12, 16.

1979 *Gondolella haslachensis haslachensis* Tatge; J. Trammer (*in: Atlas...*), p. 144, pl. 37, figs. 10, 11; pl. 38, figs. 4, 6.

Collection. — IGP UW, J. Trammer and K. Zawadzka coll.

Occurrence. — Góry Świętokrzyskie Mts (upper part of *C. spinosus* and *C. enodis/laevigatus* zones), Upper Silesia (top part of Wilkowice and Boruszowice Beds), Polish Lowlands (Upper Muschelkalk). (JT)

*Gondolella haslachensis trammeri* Kozur, 1972

Plate XL, Fig. 12

1972 *Gondolella haslachensis trammeri* Kozur n. subsp.; H. Kozur, R. Mock, p. 13, pl. 1, figs. 3—7.

1975 *Gondolella haslachensis trammeri* Kozur; J. Trammer, pl. 25, fig. 1.

1979 *Gondolella haslachensis trammeri* Kozur; J. Trammer (*in: Atlas...*), p. 145, pl. 37, fig. 12.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (*C. enodis/laevigatus* zone). (JT)

Genus *Celsigondolella* Kozur, 1968

*Celsigondolella watznaueri praecursor* (Kozur, 1968)

Plate XL, Figs. 8, 9

1968c *Gondolella (Celsigondolella) watznaueri praecursor* n. subsp.; H. Kozur, p. 135, pls. 6, 7, 9.

1972b *Gondolella (Celsigondolella) watznaueri praecursor* Kozur; J. Trammer, pl. 1, fig. 4.

1975a *Gondolella (Celsigondolella) watznaueri praecursor* Kozur; K. Zawadzka, pl. 37, figs. 1, 8.

1979 *Celsigondolella watznaueri praecursor* (Kozur); J. Trammer (*in: Atlas...*), p. 145, pl. 37, figs. 8, 9.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (top part of *Ceratites* Beds), Upper Silesia (top part of Boruszowice Beds). (JT)

**Branching conodonts**

Genus *Chirodella* Hirschmann, 1959

*Chirodella polonica* Kozur et Mostler, 1970

Plate XLI, Fig. 5

1970b *Chirodella polonica* n. sp.; H. Kozur, H. Mostler, p. 429, 430, pl. 1, figs. 5—7.

1975 *Chirodella polonica* Kozur et Mostler; J. Trammer, pl. 22, fig. 7.

1975a *Chirodella polonica* Kozur et Mostler; K. Zawadzka, pl. 35, fig. 2.

1979 *Chirodella polonica* Kozur et Mostler; J. Trammer (*in: Atlas...*), p. 145, pl. 38, fig. 5.

Collection — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (top part of Łukowa and *P. striatum* Beds), Upper Silesia (Górażdże and *Terebratula* Beds). (JT)

*Chirodella dinodoides* (Tatge, 1956)

Plate XLI, Fig. 3

- 1956 *Metalonchodina* ? *dinodoides* n. sp.; U. Tatge, p. 135, pl. 6, fig. 4.  
 1971 *Chirodella dinodoides* (Tatge); J. Trammer, pl. 2, fig. 2.  
 1975a *Chirodella dinodoides* (Tatge); K. Zawidzka, pl. 35, fig. 1.  
 1979 *Chirodella dinodoides* (Tatge); J. Trammer (*in: Atlas...*), p. 146, pl. 38, fig. 3.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia (the whole Lower Muschelkalk and Anisian). (JT)

Genus *Cornudina* Hirschmann, 1959

*Cornudina neospathoides* Zawidzka, 1972

Plate XLII, Fig. 1

- 1972 *Cornudina neospathoides* n. sp.; K. Zawidzka, pl. 2, fig. 4 (holotype).

Collection. — IGP UW T25y (holotype).

Occurrence. — Western Tatra Mts (Anisian). (KZ)

*Cornudina pandodentata* (Budurov, 1962)

Plate XLI, Fig. 13

- 1962 *Leptochirognathus* ? *pandodentata* n. sp.; K. Budurov, p. 119, pl. 2, fig. 8.  
 1971 *Parachirognathus* ? *pandodentata* (Budurov); J. Trammer, pl. 1, fig. 6.  
 1975a *Cornudina pandodentata* (Budurov); K. Zawidzka, pl. 35, figs. 18, 20.  
 1979 *Cornudina pandodentata* (Budurov); J. Trammer (*in: Atlas...*), p. 146, pl. 38, fig. 13.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (Wavy, Łukowa and *P. striatum* Beds and lowermost part of Upper Muschelkalk), Upper Silesia (Upper Gogolin, Górażdże and *Terebratula* Beds). (JT)

Genus *Diplododella* Bassler, 1925

*Diplododella meissneri* (Tatge, 1956)

Plate XLI, Fig. 12

- 1956 *Roundya meissneri* n. sp.; U. Tatge, p. 143, pl. 6, fig. 11.  
 1972c *Diplododella meissneri* (Tatge); H. Kozur, H. Mostler, p. 7, pl. 1, fig. 25; pl. 7, fig. 7.  
 1975a *Hibbardella meissneri* (Tatge); K. Zawidzka, pl. 38, fig. 8.  
 1979 *Diplododella meissneri* (Tatge); J. Trammer (*in: Atlas...*), p. 146, pl. 38, fig. 12.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts, Upper Silesia (Lower Muschelkalk and lowermost part of the Upper Muschelkalk). (JT)

Genus *Neohindeodella* Kozur, 1968

*Neohindeodella nevadensis* (Müller, 1956)

Plate XLI, Figs. 9, 10

- 1956 *Hindeodella nevadensis* Müller n. sp.; J. K. Müller, p. 826, pl. 96, fig. 2.  
 1972b *Neohindeodella nevadensis* (Müller); J. Trammer, pl. 2, fig. 3.

1975a *Neohindeodella nevadensis* (Müller); K. Zawidzka, pl. 36, fig. 6.

1979 *Neohindeodella nevadensis* (Müller); J. Trammer (in: Atlas...), p. 147, pl. 38, figs. 9, 10.

Collection. — IGP UW, J. Trammer and K. Zawidzka coll.

Occurrence. — Góry Świętokrzyskie Mts (Wavy—Łukowa Beds), Upper Silesia (Upper Gogolin—*Terebratula* Beds). (JT)

Genus *Neospathodus* Mosher, 1968  
*Neospathodus germanicus* Kozur, 1971

Plate XL, Figs. 4, 5

1972a *Neospathodus germanicus* n. sp.; H. Kozur, pp. 13, 14, pl. 5, figs. 6—12.

1975 *Neospathodus germanicus* Kozur; J. Trammer, pl. 22, figs. 4—6.

1975a *Neospathodus germanicus* Kozur; K. Zawidzka, pl. 37, figs. 21, 24

1979 *Neospathodus germanicus* Kozur; J. Trammer (in: Atlas...), p. 147, pl. 37, figs. 4, 5.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Upper Silesia (Upper Gogolin and Górażdże Beds, lower and middle parts of *Terebratula* Beds), Góry Świętokrzyskie Mts (top part of Łukowa and *P. striatum* Beds). (JT)

*Neospathodus kockeli* (Tatge, 1956)

Plate XL, Figs. 1—3, 6

1956 *Ozarkodina kockeli* n. sp.; U. Tatge, p. 137, pl. 5, figs. 13, 14.

1975 *Neospathodus kockeli* (Tatge); J. Trammer, pl. 22, figs. 1—3.

1975a *Neospathodus kockeli* (Tatge); K. Zawidzka, pl. 37, figs. 3, 15, 18, 20, 23.

1979 *Neospathodus kockeli* (Tatge); J. Trammer (in: Atlas...), p. 147, pl. 37, figs. 1—3, 6.

Collection. — IGP UW, Trammer and K. Zawidzka coll.

Occurrence. — Upper Silesia (top part of Upper Gogolin, Górażdże, *Terebratula* and lower part of Karchowice Beds), Góry Świętokrzyskie Mts (Łukowa and *P. striatum* Beds), Polish Lowlands (Lower Muschelkalk). (JT)

*Neospathodus tatricus* Zawidzka, 1972

Plate XLII, Fig. 5

1972 *Neospathodus tatricus* n. sp.; K. Zawidzka, pl. 1, fig. 1 (holotype).

1977 *Prionodina tatica* (Zawidzka); S. Kovacs, pl. 6, fig. 1.

Collection. — IGP UW T55y (holotype).

Occurrence. — Western Tatra Mts (Anisian) (KZ).

Genus *Ozarkodina* Branson et Mehl, 1933  
*Ozarkodina budurovi* Zawidzka, 1972

Plate XLII, Fig. 4

1972 *Ozarkodina budurovi* n. sp.; K. Zawidzka, pl. 2, fig. 2 (holotype).

Collection. — IGP UW T23A (holotype).

Occurrence. — Western Tatra Mts (Anisian—Ladinian). (KZ)

*Ozarkodina tortilis* Tatge, 1956

Plate XLI, Fig. 7

- 1956 *Ozarkodina tortilis* n. sp.; U. Tatge, p. 138, pl. 5, figs. 10, 11.  
 1971 *Ozarkodina tortilis* Tatge; J. Trammer, pl. 2, fig. 3.  
 1975a *Ozarkodina tortilis* Tatge; K. Zawadzka, pl. 39, figs. 2, 6.  
 1979 *Ozarkodina tortilis* Tatge; J. Trammer (*in: Atlas...*), p. 148, pl. 38, fig. 7.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (Lower Muschelkalk from the Łukowa Beds upwards, and Upper Muschelkalk, except for its uppermost part), Upper Silesia (Lower Muschelkalk from Upper Gogolin Beds upwards, and Upper Muschelkalk up to higher part of Boruszowice Beds). (JT)

Genus *Pollognathus* Kozur et Mostler, 1970*Pollognathus germanicus* (Kozur, 1968)

Plate XLI, Fig. 11

- 1968c *Priomiodina* ? *kochi germanica* n. subsp.; H. Kozur, p. 139, pl. 1, figs. 24, 25.  
 1972b *Pollognathus germanicus* (Kozur); J. Trammer, pl. 1, fig. 2.  
 1975a *Pollognathus germanicus* (Kozur); K. Zawadzka, pl. 37, fig. 9.  
 1979 *Pollognathus germanicus* (Kozur); J. Trammer (*in: Atlas...*), p. 148, pl. 38, fig. 11.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (top part of *P. discites* and *Ceratites* Beds), Upper Silesia (upper part of Wilkowice and Lower Boruszowice Beds). (JT)

*Pollognathus sequens* (Kozur, 1968)

Plate XLI, Fig. 8

- 1968a *Priomiodina sequens* n. sp.; H. Kozur, p. 140, pl. 1, fig. 28.  
 1972b *Pollognathus sequens* (Kozur); J. Trammer, pl. 1, fig. 5.  
 1979 *Pollognathus sequens* (Kozur); J. Trammer (*in: Atlas...*), p. 149, pl. 38, fig. 8.

Collection. — IGP UW, J. Trammer coll.

Occurrence. — Góry Świętokrzyskie Mts (upper part of *Ceratites* Beds), Upper Silesia (junction beds of Wilkowice and Boruszowice Beds). (JT)

Genus *Misikella* Kozur et Mock, 1974*Misikella posthernsteini* Kozur et Mock, 1974

Plate XLII, Fig. 8

- 1974b *Misikella posthernsteini* n. sp.; H. Kozur, R. Mock, p. 274, figs. 1—4.  
 1976 *Misikella posthernsteini* Kozur et Mock; R. S. Nicoll *in: S. K. Skwarko et al.*, p. 222, fig. 4A—H.  
 1978b *Misikella posthernsteini* Kozur et Mock; A. Gaździcki, p. 346, pl. 38, figs. 1—3; pl. 39, figs. 1—4; pl. 40, fig. 3.

Collection. — ZPAL C.X/7.

Occurrence. — Tatra Mts — Chochołowska Valley at the foot of Siwiańskie Turnie (Norovica Formation — Rhaetian). (AG)

*Misikella* sp. *A*

Plate XLII, Fig. 7

Collection. — ZPAL C.X/9.

Occurrence. — Tatra Mts — Chochołowska Valley at the foot of Siwiańskie Turnie (Norovica Formation — Rhaetian). (AG)

# FLORA

## MICROFLORA

### MICROPLANKTON

#### Group ACRITARCHA Evitt, 1963<sup>17</sup>

**General characteristics.** (TOZ). Acritarcha represent a group of microfossils, the systematic affiliation of which still remains debatable. A part of them are regarded as highly probable representatives of plant microplankton.

Acritarcha found in western and north-western Poland are the first findings of representatives of that group in the Polish Triassic so the analysis presented below is rather preliminary in character.

Acritarcha are usually found to accompany miospores. The majority of them are characterized by long stratigraphic ranges but, nevertheless, they are highly important as marked supplement to the image of the recorded microflora. Their record makes also possible reconstruction of ecological conditions in sedimentary environment and, in some cases, drawing some stratigraphic conclusions.

In the studied material, there were identified representatives of Acanthomorphae, Polygonomorphae, Sphaeromorphae, Herkomorphae and Tasmanititae. The most common are here spherical specimens with spiny projections, of Acanthomorphae genera: *Michystridium* (Deflandre, 1937) Downie et Sarjeant, 1963 emend. Sarjeant, 1967 and *Baltisphaeridium* (Eisenack) Downie et Sarjeant, 1963. Sphaeromorphae are also represented by numerous specimens, mainly spherical, smooth specimens of the genus *Leiosphaeridia* (Eisenack, 1958) Downie et Sarjeant, 1963, with weakly differentiated morphology.

Polygonomorphae comprise *Veryhachium* Deunff (1954) 1958 emend. Downie et Sarjeant, 1963, represented by relatively high number of species but rather innumerous individuals in the studied material. *Tasmanites* Newton, 1875 and *Crassosphaera* Cookson et Manum, 1960, were assigned to Tasmanititae, in accordance with the proposition made by F. L. Staplin *et al.* (1965). They are represented here by single specimens displaying highly characteristic morphology and the taxa are characterized by relatively short ranges in the studied sections.

Botanic affinity of the bulk of microorganisms of the Acritarcha group is still not established which impedes their paleoecological interpretation. It is only assumed that the majority of them represent marine plant microplankton. Of the Triassic specimens discussed here, *Tasmanites* and *Leiosphaeridia* were compared with recent green algae, Chlorophyceae. The former is characterized by inner structure of wall identical as in recent pelagic algae *Pachysphaera pelagica* Ostenfeld, whereas the latter may be compared with algae *Halosphaera minor* Ostenfeld (D. Wall, 1962, 1965).

<sup>17</sup> The systematics after C. Downie *et al.* (1963), as supplemented by F. L. Staplin *et al.* (1965).

The frequency and distribution of representatives of Acritarcha in the studied Triassic sections in western Poland appears related to facies character of individual stratigraphic units.

The Middle Buntsandstein yields single specimens of *Micrhystridium* and *Veryhachium*. The latter genus is usually represented by ?*Veryhachium irregulare* Jekhowsky.

The Upper Buntsandstein (Rhöt) was found to yield single specimens of *Micrhystridium* sp. div., *Tasmanites* sp., *Veryhachium* sp. div. and *Dictyotidium reticulatum* Schultz, throughout its whole section.

The share of microplankton increases to very high in the Muschelkalk, especially in its lower member and top part of the Upper Muschelkalk. In some horizons of the Lower Muschelkalk, microfloral spectrum is dominated by microplankton as miospores are represented by innumerable saccate pollen grains, brought by wind from land areas. The microplankton mainly comprises *Leiosphaeridia* sp., *Micrhystridium* sp. div. and *Baltisphaeridium* sp. div. as representatives of ?*Veryhachium irregulare* Jekhowsky, *V. reductum* (Deunff) Jekhowsky and *Dictyotidium reticulatum* Schulz are less numerous here.

Microorganisms of the Acritarcha group have not been found in the Middle Muschelkalk, where they may be missing due to a change in ecological conditions.

The mass occurrence is also found in the uppermost part of the Upper Muschelkalk. In some samples from that part of the section, microplankton predominates or it is even the only component of microfloral spectrum. The major component of the microplankton is here the genus *Leiosphaeridia* (Eisenack, 1958) Downie et Sarjeant, 1963 characterized by high variability in size but not in morphology, which appears rather uniform. Representatives of *Tasmanites* Newton are fairly numerous. The microplankton also comprises innumerable specimens of *Crassosphaera* Cookson et Manum, appearing here for the first time, as well as some *Dictyotidium reticulatum* Schulz, *Micrhystridium* (Deflandre, 1937) Downie et Sarjeant, 1963 emend. Sarjeant, 1967, *Baltisphaeridium* (Eisenack) Downie et Sarjeant, 1963, *Veryhachium* (Deunff) Deunff, 1958 emend. Downie et Sarjeant, 1963. *Veryhachium* is most often represented by the species *V. reductum* (Deunff) Jekhowsky and *V. hyalodermum* (Cookson) Schaarschmidt.

Some specimens of microplankton are still present in some sections of basal parts of the Lower Keuper, but in smaller numbers. The composition of the assemblage also changes. This is mainly connected with disappearance of genera connected with marine conditions, i.e. *Leiosphaeridia* (Eisenack) Downie et Sarjeant, *Tasmanites* Newton and *Crassosphaera* Cookson et Manum. There occur mainly specimens of *Micrhystridium* sp. div., accompanied by innumerable *Veryhachium reductum* (Deunff) Jekhowsky, *V. hyalodermum* (Cookson) Schaarschmidt and *Dictyotidium reticulatum* Schulz, which disappear completely along with change of conditions to continental, typical of the Early Keuper.

### Subgroup **Acanthomorphae** Downie, Evitt et Sarjeant, 1963

Genus *Baltisphaeridium* Eisenack, 1958, emend. Downie et Sarjeant, 1963  
*Baltisphaeridium longispinosum* (Eisenack, 1931), Eisenack, 1959

Plate XLIII, Figs. 17—19

- 1959 *Baltisphaeridium longispinosum* (Eisenack, 1931); A. Eisenack, p. 194, pl. 15, fig. 1 (neotype).  
 1979 *Baltisphaeridium longispinosum* (Eisenack) Eisenack; T. Orłowska-Zwolińska (in: Atlas...), p. 152, pl. 39, figs. 17—19.

Collection<sup>18</sup>. — MUZ IG 481/38, 481/37.

Occurrence. — Central and north-eastern Poland (Ordovician), western Poland (Ordovician and Upper Muschelkalk). (TOZ).

*Baltisphaeridium aciculatum* Orłowska-Zwolińska, 1979

Plate XLIII, Figs. 1—4

1979 *Baltisphaeridium aciculatum* sp. n.; T. Orłowska-Zwolińska (*in: Atlas...*), p. 152, pl. 39, figs. 1—4.

Collection. — MUZ IG 483/107, 483/104, 481/56.

Diagnosis. — Circular-ovate in outline; wall two-layered; processes thin, needle-like, short, straight or hook-like.

Occurrence. — Western Poland (Upper Muschelkalk and Lower Keuper). (TOZ)

*Baltisphaeridium debilispinum* Wall et Downie, 1963

Plate XLIII, Figs. 10—12

1963 *Baltisphaeridium debilispinum* nov. sp.; D. Wall, C. Downie, p. 777, pl. 112, figs. 1, 2; text-fig. 3a, b.

1979 *Baltisphaeridium debilispinum* Wall et Downie: T. Orłowska-Zwolińska (*in: Atlas...*), p. 153, pl. 39, figs. 10—12.

Collection. — MUZ IG 487/94.

Occurrence. — Western Poland and Silesian-Cracow Upland (Upper Muschelkalk). (TOZ)

Genus *Micrhystridium* (Deflandre, 1937) Downie et Sarjeant, 1963, emend. Sarjeant, 1967

*Micrhystridium recurvatum* Valensi f. *brevispinosa* Valensi, 1953

Plate XLIII, Figs. 5—9

1953 *Micrhystridium recurvatum* nov. sp. f. *brevispinosa* Valensi; L. Valensi, pp. 43, 44, pl. 6, figs. 9, 10.

1979 *Micrhystridium recurvatum* Valensi f. *brevispinosa* Valensi; T. Orłowska-Zwolińska (*in: Atlas...*), p. 153, pl. 39, figs. 5—9.

Collection. — MUZ IG 483/124, 483/116, 481/25.

Occurrence. — Western Poland (Upper Muschelkalk and Lower Keuper). (TOZ)

*Micrhystridium inconspicuum* (Deflandre, 1935) Deflandre, 1937

Plate XLIII, Figs. 13—16

1935 *Hystrichosphaera inconspicua* nov. sp.; G. Deflandre, p. 233, pl. 9, figs. 11, 12.

1937 *Micrhystridium inconspicuum* (Deflandre, 1935) nov. comb.; G. Deflandre, p. 32, pl. 12, fig. 11.

1979 *Micrhystridium inconspicuum* (Deflandre/ Deflandre); T. Orłowska-Zwolińska (*in: Atlas...*), p. 153, pl. 39, figs. 13—16.

<sup>18</sup> Number of preparation, in which a given specimen is kept in the collections.

Collection. — MUZ IG 481/229a, 481/164.

Occurrence. — Western Poland (Middle and Upper Buntsandstein). (TOZ)

Subgroup **Polygonomorphae** Downie, Evitt et Sarjeant, 1963

Genus *Veryhachium* Deunff (1954) 1958 emend. Downie et Sarjeant, 1963

*Veryhachium reductum* (Deunff, 1958) Jekhowsky, 1961, f. *trispinosoides* Jekhowsky, 1961

Plate XLIV, Figs. 8, 9

1958 *Veryhachium trisulcum* (Deunff, 1952) var. *reductum* Deunff; I. Deunff, p. 27, pl. 1, figs. 8, 11.

1961 *Veryhachium reductum* (Deunff, 1958) f. *trispinosoides* Jekhowsky; B. de Jekhowsky, pp. 210—212, pl. 2, figs. 22—32.

1979 *Veryhachium reductum* (Deunff) Jekhowsky f. *trispinosoides* Jekhowsky; T. Orłowska-Zwolińska (in: Atlas...), p. 154, pl. 40, figs. 8, 9.

Collection. — MUZ IG 481/58, 481/38.

Occurrence. — Western Poland (Muschelkalk). (TOZ)

*Veryhachium reductum* (Deunff, 1958) Jekhowsky,  
1961 f. *breve* Jekhowsky, 1961

Plate XLIV, Figs. 5, 6

1961 *Veryhachium reductum* (Deunff, 1958) Jekhowsky forma *breve*; B. de Jekhowsky, pp. 210, 212, pl. 2, figs. 38—44.

1979 *Veryhachium reductum* (Deunff) Jekhowsky f. *breve* Jekhowsky; T. Orłowska-Zwolińska (in: Atlas...), p. 154, pl. 40, figs. 5, 6.

Collection. — MUZ IG 481/109, 481/110.

Occurrence. — Western Poland (Muschelkalk). (TOZ)

*Veryhachium hyalodermum* (Cookson, 1956) Schaarschmidt, 1963

Plate XLIV, Figs. 3, 4

1956 *Palaetetradinium hyalodermum* nov. sp.; I. C. Cookson, p. 188, pl. 1, figs. 12—16.

1962 *Wilsonartrum colonicum* nov. sp.; J. Jansonius, p. 89, pl. 16, fig. 45.

1963 *Veryhachium hyalodermum* (Cookson) nov. comb.; F. Schaarschmidt, p. 62, pl. 17, figs. 1—7.

1979 *Veryhachium hyalodermum* (Cookson) Schaarschmidt; T. Orłowska-Zwolińska (in: Atlas...), p. 154, pl. 40, figs. 3, 4.

Collection. — MUZ IG 483/126, 484/71.

Occurrence. — Western Poland (Upper Muschelkalk and Lower Keuper). (TOZ)

?*Veryhachium irregulare* Jekhowsky, 1961

Plate XLIV, figs. 1, 2, 7

1961 *Veryhachium* ? *irregulare* nov. sp.; B. de Jekhowsky, p. 208, pl. 1, figs. 1—21.

1979 ?*Veryhachium irregulare* Jekhowsky; T. Orłowska-Zwolińska (in: Atlas...), p. 155, pl. 40, figs. 1, 2, 7.

Collection. — MUZ IG 482/19, 482/18.

Occurrence. — Western Poland (Middle Buntsandstein). (TOZ)

*Veryhachium dualispinum* Wall, 1965

Plate XLIV, Fig. 10

1965 *Veryhachium dualispinum* Wall nov. sp.; D. Wall, p. 159, pl. 3, figs. 15—18; pl. 8, fig. 7.  
 1979 *Veryhachium dualispinum* Wall; T. Orłowska-Zwolińska (in: Atlas...), p. 155, pl. 40, fig. 10.

Collection. — MUZ IG 481/26.

Occurrence. — Western Poland (Upper Muschelkalk). (TOZ)

Subgroup **Sphaeromorphitae** Downie, Evitt et Sarjeant, 1963Genus *Leiosphaeridia* Eisenack, 1958 emend. Downie et Sarjeant, 1963

Plate XLV, Figs. 1—4

1979 *Leiosphaeridia* Eisenack emend. Downie et Sarjeant; T. Orłowska-Zwolińska (in: Atlas...), p. 155, pl. 41, figs. 1—4.

Collection. — MUZ IG 481/45, 481/109, 492/39.

Occurrence. — Extra-Carpathian Poland (especially numerous in Muschelkalk). (TOZ)

Subgroup **Herkomorphitae** Downie, Evitt et Sarjeant, 1963Genus *Dictyotidium* Eisenack, 1955*Dictyotidium reticulatum* Schulz, 1965

Plate XLIV, Figs. 11, 12

1965 *Dictyotidium reticulatum* nov. sp.; E. Schulz, p. 278, pl. 23, figs. 12—14.

1979 *Dictyotidium reticulatum* Schulz; T. Orłowska-Zwolińska (in: Atlas...), p. 156, pl. 40, figs. 11, 12.

Collection. — MUZ IG 484/71, 483/124.

Occurrence. — Western Poland (Upper Muschelkalk and Lower Keuper). (TOZ)

Subgroup **Tasmanititae** (Sommer) Staplin, Jansonius et Pocock, 1965Genus *Tasmanites* Newton, 1875*Tasmanites* sp. A

Plate XLV, Figs. 5, 6

1979 *Tasmanites* sp. A; T. Orłowska-Zwolińska (in: Atlas...), p. 156, pl. 41, figs. 5, 6.

Collection. — MUZ IG 492/38, 483/123.

Occurrence. — Western Poland (Upper Muschelkalk). (TOZ)

*Tasmanites* sp. B

Plate XLVI, Figs. 4, 6

1979 *Tasmanites* sp. B; T. Orłowska-Zwolińska (in: Atlas...), p. 156, pl. 42, figs. 4, 6.

Collection. — MUZ IG 483/117.

Occurrence. — Western Poland (Upper Muschelkalk). (TOZ)

Genus *Crassosphaera* Cookson et Manum, 1960  
*Crassosphaera* cf. *hexagonalis* Wall, 1965

Plate XLVI, Figs. 1, 3

1979 *Crassosphaera* cf. *hexagonalis* Wall; T. Orłowska-Zwolińska (*in: Atlas...*), p. 156, pl. 42, figs. 1, 3.

Collection. — MUZ IG 483/117.

Occurrence. — Western Poland (Upper Muschelkalk). (TOZ)

*Crassosphaera triassica* Orłowska-Zwolińska, 1979

Plate XLVI, Figs. 2, 5

1979 *Crassosphaera triassica* sp. n.; T. Orłowska-Zwolińska (*in: Atlas...*), p. 157, pl. 42, figs. 2 (holotype), 5.

Collection. — MUZ IG 483/119.

Diagnosis. — Circular in outline, wall thick, ornamented. Ornamentation of surface consisting of small but markedly protruding elements. Pores of channels small, densely spaced at the surface.

Occurrence. — Western Poland (Upper Muschelkalk). (TOZ)

## OOGONIA — GYROGONITES

### Class CHAROPHYTA

**General characteristics.** (TM). In the fossil state, oogonia of the Charophyta are usually preserved. Their calcareous coatings, so-called gyrogonites, often occur in masses, sometimes being the only fossils found in continental sediments. At the present state of knowledge, they may be used in defining large stratigraphic units as well as in their correlation. Individual species may be used as indices of sedimentary conditions, interpreted as limnic, oligohaline, and miohaline to mesohaline by H. Kozur (1971). The studies carried out by other authors showed that some species could adapt to marine waters, which is indicated by findings of vegetative remains of Charophyta together with marine fauna, *e.g.* in the Carboniferous and Sarmatian (V. P. Maslov, 1963). However, the majority of authors excluded growth in marine environment, suggesting rather accidental transport of Charophyta gyrogonites from limnic-lagoonal environment to the marine.

In Poland, the oogonia of the Charophyta became the subject of interest of some authors only (J. Znosko, 1955; O. Styk, 1958; H. Szyperko-Śliwczyńska, 1961; E. Odrzywolska-Bieńkowska, 1962; W. Bilan, 1969, 1974), who reported their presence in individual lithological members of the Triassic.

The data on occurrence of Charophyta in older members of the Triassic are fragmentary and the recorded gyrogonites remain undescribed. The data gathered in the course of megaspore studies show that Charophyta are not present in marly-calcareous Lower Buntsandstein rocks. The lack of gyrogonites in these rocks was presumably due to too high salinity of the basin at that time, precluding growth and development of Charophyta which usually live in waters with salinity not higher than 18‰.

Charophyta become very common in overlaying brick-red claystones and marly mudstones of the Middle Buntsandstein, formed in brackish waters with reduced salinity. Charophyta occurring in these rocks presumably represent uniform assemblage, comprising representatives of the genera *Porochara* and *Sphaerochara*, typical of that time interval, as well as *Altochara lipatovae* (Kisielewski) Sajdakovsky, quantitatively predominating in it.

Gyrogonites are present in all the lithological members of the Keuper: Lower Keuper, Lower Gypsum Beds, Reed Sandstone and Upper Gypsum Beds. They are especially common in mottled and various-coloured clay rocks of the Upper Keuper, where they are often accompanied by other fossils such as ostracods, gastropods, fish teeth and scales, indicative of brackish environment. Innumerable gyrogonite assemblages sporadically occur together with megaspores indicative of limnic character of sediments. The available data, however, show that Charophyta most often occur independently of megaspores and they repeatedly disappear and reappear in the Keuper section. This suggests changes in sedimentary conditions in the Keuper basin in Poland, connected with repeated transitions from continental environment to the brackish.

The paper by W. Bilan (1969) has been the first detailed study of Charophyta occurring in the inferred Keuper in Poland. The question of age of these rocks — cherry-red and green mottled clays — was also not solved by the record of numerous charophyte, among which there have been identified *Maslovichara gracilis* Sajdakovsky, *Stellatochara maedleri* Horn af Rantzien, *S. donbassica* (Demin) Sajdakovsky, *S. schneiderae* Sajdakovsky, *Porochara brotzeni* (Horn at Rantzien) Grambast, *P. triassica* (Sajdakovsky) Grambast, *P. urusovi* Sajdakovsky, *P. belorussica* Sajdakovsky, *Stenochara maedleri* (Horn af Rantzien) Grambast, *S. elongata* (Sajdakovsky) Sajdakovsky.

Attention should be paid to the fact that the above species are known from all the biostratigraphic zones differentiated in the Triassic of southern part of the East-European Platform and Caspian Depression by L. J. Sajdakovsky (1966, 1968) and F. J. Kiselevsky (1969). Some of them, e.g. *Porochara brotzeni* (Horn af Rantzien) Grambast and *Stenochara maedleri* (Horn af Rantzien) Grambast, are also known from the Middle Triassic and Keuper of Sweden (H. Horn af Rantzien, 1954) and Middle Triassic of the GDR (H. Kozur, P. Reinhardt, 1969).

In his next paper, W. Bilan (1974) gave descriptions of three new species of Charophyta. One of them, *Stellatochara kozuri* Bilan, has been found in the Reed Sandstone, and the two others, *Auerbachichara rhaetica* Bilan and *A. polonica* Bilan, are regarded as characteristic for the Rhaetic in the Silesian-Cracow Upland.

## MIOSPORES<sup>19</sup>

**General characteristics.** (TOZ). Miospores occur almost throughout the Triassic section — from the Middle Buntsandstein to the Lias, being recently also recorded in the Lower Buntsandstein. They are most common in gray claystones, mudstones, fine-grained sandstones as well as limestones finely laminated with claystones. Accumulation of miospores dispersed in sediment is usually

<sup>19</sup> The systematics after R. Potonié (1956—1970).

related to sedimentation in nearshore zone of basin, of the delta or lagoon type. Saccate pollen grains were also deposited in areas more distant from the coast. Miospores mainly representing terrestrial plants are sometimes accompanied by very abundant microplankton which is very important for reconstruction of ecological conditions in sedimentary environment.

In rocks, miospores are usually found dispersed, *i.e.* unconnected with parent plants so they are classified with the use of morphographic system of R. Potonié (1956—1970).

Dispersed miospores are of marked value for stratigraphy of the Triassic. The image of Triassic microflora appears markedly diversified due to either evolution of species or changes in their frequency. Taking into account stratigraphic ranges of individual species, the moment of their appearance and quantitative share in spectra, there were differentiated microfloral assemblages of stratigraphic value. On the basis of characteristic assemblages it is possible to date individual members of the Triassic, correlate the studied sediments in area of Poland, as well as to compare them with coeval strata developed in either epicontinental or Alpine facies in other parts of Europe. Attention should be drawn to that fact as miospores are relatively common and frequent in the Triassic.

The Buntsandstein and Muschelkalk have been characterized at early stages of the studies, on the basis of a few borehole columns from western Poland.

The microflora of the Keuper and Rhaetic is better known as the rocks have been studied in numerous borehole columns in the extra-Carpathian Poland. The palynological-stratigraphic scheme of the Keuper and Rhaetic has been compiled on the basis of borehole data from western Poland as sections in that region are relatively complete and tectonically undisturbed.

Table 13 presents selected species of marked stratigraphic value and the plates — these species and holotypes of those described by the authoress. Holotypes of other species of spores and pollen grains from the Keuper of Poland have been described by M. Pautsch (1971, 1973).

The spectrum of the Lower Buntsandstein displays features transitional between Permian and Triassic microflora. It is characterized by high share of pollen grains known from the Upper Permian. Of these, there are usually present *Protohaploxypinus pantii* (Jansonius) Orłowska-Zwolińska, *P. jacobii* (Jansonius) Hart, *Strotersporites richterii* (Klaus) Wilson and *Taeniaesporites noviaulensis* Leschik whereas pollen grains of palinoderm *Lueckisporites virkkiae* normae A, B, C, typical of the Permian only (H. Visscher, 1971), are missing. Floral elements typical of the Triassic here include *Lundbladispota* and *Densoisporites*. The most characteristic is the presence of miospores *Lundbladispota obsoleta* Balme, *L. willmotti* Balme, *Kraeuselisporites apiculatus* Jansonius, *Densoisporites playfordi* (Balme) Dettmann and *Endosporites papillatus* Jansonius.

The assemblage appears markedly similar to microfloral association "Protohaploxypinus", found in the Griesbachian of eastern Greenland by B. E. Balme (1979) and assigned to the Scythian in accordance with the ammonite subdivision of E. T. Tozer (1967).

The Middle Buntsandstein is characterized by occurrence of well preserved microflora, easy to identify on the basis of its specific composition. Miospores Proximegerminantes predominate quantitatively in the spectrum. The most important of these include genera *Densoisporites* (with the species *D. nejburgii*) and *Lundbladispota*.

Spores *Lycoposporites* and *Lundbladispota* are regarded as botanically affined to spores Lycopodiales. This statement is best supported by similarity in structure

of exine of spores *Densoisporites nejburgii* (Schulz) Balme and those of fossil plant *Pleuromeia rossica* Neuburg from the Triassic of the USSR, shown by O. P. Jaroshenko (1975). The results of these comparisons make it possible to speak about vivid development of lycopods plants, regarded as halophytes overgrowing saline, swampy coasts of laggons in times of sedimentation of the Middle Buntsandstein.

Affinity with any known plants is still debatable in the case of *Cycloverruiriletes presselensis* Schulz which is of utmost importance for stratigraphy, on account of its short vertical range and wide geographic distribution. It may be only stated that its morphological features suggest similarity to fern spores.

Less numerous but common miospores belong to the species *Cyclotriletes oligogranifer* Mädlér and *C. microgranifer* Mädlér, *Punctatisporites triassicus* Schulz and genera *Spharipollenites* and *Cycadopites* (Table 13). Spores *Cyclotriletes* appear morphologically similar to those of Osmundaceae (K. Mädlér, 1964b), and *Punctatisporites* — to spores of still imprecisely identified ferns.

In the case of Disaccites, attentions should be paid to pollen grains belonging to *Striatiti*, especially those of the genera *Taniaesporites* Leschik emend. Klaus and *Protohaploxypinus* Samoilovitch emend. Hart.

Disacciatrileti are represented by species of the genus *Platysaccus* Naumova.

A strikingly different microflora, rich in species and individuals, occurs in the Rhöt. The major difference between the above spectra is connected with predominance of the group *Variegerminantes* in number of species and individuals. It is represented by genera: *Taniaesporites*, *Protohaploxypinus* and *Striatoabietites*.

Rhöt rocks are also characterized by *Angustisulcites* Freudenthal emend. Visscher, unknown from older ones.

The microfloral assemblage of the Rhöt is also characterized by the appearance of pollen grains *Triadispora* Klaus. This genus is widely known from the Rhöt and usually represented by large numbers of specimens (Table 13). The grains are regarded as botanically affined to extinct plants of the order Coniferales.

In the case of *Disacciatriletes*, attention should be mainly paid to *Voltziaesporites heteromorpha* Klaus (Table 13). Large pollen grains *Brachysaccus ovalis* Mädlér are also characteristic there.

In the above assemblage, especially when it comes from upper part of the section, attention should be also paid to the occurrence of spores *Microcachrydites* (Cookson) Couper and *Succinctisporites grandior* Leschik sensu Mädlér. The latter presumably represents the family Lebachiaceae of Coniferales.

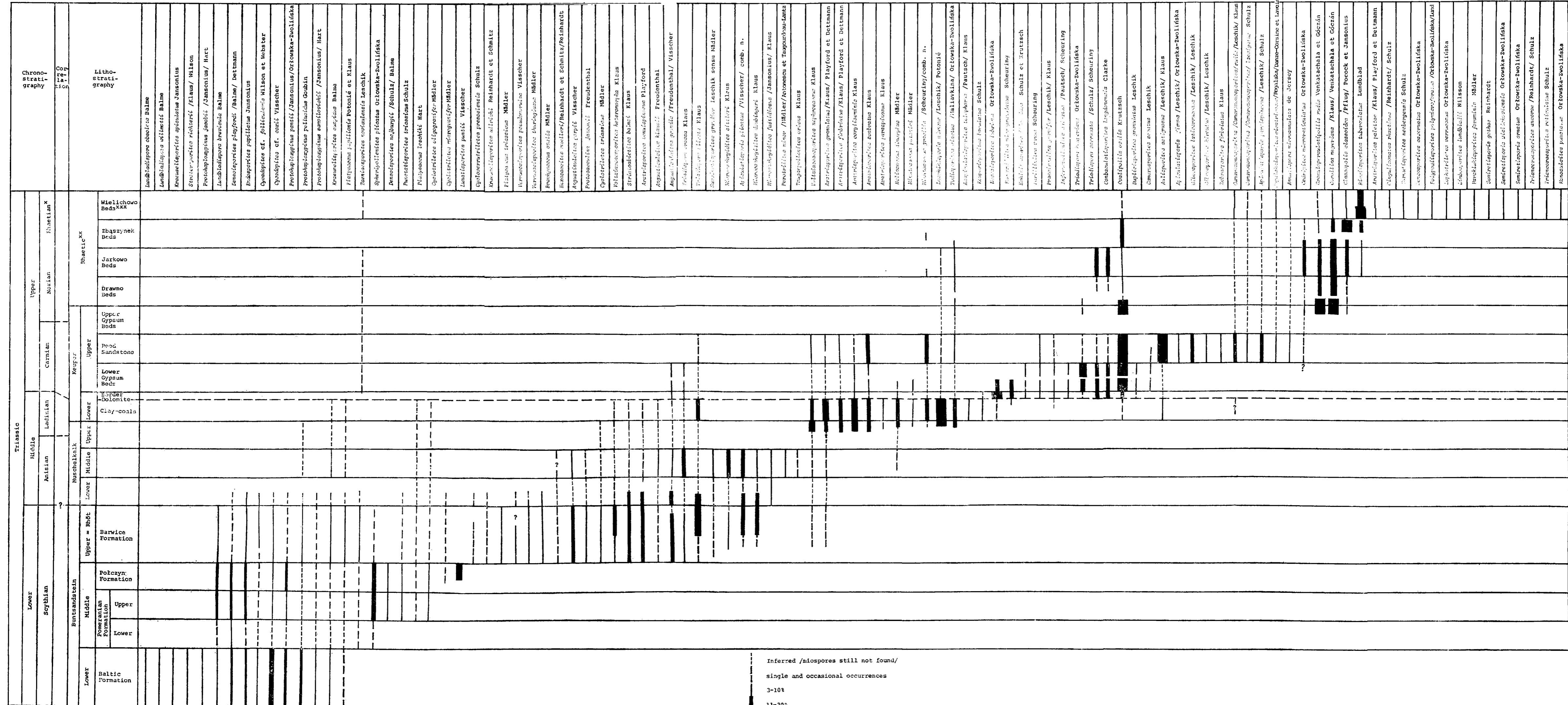
Of the *Monocolpates* group, there were identified *Cycadopites* and *Monosulcites* sp.

The share of the *Proximegerminantes* group is small in the Rhöt strata. Spores *Densoisporites nejburgii* (Schulz) Balme sporadically occur in the Rhöt, only locally forming large accumulations. In turn, Triassic species of the genus *Verrucosisporites*, belonging to Pteropsida, are regularly distributed. Spores of Lycopsida were presumably represented by the genus *Aratrisporites* (Leschik) Playford et Dettmann with stratigraphically important species *A. tenuispinosus* Playford.

In Muschelkalk rocks, mainly carbonate, miospores have been primarily reported from subordinate intercalations of claystones and mudstones so the obtained image remains incomplete. Microflora recorded in lower part of the Lower Muschelkalk appears similar to the Rhöt. It should be noted that similar

Stratigraphic range

the extra-Carpathian Poland (T. Orłowska-Zwolińska)



- - - - - Inferred / miospores still not found /  
 single and occasional occurrences  
 3-10%  
 11-30%  
 31-50%  
 over 50%

\*Alpine stage according to chronostratigraphic subdivision.  
 xx. Lithostratigraphic unit differentiated in area of epicontinental sedimentation in Poland in the Triassic.  
 xxx. Miospore assemblage characteristic for the Wielichowo Beds in western Poland also known from the Bartoszyce Beds in north-east Poland.

microfloral assemblages, characterized by predominance of Coniferales, have been repeatedly noted in the Rhöt and Muschelkalk (H. Visscher, A. L. T. M. Commissaris, 1968; E. G. Smith, G. Warrington, 1971; G. Warrington, 1973).

In Lower Muschelkalk section, miospores are often accompanied by abundant microplankton. Microfloral assemblage characterized by predominance of microplankton and subordinate share of pollen grains is of facies significance. It indicates marine character of sediments, in which planktonic forms represent autochthonous elements, and large grains of Coniferales pollen — elements presumably brought by wind from neighbouring land area.

As it was stated above, spores are rather innumerable in the assemblage. Of them, attention should be paid to the presence of *Perotrilites minor* (Mädler) Antonescu et Taugourdeau-Lantz and *Cristianisporites triangulatus* Antonescu and *Concentricisporites nevesi* Antonescu, indicative of the Lower Muschelkalk spectrum in Poland and, at the same time, making possible correlation of the strata and the Anisian in the Alps.

The successive well-developed microfloral assemblage has been found in rocks dated at the Middle Muschelkalk. It does not comprise microplankton but only miospores representing terrestrial plants. Middle Muschelkalk microflora is still rich in pollen grains (Table 13). The *Proximegerminantes* is represented by innumerable specimens.

The assemblage, still displaying several features in common with the Rhöt microflora, is characterized by cooccurrence of the species *Perotrilites minor* (Mädler) Antonescu et Taugourdeau-Lantz and *Tsugaepollenites oriens* Klaus. Their presence is specific for that assemblage and it makes possible dating of the strata of the Middle Muschelkalk as Middle Anisian in the chronostratigraphic subdivision.

In the Upper Muschelkalk, sporomorphs have been hitherto recorded in top parts of the section only. The top parts are built of carbonates with gray clay intercalations which yield rich microflora, comprising both miospores and microplankton. Plankton predominates in samples coming from lower part of that interval, and miospores become more abundant in the upper part (Table 13).

Planktonic microorganisms, still predominating in top part of the Upper Muschelkalk, are also present in the Lower Keuper but in smaller amounts and somewhat changed specific composition. Along with development of continental sedimentary conditions in the Keuper, the microorganisms disappeared and the microfloral spectrum became enriched in spores and pollen grains.

The *Proximegerminantes* group is characterized by quantitative predominance of spores *Aratrisporites* (Leschik) Playford et Dettmann and *Todisporites* Couper (Table 13).

*Aratrisporites*, although known from older strata, is regarded as characteristic element of Keuper microflora as it appears neither omnipresent nor dominant below the Keuper. On the basis of morphological similarity to spores of modern Isoëtaceae, it is interpreted as a representative of lycopod plants. Fossil spores with morphology of *Aratrisporites* were found together with macrofossils of *Cylostrobus*, assigned to tree-like Lycopsida (R. Helby, A. R. M. Martin, 1965) in the Triassic of Australia.

Of spores less frequent in the strata, attention should be paid to *Leschikisporis aduncus* (Leschik) Potonié, similar in morphology to spores of fossil plant *Asterotheca meriani* Brongniart, fern of the family Marattiaceae, found in the Upper Triassic of Austria. Spores *Todisporites* and *Cyclotriletes* are regarded as belonging

to ferns of the family Osmundaceae. The botanic affinity remains debatable in the case of some spores important for stratigraphy of the Keuper, such as *Palaeosporangisporis europaeus* Schulz and *Keuperisporites baculatus* Schulz.

The Lower Keuper assemblage also comprises numerous pollen grains of Coniferales. Moreover, it is characterized by the presence of large monosaccate grains *Heliosaccus dimorphus* Mädlér. Microflora of top part of the Upper Muschelkalk and Lower Keuper display features of the Ladinian ones.

Strata of the Border Dolomite (top of the Lower Keuper) display a radical change in Lower Keuper microfloral assemblage (Plate 13). Gray clay intercalations in that member yield a number of new species and genera and the shares of individual miospores in the spectrum change.

Although sedimentation of the Border Dolomite proceeded in marine environment, character of the microflora was probably influenced by new climatic conditions, clearly marked in times of sedimentation of the Lower Gypsum Beds (the lowest member of the Upper Keuper).

The Border Dolomite microfloral assemblage displays a decrease in share of spores. It comprises large numbers of pollen grains *Ovalipollis* Krutzsch, representing extinct plants possibly belonging to Coniferales (B. W. Scheuring, 1970). In this assemblage, there are also highly common pollen grains *Triadispora* Klaus, also known from the Lower and Middle Triassic but here including some typical Keuper species: *T. keuperiana* Orłowska-Zwolińska and *T. verrucata* (Schulz) Scheuring. According to B. W. Scheuring (1976), similar grains with clear trilete mark on the body have been found *in situ* in cone *Sertostrobus laxus* Grauvogel-Stamm. Taking into account the structural similarity of *Sertostrobus* and *Voltziostrobus*, he inferred affinity of *Triadispora* and conifers Voltziaceae.

The assemblage also comprises numerous pollen grains *Eucommiidites microgranulatus* Scheuring. The genus *Eucommiidites* is regarded as affined to grains of cycads (Cycadopsida).

*Conbaculatisporites longdonensis* Clarke and *Echinitosporites iliacoides* Schulz et Krutzsch predominate among spores.

*Praecirculina granifer* (Leschik) Klaus and *Duplicisporites granulatus* Leschik appear for the first time in the Border Dolomite, and *Camerosporites secatus* Leschik — in the overlaying Lower Gypsum Beds.

The above discussed microflora of the Border Dolomite continues to occur in the Lower Gypsum Beds, generally forming a single spore-pollen assemblage. The differences are mainly connected with extinction of *Echinitosporites iliacoides* Schulz et Krutzsch and increase in frequency of *Triadispora verrucata* (Schulz) Scheuring in higher parts of the Lower Gypsum Beds.

The Border Dolomite microflora still comprises elements typical of the Ladinian, especially *Echinitosporites iliacoides* Schulz et Krutzsch and *Eucommiidites microgranulatus* Scheuring but its character is generally close to Carnian microflora, which is evidenced by appearance of species of the Circumpolles group: *Duplicisporites granulatus* (Leschik) emend. Klaus, *Praecirculina granifer* (Leschik) Klaus, and mass occurrence of *Ovalipollis* sp. div. Microflora of the Lower Gypsum Beds corresponds to the Carnian on account of the presence of *Camerosporites secatus* Leschik emend. Clarke and *Enzonalsporites* sp. div.

The overlaying Reed Sandstone displays repeated increase in share of the Proximegerminantes group. After arid period, connected with sedimentation of the Lower Gypsum Beds, the climate became once more humid and moderate

and, therefore, favourable for intense development of vegetation. Several species recorded in the Reed Sandstone, especially those of the genera *Aratrisporites* and *Todisporites*, are known from the Lower Keuper spectrum. Nevertheless, the Reed Sandstone microflora, rich in species, markedly differs from others Keuper assemblages (Table 13). The differences are connected with mass occurrence of the species *Aulisporites astigosus* (Leschik) Klaus in some sections as well as first appearance of several species in the Keuper: *Rogalskaisporites cicatricosus* (Rogalska) Danzé-Corsin et Laveine, *Camarozonosporites* (*Camarozonosporites*) *rudis* (Leschik) Klaus, *Zebrasporites fimbriatus* Klaus and others.

Frequent occurrence of spores *Todisporites* and *Leschikisporis* indicates, as it was mentioned above, vivid development of ferns Osmundaceae and Marattiaceae. Fossil spores *Toroisporis*, sometimes common, also represent Pteridopsida. Increase in number of specimens of *Aratrisporites* sp. div. and occurrence of spores *Kraeuselisporites* sp. div. and *Camarozonosporites* sp. div. are connected with development of Lycopsida. The share of spores *Calamospora tener* (Leschik) de Jersey, sometimes large, emphasizes the importance of horsetails Sphaenopsida.

Among Variegerminantes, *Ovalipollis* are most common, being accompanied by less frequent *Brachysaccus* and other Disaccites of poorly known systematic position.

Attention should be also paid to *Gibeosporites lativerrucosus* (Leschik) Leschik, 1959 and *G. hirsutus* (Leschik) Leschik, 1959 on account of their short stratigraphic range.

The presence of index species makes it possible to precise the age of Reed Sandstone strata at the Julian substage of the Carnian stage.

Vivid development of vegetation in times of sedimentation of the Reed Sandstone became possibly impeded by the onset of arid, desert climatic conditions, predominating in times of sedimentation of the Upper Gypsum Beds. This is shown by both the character of strata and the lack of sporomorphs.

Microflora does not reappear below the top part of the Upper Gypsum Beds. In these strata, it is mainly represented by *Granuloperculatipollis rudis* Venkatachala et Góczán and *Corollina meyeriana* (Klaus) Venkatachala et Góczán, presumably belonging to the extinct family Cheirolepidaceae (Coniferopsida). The miospores appeared for the first time in the Norian in the Alps (W. Klaus, 1960; H. Mostler *et al.*, 1978). This suggests that gray claystones and mudstones of the top part of the Upper Gypsum Beds, in which they have been recorded, may be correlated with the Norian. The above species are also present in the uppermost Triassic in Poland.

Epicontinental sediments of the uppermost Triassic, separating the Upper Gypsum Beds of the Keuper and the Liassic, were traditionally termed as the Rhaetic. According to the scheme given by R. Dadlez and J. Kopik (1963), they comprise the following members in western part of the country (from the base upwards): Drawno, Jarkowo, Zbąszynek and Wielichowo Beds. The Rhaetic in that meaning is a lithostratigraphic unit and its range does not agree with that of the chronostratigraphic Rhaetic stage but rather falls within the interval of the Alpine stages Norian and Rhaetic. Microfloral assemblages of the Norian and Rhaetic are similar and difficult to separate (H. Mostler *et al.*, 1978). Moreover, the Norian-Rhaetic boundary is delineated in various ways (see *e.g.* J. Wiedmann *et al.*, 1979; E. T. Tozer, 1979). It follows that at present it is still impossible to establish chronostratigraphic position of strata of the uppermost

Triassic in Poland in unequivocal way as this depends on further decisions concerning stratotypes in area of geosynclinal Triassic.

The above discussed strata of the uppermost Triassic in Poland yield rich microflora. In that microflora, there may be differentiated two characteristic assemblages which give basis for establishing two palynological zones. An older assemblage, found in the Drawno, Jarkowo and Zbąszynek Beds (but most often in higher parts of the Jarkowo and Zbąszynek Beds), is characterized by continuing frequent occurrence of pollen grains *Corollina* sp. div. and *Granuloperculatipollis rudis* Venkatachala et Góczán and appearance of a successive species of the family Cheirolepidaceae, i.e. *Classopollis classoides* (Pflug) Pocock et Jansonius. Affinity of that species with the family Cheirolepidaceae has been confirmed by identification of the genus *Hirmerella* Horhammer (syn. *Cheirolepis* Schimper) as parent plant of the dispersed miospores.

According to V. A. Vachrameev (1970), Cheirolepidaceae represented a group of tree-like plants, growing on slopes of elevated areas under rather arid climatic conditions.

Other elements common in the above mentioned strata include *Enzonalaspores*, *Ovalipollis*, *Brachysaccus neomundanus* (Leschik) Mädler and *Cedripites microreticulatus* Orłowska-Zwolińska. Specimens of *Ricciisporites tuberculatus* Lundblad, initially innumerable in the section, became important component of the spectrum in higher parts of the Zbąszynek Beds and overlaying Wielichowo Beds.

The assemblage is also characterized by spores with stratigraphic ranges exceeding the above mentioned time interval but representing constant and characteristic element of the microflora: *Nevesisporites limatulus* Playford, *Carnisporites granulatus* Schulz, *Heliosporites reissingeri* (Harris) Chaloner and *Taurocusporites* sp. div.

Botanic suggestions may be put forward only in the case of *Heliosporites reissingeri* (Harris) Chaloner which displays marked morphological similarity to spores of recent plant *Selaginella selaginoides* (Linnaeus) Link. The spore-pollen assemblage of the Drawno, Jarkowo and Zbąszynek Beds represents type of microflora rather coherent in general character. The age of this assemblage probably may be defined as Norian.

A sudden, very clear change in vegetation is found in the overlaying Wielichowo Beds (R. Dadlez, J. Kopik, 1963; J. Kopik, 1967). The species predominating in spore-pollen assemblage of underlying strata are either almost completely missing there or represented by markedly less numerous populations whereas there appear spores with stratigraphic range close or slightly larger than the Wielichowo Beds: *Triancoraesporites ancorae* (Reinhardt) Schulz, *T. reticulatus* Schulz, *Cornutisporites seebergensis* Schulz, *Semiretisporis gothae* Reinhardt, *S. wielichoviensis* Orłowska-Zwolińska, *Cingulizonates rhaeticus* (Reinhardt) Schulz, *Polypodiisporites polymicroforatus* (Orłowska-Zwolińska) Lund and *Limbosporites lundbladii* Nilsson.

The assemblage is also characterized by very high share of *Ricciisporites tuberculatus* Lundblad and smooth *Triletes*. The latter display morphological similarity to Cyatheaceae, Schizeaceae and Dipteridaceae.

In the spectra of the Wielichowo Beds there may be noted predominance of spores presumably belonging to Pteridophyta on pollen grains representing fossil Coniferopsida. This indicates mainly humid climate, favourable for Pteridophyta plants, under limnic conditions predominating at that time in the extra-Carpathian Poland. This microflora defines Rhaetic age of the sediments.

## Anteturma PROXIMEGERMINANTES Potonié, 1970

Turma *Triletes*—Azonales (Reinsch, 1881) Potonié, 1970

## Subturma Azonotriletes Luber, 1935

Infraturma *Laevigati* (Bennie et Kidston, 1886) Potonié, 1956Genus *Aulisporites* Leschik, 1955 emend. Klaus, 1960*Aulisporites astigosus* (Leschik, 1955) Klaus, 1960

Plate LXII, Figs. 3, 4

1955 *Calamospora astigosus* n. sp.; G. Leschik, p. 22, pl. 2, fig. 17.1960 *Aulisporites astigosus* (Leschik) nov. comb.; W. Klaus, p. 119, pl. 28, figs. 2, 3.1979 *Aulisporites astigosus* (Leschik) Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 166, pl. 58, figs. 3, 4.Collection<sup>20</sup>. — MUZ IG 487/63, 489/1.

Occurrence. — Extra-Carpathian Poland (Lower Keuper — single occurrences, Reed Sandstone — mass occurrences). (TOZ)

Genus *Punctatisporites* (Ibrahim, 1933) Potonié et Kremp, 1954*Punctatisporites triassicus* Schulz, 1964

Plate XLVII, Figs. 5, 6

1964 *Punctatisporites triassicus* nov. sp.; E. Schulz, p. 598, pl. 1, fig. 1.1973 *Punctatisporites* sp.; M. I. Bogatscheva, K. V. Vinogradova, pl. 1, fig. 1.1979 *Punctatisporites triassicus* Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 166, pl. 43, figs. 5, 6.

Collection. — MUZ IG 482/18, 482/12.

Occurrence. — Western Poland (Middle Buntsandstein). (TOZ)

Genus *Todisporites* Couper, 1958*Todisporites cinctus* (Maliavkina, 1964) Orłowska-Zwolińska, 1971

Plate LXII, Figs. 1, 2

1964 *Neocalamites punctata* (Maliavkina) emend. Maliavkina var. *cincta* Maliavkina; V. S. Maliavkina, p. 40, pl. 24a, fig. 1.1966 *Todisporites* sp. 2; E. Schulz, pl. 5c, no. 210.1971 *Todisporites cinctus* Maliavkina nov. comb.; T. Orłowska-Zwolińska, p. 635, pl. 1, figs. 1—4.1979 *Todisporites cinctus* (Maliavkina) Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 166, pl. 58, figs. 1, 2.

Collection. — MUZ IG 485/37, 489/107.

Occurrence. — Western, north-eastern Poland and Góry Świętokrzyskie Mts (top part of Upper Muschelkalk and Lower Keuper — mass occurrences, Upper Keuper and Rhaetic — single occurrences). (TOZ)

Infraturma *Apiculati* (Bennie et Kidston, 1886) Potonié, 1956Genus *Cyclotriletes* Mädlar, 1964*Cyclotriletes microgranifer* Mädlar, 1964

Plate XLVII, Figs. 1—3, Plate LI, Fig. 1

<sup>20</sup> Number of preparation, in which a given specimen is kept in the collections.

- 1964b *Cyclotriletes microgranifer* nov. sp.; K. Mädlér, pp. 35, 99, pl. 1, figs. 2, 3; pl. 8, fig. 19.  
 1979 *Cyclotriletes microgranifer* Mädlér; T. Orłowska-Zwolińska (in: Atlas...), p. 167, pl. 43, figs. 1—3, pl. 47, fig. 1.

Collection. — MUZ IG 482/12, 482/36, 482/26, 483/144.

Occurrence. — Western Poland (Middle Buntsandstein and Rhöt — fairly common, Upper Muschelkalk and Lower Keuper — sporadical). (TOZ)

*Cyclotriletes oligo-granifer* Mädlér, 1964

Plate XLVII, Fig. 4

- 1964b *Cyclotriletes oligo-granifer* nov. sp.; K. Mädlér, pp. 39, 99, pl. 1, fig. 1; pl. 5, fig. 4; pl. 8, fig. 18.  
 1979 *Cyclotriletes oligo-granifer* Mädlér; T. Orłowska-Zwolińska (in: Atlas...), p. 167, pl. 43, fig. 4.

Collection. — MUZ IG 482/11.

Occurrence. — Western Poland (Middle Buntsandstein, Rhöt, Upper Muschelkalk and Lower Keuper). (TOZ)

*Cyclotriletes triassicus* Mädlér, 1964

Plate LI, Figs. 2—4

- 1964b *Cyclotriletes triassicus* nov. sp.; K. Mädlér, p. 41, pl. 1, fig. 7.  
 1968 cf. *Cyclotriletes triassicus* Mädlér; H. Visscher, A. L. T. M. Commissaris, pl. 1, figs. 6—8.  
 1979 *Cyclotriletes triassicus* Mädlér; T. Orłowska-Zwolińska (in: Atlas...), p. 168, pl. 47, figs. 2—4.

Collection. — MUZ IG 483/133.

Occurrence. — Western Poland (Rhöt and Lower and Middle Muschelkalk). (TOZ)

Genus *Cycloverru-triletes* Schulz, 1964  
*Cycloverru-triletes presselensis* Schulz, 1964

Plate XLVII, Fig. 7; Plate XLVIII, Figs. 1, 2, 4

- 1964 *Cycloverru-triletes presselensis* nov. sp.; E. Schulz, p. 601, pl. 1, fig. 4.  
 1979 *Cycloverru-triletes presselensis* Schulz; T. Orłowska-Zwolińska (in: Atlas...), p. 168, pl. 43, fig. 7; pl. 44, figs. 1, 2, 4.

Collection. — MUZ IG 482/17, 482/19, 482/11.

Occurrence. — Western Poland (upper part of Middle Buntsandstein). (TOZ)

Genus *Verrucosiporites* (Ibrahim, 1933) Potonié et Kremp, 1954  
*Verrucosiporites pseudomorulae* Visscher, 1967

Plate LII, Figs. 1, 2

- 1967 *Verrucosiporites pseudomorulae* nov. sp.; H. Visscher, p. 331, pl. 1, fig. 4; text-fig. 5c.  
 1979 *Verrucosiporites pseudomorulae* Visscher; T. Orłowska-Zwolińska (in: Atlas...), p. 168, pl. 48, figs. 1, 2.

Collection. — MUZ IG 483/141, 483/135.

Occurrence. — Western Poland (Rhöt). (TOZ)

*Verrucosiporites thuringiacus* Mädlér, 1964

Plate LII, Fig. 6; Plate LIII, Fig. 1

- 1964b *Verrucosiporites thuringiacus* nov. sp.; K. Mädlar, p. 43, pl. 1, fig. 10.  
 1965 *Triassisporites roeticus* nov. sp.; E. Schulz, p. 258, pl. 20, figs. 4, 5.  
 1979 *Verrucosiporites thuringiacus* Mädlar; T. Orłowska-Zwolińska (*in: Atlas...*), p. 169, pl. 48, fig. 6; pl. 49, fig. 1.

Collection. — MUZ IG 481/164, 481/166.

Occurrence. — Western Poland (Rhöt and Lower Muschelkalk). (TOZ)

Genus *Anapiculatisporites* R. Potonié et Kremp, 1954  
*Anapiculatisporites telephorus* (Pautsch, 1958) Klaus, 1960

Plate LXII, Figs. 5, 6

- 1958 *Sporites telephorus* nov. sp.; M. Pautsch, p. 323, pl. 1, fig. 12.  
 1960 *Anapiculatisporites telephorus* (Pautsch) nov. comb.; W. Klaus, p. 124, pl. 29, fig. 17.  
 1962 *Anapiculatisporites telephorus* (Klaus) Jansonius non *Sporites telephorus* Pautsch; J. Jansonius, p. 45.  
 1964b *Carnisporites telephorus* (Pautsch) nov. comb.; K. Mädlar, p. 95, pl. 8, fig. 9.  
 1971 *Carnisporites cf. telephorus* (Pautsch) Mädlar; M. Pautsch, p. 13, pl. 2, fig. 3.  
 1979 *Anapiculatisporites telephorus* (Pautsch) Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 169, pl. 58, figs. 5, 6.

Collection. — MUZ IG 488/77.

Occurrence. — North-western and southern Poland, Carpathian foreland, Góry Świętokrzyskie Mts (top part of Upper Muschelkalk—Keuper—Rhaetic). (TOZ)

Genus *Apiculatisporis* R. Potonié et Kremp, 1956  
*Apiculatisporis firmus* (Leschik, 1955) Orłowska-Zwolińska, 1976

Plate LXII, Fig. 8

- 1955 *Apiculatasporites firmus* nov. sp.; G. Leschik, p. 33, pl. 4, fig. 13.  
 1976 *Apiculatisporis firmus* (Leschik) nov. comb.; T. Orłowska-Zwolińska, p. 563, pl. 1, fig. 8.  
 1979 *Apiculatisporis firmus* (Leschik) Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 169, pl. 58, fig. 8.

Collection. — MUZ IG 488/3.

Occurrence. — Central Poland (Reed Sandstone). (TOZ)

*Apiculatisporis parvispinosus* (Leschik, 1955) Schulz, 1962

Plate LXII, Figs. 7, 10

- 1955 *Apiculatisporites parvispinosus* Leschik; G. Leschik, p. 17, pl. 2, figs. 1—4.  
 1962 *Apiculatisporis parvispinosus* (Leschik); E. Schulz, p. 312, pl. 2, figs. 16—19.  
 1979 *Apiculatisporis parvispinosus* (Leschik) Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 170, pl. 58, figs. 7, 10.

Collection. — MUZ IG 488/20, 488/47.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone, Wielichowo Beds). (TOZ)

*Apiculatisporis plicatus* (Visscher, 1967) Orłowska-Zwolińska, 1979

Plate LI, Figs. 5, 6; Plate LX, Figs. 1, 2

- 1967 *Apiculatasporites plicatus* nov. sp.; H. Visscher, p. 328, pl. 3, fig. 3, text-fig. 3.  
 1979 *Apiculatisporis plicatus* (Visscher) comb. n.; T. Orłowska-Zwolińska (*in: Atlas...*), p. 170, pl. 47, figs. 5, 6; pl. 56, figs 1, 2.

Collection. — MUZ IG 481/128, 481/156, 481/91, 481/90.

Occurrence. — Western Poland (upper part of Rhöt, Middle Muschelkalk).  
(TOZ)

Genus *Lophotriletes* (Naumova, 1937) R. Potonié et Kremp, 1954  
*Lophotriletes verrucosus* Orłowska-Zwolińska, 1966

Plate LXIX, Fig. 2

1966 *Lophotriletes verrucosus* nov. sp.; T. Orłowska-Zwolińska, p. 1010, pl. 2, figs. 11, 12.

non 1967 *Lophotriletes verrucosus* nov. sp.; E. Schulz, p. 561, pl. 2, figs. 12—14.

1979 *Lophotriletes verrucosus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 170, pl. 65, fig. 2.

Collection. — MUZ IG 494/17 (holotype).

Occurrence. — Western Poland (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

Genus *Conbaculatisporites* Klaus, 1960  
*Conbaculatisporites longdonensis* Clarke, 1965

Plate LXIII, Fig. 3

1965 *Conbaculatisporites longdonensis* nov. sp.; R. F. A. Clarke, p. 299, pl. 36, figs. 1—5.

1966 ?*Apiculatisporis megaspinosus* nov. sp.; E. Schulz, p. 131, pl. 3, figs. 3, 4.

1970 *Porcellispora longdonensis* (Clarke) nov. comb.; B. W. Scheuring, p. 103, pl. 37, figs. 398—403, pl. 38, figs. 404—407.

1979 *Conbaculatisporites longdonensis* Clarke; T. Orłowska-Zwolińska (*in: Atlas...*), p. 171, pl. 59, fig. 3.

Collection. — MUZ IG 487/89.

Occurrence. — Extra-Carpathian Poland (Keuper — Boundary Dolomite and Lower Gypsum Beds — common, Reed Sandstone — single specimens and Jarkowo Beds — common). (TOZ)

Genus *Keuperisporites* Schulz, 1965  
*Keuperisporites baculatus* Schulz, 1965

Plate LXIII, Figs. 1, 2

1965 *Keuperisporites baculatus* nov. sp.; E. Schulz, p. 259, pl. 20, figs. 1—3.

1979 *Keuperisporites baculatus* Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 171, pl. 59, figs. 1, 2.

Collection. — MUZ IG 489/153, 485/84.

Occurrence. — Western Poland, Góry Świętokrzyskie Mts, Carpathian foreland (Lower Keuper). (TOZ)

Infracrura **Murornati** R. Potonié et Kremp, 1954

Genus *Limbosporites* Nilsson, 1958  
*Limbosporites lundbladii* Nilsson, 1958

Plate LXXI, Figs. 4, 5

1958 *Limbosporites lundbladii* nov. sp.; T. Nilsson, p. 47, pl. 3, fig. 7.

1979 *Limbosporites lundbladii* Nilsson; T. Orłowska-Zwolińska (*in: Atlas...*), p. 172, pl. 67, figs. 4, 5.

Collection. — MUZ IG 494/31, 494/32.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bar-toszyce Beds). (TOZ)

Genus *Polypodiisporites* Potonié et Gellrich ex Potonié, 1956  
*Polypodiisporites polymicroforatus* (Orłowska-Zwolińska, 1966) Lund, 1977

Plate LXIX, Figs. 3, 6

- 1966 *Foveosporites polymicroforatus* nov. sp.; T. Orłowska-Zwolińska, p. 1011, pl. 3, figs. 19—21.  
1967 *Convolutispora microfoveolata* nov. sp.; E. Schulz, p. 571, pl. 6, figs. 10, 11.  
1977 *Polypodiisporites polymicroforatus* (Orłowska-Zwolińska) nov. comb.; J. J. Lund, p. 58, pl. 3, figs. 6a, b.

Collection. — MUZ IG 493/29 (holotype).

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bar-toszyce Beds). (TOZ)

Genus *Paraklukisporites* Mädlér, 1964  
*Paraklukisporites foraminis* Mädlér, 1964

Plate LXX, Figs. 2, 3

- 1964a *Paraklukisporites foraminis* nov. sp.; K. Mädlér, p. 193, pl. 3, fig. 13.  
1966 *Foveosporites cavernatus* nov. sp.; T. Orłowska-Zwolińska, p. 1010, pl. 2, figs. 13, 14.  
1979 *Paraklukisporites foraminis* Mädlér; T. Orłowska-Zwolińska (*in: Atlas...*), p. 172, pl. 66, figs. 2, 3.

Collection. — MUZ IG 494/7.

Occurrence. — Western Poland (Wielichowo Beds and Lower Liassic). (TOZ)

Genus *Rogalskaisporites* Danzé-Corsin et Laveine, 1963  
*Rogalskaisporites cicatricosus* (Rogalska, 1954) Danzé-Corsin et Laveine, 1963

Plate LXII, Fig. 9

- 1954 *Sporites cicatricosus* nov. sp.; M. Rogalska, p. 26, pl. 12, fig. 11.  
1963 *Rogalskaisporites cicatricosus* (Rogalska) nov. comb.; P. Briche, P. Danzé-Corsin, J. P. Laveine, p. 80.  
1967 *Stereisporites* (*Rogalskaisporites*) *cicatricosus* (Rogalska) Danzé-Corsin et Laveine emend.; E. Schulz, p. 557, pl. 1, figs. 8, 9.  
1979 *Rogalskaisporites cicatricosus* (Rogalska) Danzé-Corsin et Laveine; T. Orłowska-Zwolińska (*in: Atlas...*), p. 173, pl. 58, fig. 9.

Collection. — MUZ IG 488/36.

Occurrence. — Western, southern and central Poland (Reed Sandstone — Middle Jurassic). (TOZ)

Genus *Semiretisporis* Reinhardt, 1962  
*Semiretisporis gothae* Reinhardt, 1962

Plate LXIX, Figs. 1, 4

- 1962 *Semiretisporites gothae* nov. sp.; P. Reinhardt, p. 709, pl. 2, figs. 6, 8.  
1979 *Semiretisporis gothae* Reinhardt; T. Orłowska-Zwolińska (*in: Atlas...*), p. 173, pl. 65, figs. 1, 4.

Collection. — MUZ IG 493/29.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bar-toszyce Beds). (TOZ)

*Semiretisporis ornatus* Orłowska-Zwolińska, 1966

Plate LXX, Figs. 1, 7

- 1966 *Semiretisporis ornatus* nov. sp.; T. Orłowska-Zwolińska, p. 1092, pl. 5, figs. 24, 25.  
 1979 *Semiretisporis ornatus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 174, pl. 66, figs. 1, 7.

Collection. — MUZ IG 494/12, 494/11 (holotype).

Occurrence. — Western Poland (Wielichowo Beds). (TOZ)

*Semiretisporis wielichoviensis* Orłowska-Zwolińska, 1966

Plate LXIX, Fig. 5

- 1966 *Semiretisporis wielichoviensis* nov. sp.; T. Orłowska-Zwolińska, p. 1012, pl. 4, fig. 3.  
 1967 *Semiretisporis maljawkinae* nov. sp.; E. Schulz, p. 578, pl. 10, fig. 6; pl. 11, fig. 3.  
 1979 *Semiretisporis wielichoviensis* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 174, pl. 65, fig. 5.

Collection. — MUZ IG 494/14 (holotype).

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bar-toszyce Beds). (TOZ)

Genus *Zebрасporites* Klaus, 1960*Zebрасporites fimbriatus* Klaus, 1960

Plate LXVIII, Fig. 10

- 1960 *Zebрасporites fimbriatus* nov. sp.; W. Klaus, p. 139, pl. 30, fig. 22.  
 1979 *Zebрасporites fimbriatus* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 174, pl. 64, fig. 10.

Collection. — MUZ IG 488/29.

Occurrence. — Southern, central and north-eastern Poland (Reed Sandstone). (TOZ)

Turma **Triletes—Zonales** (Bennie et Kidston, 1886) Potonié, 1970

## Subturma Auritotriletes Potonié et Kremp, 1954

Infraturma **Auriculati** (Schopf, 1938) Potonié et Kremp, 1954Genus *Cornutisporites* Schulz, 1962*Cornutisporites seebergensis* Schulz, 1962

Plate LXX, Fig. 4

- 1962 *Cornutisporites seebergensis* nov. sp.; E. Schulz, p. 310, pl. 2, figs. 7, 8.  
 1979 *Cornutisporites seebergensis* Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 175, pl. 66, fig. 4.

Collection. — MUZ IG 494/17.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bar-toszyce Beds). (TOZ)

Genus *Triancoraesporites* Schulz, 1962*Triancoraesporites ancorae* (Reinhardt, 1962) Schulz, 1967

Plate LXX, Fig. 5

- 1962 *Walzispora ancorae* nov. sp.; P. Reinhardt, p. 705, pl. 1, fig. 14.  
 1962 *Triancoraesporites communis* nov. sp.; E. Schulz, p. 311, pl. 2, fig. 4.

- 1967 *Triancoraesporites ancorae* (Reinhardt) nov. comb.; E. Schulz, p. 580, pl. 11, figs. 4, 5.  
 1979 *Triancoraesporites ancorae* (Reinhardt) Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 175, pl. 66, fig. 5.

Collection. — MUZ IG 494/9.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

*Triancoraesporites reticulatus* Schulz, 1962

Plate LXX, Fig. 6

- 1962 *Triancoraesporites reticulatus* nov. sp.; E. Schulz, p. 311, pl. 2, figs. 12, 13.  
 1979 *Triancoraesporites reticulatus* Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 175, pl. 66, fig. 6.

Collection. — MUZ IG 494/16.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

Subturma Zonotriletes Waltz, 1935

Infraturma *Cingulati* (Potonié et Kremp, 1954), Dettmann, 1963

Genus *Annulispora* de Jersey, 1959

*Annulispora microannulata* de Jersey, 1962

Plate LXII, Figs. 11, 12

- 1962 *Annulispora microannulata* nov. sp.; N. J. de Jersey, p. 5, pl. 1, figs. 16, 17, 19.  
 1979 *Annulispora microannulata* de Jersey; T. Orłowska-Zwolińska (*in: Atlas...*), p. 176, pl. 58, figs. 11, 12.

Collection. — MUZ IG 491/117, 486/43.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone and Wielichowo Beds). (TOZ)

Genus *Cingulizonates* (Dybová et Jachowicz, 1957) Butterworth, Jansonius, Smith et Staplin, 1964

*Cingulizonates rhaeticus* (Reinhardt, 1962) Schulz, 1967

Plate LXXI, Figs. 1—3

- 1962 *Aequitriradites rhaeticus* nov. sp.; P. Reinhardt, p. 709, pl. 2, fig. 3.  
 1966 *Cingulizonates delicatus* nov. sp.; T. Orłowska-Zwolińska, p. 1014, pl. 7, fig. 36.  
 1967 *Cingulizonates rhaeticus* (Reinhardt) nov. comb.; E. Schulz, p. 584, pl. 13, figs. 6, 7.  
 1970 *Cingulizonates insignis* nov. sp.; E. V. Semenova, p. 83, pl. 2, figs. 21a, b.  
 1979 *Cingulizonates rhaeticus* (Reinhardt) Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 176, pl. 67, figs. 1—3.

Collection. — MUZ IG 494/25, 494/26, 488/78.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

Genus *Densosporites* (Berry, 1937) Potonié et Kremp, 1954

*Densosporites cavernatus* Orłowska-Zwolińska, 1966

Plate LXXI, Figs. 7—9

- 1966 *Densosporites cavernatus* nov. sp.; T. Orłowska-Zwolińska, p. 1013, pl. 6, figs. 26, 29, 30.

- 1967 *Densosporites foveocingulatus* nov. sp.; E. Schulz, p. 582, pl. 12, figs. 7, 8.  
 1979 *Densosporites cavernatus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 177, pl. 67, figs. 7—9.

Collection. — MUZ IG 494/6, 494/17 (holotype).

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

Genus *Densoisporites* Weyland and Krieger emend. Dettmann, 1963  
*Densoisporites nejburgii* (Schulz, 1964) Balme, 1970

Plate XLVIII, Figs. 3, 5—8

- 1964 *Lundbladispора nejburgii* nov. sp.; E. Schulz, p. 604, pl. 2, figs. 8, 9.  
 1970 *Densoisporites nejburgii* (Schulz) nov. comb.; B. E. Balme, p. 341, pl. 4, figs. 5—8.  
 1979 *Densoisporites nejburgii* (Schulz) Balme; T. Orłowska-Zwolińska (*in: Atlas...*), p. 177, pl. 44, figs. 3, 5—8.

Collection. — MUZ IG 492/80, 492/102, 481/191, 482/28, 482/11.

Occurrence. — Western Poland (Middle Buntsandstein — very common, Rhöt — single to sporadic occurrences). (TOZ)

*Densoisporites playfordi* (Balme, 1963) Dettmann, 1963

Plate XLVIII, Figs. 9, 10

- 1963 *Lundbladispора playfordii* nov. sp.; B. E. Balme, p. 23, pl. 5, figs. 4—8, text-fig. 2a, b.  
 1963 *Densoisporites* (al. *Lundbladispора*) *playfordi* Balme nov. comb.; M. E. Dettmann, p. 83.  
 1979 *Densoisporites playfordi* (Balme) Dettmann; T. Orłowska-Zwolińska (*in: Atlas...*), p. 178, pl. 44, figs. 9, 10.

Collection. — MUZ IG 492/68, 492/101.

Occurrence. — Western Poland (Lower and Middle Buntsandstein — common, Rhöt — sporadic occurrences). (TOZ)

Genus *Nevesisporites* de Jersey et Paten, 1964  
*Nevesisporites lubricus* Orłowska-Zwolińska, 1972

Plate LXIII, Fig. 6

- 1972 *Nevesisporites lubricus* nov. sp.; T. Orłowska-Zwolińska, p. 309, pl. 6, figs. 41, 42.  
 1979 *Nevesisporites lubricus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 178, pl. 59, fig. 6.

Collection. — MUZ IG 489/47 (holotype).

Occurrence. — Góry Świętokrzyskie Mts (Lower Keuper). (TOZ)

Infraturma *Patinati* Butterworth et Williams, 1958

Genus *Camarozonosporites* Pant, 1954 ex Potonié, 1956 emend. Klaus, 1960  
*Camarozonosporites* (*Camarozonosporites*) ditto in W. Krutzsch, 1963  
*Camarozonosporites* (*Camarozonosporites*) *laevigatus* Schulz, 1967

Plate LXIII, Fig. 9

- 1967 *Camarozonosporites* (*Camarozonosporites*) *laevigatus* sp. nov.; E. Schulz, p. 572, pl. 7, figs. 7—9; pl. 25, fig. 3.  
 1979 *Camarozonosporites* (*Camarozonosporites*) *laevigatus* Schulz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 178, pl. 59, fig. 9.

Collection. — MUZ IG 488/28.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone and Wielichowo Beds). (TOZ)

*Camarozonosporites (Camarozonosporites) rudis* (Leschik, 1955) Klaus, 1960

Plate LXIII, Figs. 7, 8

1955 *Verrucosisporites rudis* nov. sp.; G. Leschik, p. 1, pl. 1, fig. 12.

1960 *Camarozonosporites rudis* (Leschik) nov. comb. et emend.; W. Klaus, p. 136, pl. 29, figs. 12, 14.

1967 *Camarozonosporites (Camarozonosporites) rudis* (Leschik) Klaus; E. Schulz, p. 572, pl. 7, figs. 3—6.

1979 *Camarozonosporites (Camarozonosporites) rudis* (Leschik); T. Orłowska-Zwolińska (in: Atlas...), p. 179, pl. 59, figs. 7, 8.

Collection. — MUZ IG 491/117, 487/82.

Occurrence. — Extra-Carpathian Poland (Lower Keuper? — sporadically, Reed Sandstone and Wielichowo Beds — regularly). (TOZ)

Infraturma **Zonati** Potonié et Kremp, 1954

Genus *Endosporites* Wilson et Coe, 1940

*Endosporites papillatus* Jansonius, 1962

Plate XLIX, Figs. 4—6

1962 *Endosporites papillatus* nov. sp.; J. Jansonius, p. 50, pl. 11, figs. 28—31.

1979 *Endosporites papillatus* Jansonius; T. Orłowska-Zwolińska (in: Atlas...), p. 179, pl. 45, figs. 4—6.

Collection. — MUZ IG 482/33, 482/35, 482/34.

Occurrence. — Western Poland (Lower and Middle Buntsandstein — fairly common, Rhöt and Lower Muschelkalk — rare). (TOZ)

Genus *Kraeuselisporites* (Leschik, 1955) Jansonius, 1962

*Kraeuselisporites cuspidus* Balme, 1963

Plate LII, Fig. 5; Plate LX, Fig. 6

1963 *Kraeuselisporites cuspidus* nov. sp.; B. E. Balme, p. 19, pl. 5, figs. 9—11, text-fig. 2c, d.

1979 *Kraeuselisporites cuspidus* Balme; T. Orłowska-Zwolińska (in: Atlas...), p. 179, pl. 48, fig. 5; pl. 56, fig. 6.

Collection. — MUZ IG 483/127, 481/79.

Occurrence. — Western Poland (Buntsandstein and Lower Muschelkalk). (TOZ)

*Kraeuselisporites ullrichi* Reinhardt et Schmitz, 1965

Plate LIII, Fig. 3

1965 *Kraeuselisporites ullrichi* nov. sp.; P. Reinhardt, W. Schmitz, p. 22, pl. 3, figs. 1—3, 7; pl. 4, figs. 4—6.

1979 *Kraeuselisporites ullrichi* Reinhardt et Schmitz; T. Orłowska-Zwolińska (in: Atlas...), p. 180, pl. 49, fig. 3.

Collection. — MUZ IG 481/169.

Occurrence. — Western Poland (Rhöt and Lower Muschelkalk). (TOZ)

Genus *Perotrilites* Couper, 1953*Perotrilites minor* (Mädler, 1964) Antonescu et Taugourdeau—Lantz, 1973)

Plate LX, Figs. 3—5, 8, 9

1964b *Aequitriradites minor* nov. sp.; K. Mädler, p. 78, pl. 5, figs. 14—20.1973 *Perotrilites minor* (Mädler) nov. comb.; E. Antonescu, J. Taugourdeau—Lantz, p. 7, pl. 6, figs. 63—68, 71, 74.1979 *Perotrilites minor* (Mädler) Antonescu et Taugourdeau—Lantz; T. Orłowska-Zwolińska (*in: Atlas...*), p. 180, pl. 56, figs. 3—5, 8, 9.

Collection. — MUZ IG 481/79, 481/80, 481/81.

Occurrence. — Western Poland (Lower and Middle Muschelkalk). (TOZ)

Turma *Monoletes* Ibrahim, 1933Subturma *Azonomonoletes* Luber, 1955Infraturma *Laevigatomoleti* Dybová et Jachowicz, 1957Genus *Leschikisporis* Potonié, 1958 emend. Bharadwaj et Singh, 1964*Leschikisporis aduncus* (Leschik, 1955) Potonié, 1958

Plate LXIII, Figs. 4, 5

1955 *Punctatosporites aduncus* nov. sp.; G. Leschik, p. 27, pl. 3, figs. 16, 17.1958 *Leschikisporis aduncus* (Leschik) nov. comb.; R. Potonié, p. 18, pl. 1, fig. 9.1979 *Leschikisporis aduncus* (Leschik) Potonié; T. Orłowska-Zwolińska (*in: Atlas...*), p. 180, pl. 59, figs. 4, 5.

Collection. — MUZ IG 487/66, 489/37.

Occurrence. — Extra-Carpathian Poland (top part of Upper Muschelkalk—Keuper). (TOZ)

Infraturma *Sculptatomoleti* Dybová et Jachowicz, 1957Genus *Aratrisporites* (Leschik, 1955) Playford et Dettmann, 1965*Aratrisporites coryliseminis* Klaus, 1960

Plate LXIV, Figs. 4, 5

1960 *Aratrisporites coryliseminis* nov. sp.; W. Klaus, p. 147, pl. 53, figs. 39, 40.1979 *Aratrisporites coryliseminis* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 181, pl. 60, figs. 4, 5.

Collection. — MUZ IG 485/38, 485/40.

Occurrence. — Extra-Carpathian Poland (top part of Upper Muschelkalk—Keuper). (TOZ)

*Aratrisporites granulatus* (Klaus, 1960) Playford et Dettmann, 1965

Plate LXIV, Figs. 7, 8

1949 *Pollenites saturni* nov. sp.; F. Thiergart, p. 12, pl. 1, fig. 20.1960 *Saturnisporites granulatus* nov. sp.; W. Klaus, p. 143, pl. 32, fig. 34.1964b *Aratrisporites saturni* (Thiergart, 1949) nov. comb.; K. Mädler, p. 104, pl. 9, figs. 8—12.1965 *Aratrisporites granulatus* (Klaus) nov. comb.; G. Playford, M. E. Dettmann, p. 152.1979 *Aratrisporites granulatus* (Klaus) Playford et Dettmann; T. Orłowska-Zwolińska (*in: Atlas...*), p. 181, pl. 60, figs. 7, 8.

Collection. — MUZ IG 484/57, 483/125.

Occurrence. — Extra-Carpathian Poland (Rhöt and Middle Muschelkalk — sporadically, top part of Upper Muschelkalk and Keuper—common, Reed Sandstone — fairly common). (TOZ)

*Aratrisporites fimbriatus* (Klaus, 1960) Playford et Dettmann, 1965

Plate LX, Fig. 7; Plate LXIV, Fig. 11

1960 *Saturnisporites fimbriatus* nov. sp.; W. Klaus, pp. 142, 143, pl. 32, figs. 32, 33.

1965 *Aratrisporites fimbriatus* (Klaus) nov. comb.; G. Playford, M. E. Dettmann, p. 152.

1979 *Aratrisporites fimbriatus* (Klaus) Playford et Dettmann; T. Orłowska-Zwolińska, p. 182, pl. 56, fig. 7; pl. 60, fig. 11.

Collection. — MUZ IG 481/80, 485/38.

Occurrence. — Extra-Carpathian Poland (Rhöt and Middle Muschelkalk — sporadically, top part of Upper Muschelkalk and Lower Keuper — regular and common, Reed Sandstone — sporadically). (TOZ)

*Aratrisporites palettae* (Klaus, 1960) Playford et Dettmann, 1965

Plate LXXI, Fig. 6

1960 *Saturnisporites palettae* nov. sp.; W. Klaus, p. 144, pl. 32, fig. 36.

1965 *Aratrisporites palettae* (Klaus) nov. comb.; G. Playford, M. E. Dettmann, p. 152.

1966 *Saturnisporites spinosus* nov. sp.; T. Orłowska-Zwolińska, p. 1014, pl. 9, figs. 44, 45.

1979 *Aratrisporites palettae* (Klaus) Playford et Dettmann; T. Orłowska-Zwolińska (*in: Atlas*), p. 182, pl. 67, fig. 6.

Collection. — MUZ IG 494/16.

Occurrence. — Western (Wielichowo Beds) and north-eastern Poland (Bartoszyce Beds). (TOZ)

*Aratrisporites paraspinosus* Klaus, 1960

Plate LXIV, Figs. 3, 6

1960 *Aratrisporites paraspinosus* nov. sp.; W. Klaus, p. 148, pl. 33, figs. 43, 44.

1979 *Aratrisporites paraspinosus* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 182, pl. 60, figs. 3, 6.

Collection. — MUZ IG 487/87, 485/12.

Occurrence. — Extra-Carpathian Poland (top part of Upper Muschelkalk, Lower and Upper Keuper). (TOZ)

*Aratrisporites scabratus* Klaus, 1960

Plate LXIV, Figs. 9, 10

1960 *Aratrisporites scabratus* nov. sp.; W. Klaus, p. 147, pl. 32, figs. 37, 38.

1979 *Aratrisporites scabratus* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 183, pl. 60, figs. 9, 10.

Collection. — MUZ IG 485/35, 489/44.

Occurrence. — Extra-Carpathian Poland (top part of Upper Muschelkalk, Lower Keuper — very common, Lower Gypsum Beds and Reed Sandstone — innumerable). (TOZ)

*Aratrisporites tenuispinosus* Playford, 1965

Plate LII, Figs. 3, 4

1965 *Aratrisporites tenuispinosus* nov. sp.; G. Playford, p. 196, pl. 11, figs. 3—7.

1979 *Aratrisporites tenuispinosus* Playford; T. Orłowska-Zwolińska (in: Atlas), p. 183, pl. 48, figs. 3, 4.

Collection. — MUZ IG 483/140, 481/131.

Occurrence. — Western Poland (Rhöt — regularly, Muschelkalk and Lower Keuper — sporadically). (TOZ)

Genus *Echinosporites* Schulz et Krutzsch, 1961  
*Echinosporites iliacooides* Schulz et Krutzsch, 1961

Plate LXIV, Figs. 1, 2

1961 *Echinosporites iliacooides* nov. sp.; E. Schulz, W. Krutzsch, p. 122, pl. 18, figs. 1—20.

1979 *Echinosporites iliacooides* Schulz et Krutzsch; T. Orłowska-Zwolińska (in: Atlas...), p. 183, pl. 60, figs. 1, 2.

Collection. — MUZ IG 485/30.

Occurrence. — Extra-Carpathian Poland (Lower Keuper — sporadically, Border Dolomite and lower part of Lower Gypsum Beds — regularly and very frequently). (TOZ)

Anteturma VARIEGERMINANTES Potonié, 1970

Turma *Saccites* Erdtman, 1947

Subturma *Monosaccites* (Chitaley, 1951) Potonié et Kremp, 1954

Infraturma *Aletesacciti* Leschik, 1955

Genus *Heliosaccus* Mädlar 1964  
*Heliosaccus dimorphus* Mädlar, 1964

Plate LXV, Figs. 1, 2

1964a *Heliosaccus dimorphus* nov. sp.; K. Mädlar, p. 172, pl. 1, figs. 6, 7.

1970 *Walchiites crassus* nov. sp.; L. M. Varjuchina, pl. 2, fig. 1.

1971 *Circulisaccus major* nov. sp.; M. Pautsch, p. 28, pl. 7, figs. 1, 4; pl. 8, fig. 1.

1973 *Cordaitina major* (Pautsch) nov. comb.; M. Pautsch, p. 134, pl. 3, figs. 1, 4, 5.

1979 *Heliosaccus dimorphus* Mädlar; T. Orłowska-Zwolińska (in: Atlas...), p. 184, pl. 61, figs. 1, 2.

Collection. — MUZ IG 488/72.

Occurrence. — Western and northern Poland, Góry Świętokrzyskie Mts (top part of Muschelkalk — sporadically, Lower Keuper — regularly), Carpathian foreland—Trzciana section studied by M. Pautsch (1971) (Lower Keuper<sup>21</sup>). (TOZ)

Infraturma *Saccizonati* Bharadwaj, 1957

Genus *Tsugaepollenites* Potonié et Benitz, 1934  
*Tsugaepollenites oriens* Klaus, 1964

Plate LXI, Figs. 6, 7, 9

1964 *Tsugaepollenites oriens* nov. sp.; W. Klaus, p. 15, pl. 4, fig. 42.

1970 *Cerebropollenites mesozoicus* (Couper) Nilsson; E. Antonescu, p. 25, pl. 12, fig. 1.

1979 *Tsugaepollenites oriens* Klaus; T. Orłowska-Zwolińska (in: Atlas...), p. 184, pl. 57, figs. 6, 7, 9.

<sup>21</sup> According to E. Głowacki and H. Senkowiczowa (1969).

Collection. — MUZ IG 481/80, 481/81, 481/90.

Occurrence. — Western Poland (Middle Muschelkalk). (TOZ)

Subturma *Disaccites* Cookson, 1947

Infraturma *Striatiti* Pant, 1954

Genus *Infernopollenites* Scheuring, 1970

*Infernopollenites sulcatus* (Pautsch, 1958) Scheuring, 1970

Plate LXVI, Fig. 2

1958 *Pollenites sulcatus* nov. sp.; M. Pautsch, p. 323, pl. 1, fig. 8.

1964 *Taemiaesporites sulcatus* (Pautsch) nov. comb.; G. F. Hart, p. 1188.

1970 *Infernopollenites sulcatus* (Pautsch) nov. comb.; B. W. Scheuring, p. 45, pl. 13, figs. 79—82; pl. 14, figs. 87, 88.

1971 *Umbrellisaccus sulcatus* (Pautsch) nov. comb.; M. Pautsch, p. 33, pl. 11, figs. 1, 3.

1979 *Infernopollenites sulcatus* (Pautsch) Scheuring; T. Orłowska-Zwolińska (in: Atlas...), p. 185, pl. 62, fig. 2.

Collection. — MUZ IG 485/27.

Occurrence. — North-western Poland, Silesian-Cracow Upland, Góry Świętokrzyskie Mts, Carpathian foreland (Lower Keuper — sporadical, Border Dolomite, Lower Gypsum Beds — regular, Reed Sandstone — sporadical). (TOZ)

Genus *Lunatisporites* Leschik, 1956 emend. Bharadwaj, 1962

*Lunatisporites puntii* Visscher, 1967

Plate L, fig. 1; Plate LIV, Fig. 5

1967 *Lunatisporites puntii* nov. sp.; H. Visscher, p. 358, text-fig. 25, pl. 14, fig. 3.

1979 *Lunatisporites puntii* Visscher; T. Orłowska-Zwolińska (in: Atlas...), p. 185, pl. 46, fig. 1; pl. 50, fig. 5.

Collection. — MUZ IG 481/189, 483/133.

Occurrence. — Western Poland (Middle Buntsandstein — rare, Rhöt and Lower Muschelkalk — regular). (TOZ)

Genus *Ovalipollis* Krutzsch, 1955

*Ovalipollis ovalis* Krutzsch, 1955

Plate LXV, Fig. 3

1955 *Ovalipollis ovalis* nov. sp.; W. Krutzsch, p. 70, pl. 1, figs. 1—5.

non 1962 *Ovalipollis ovalis* Krutzsch?; J. Jansonius, pl. 13, fig. 9.

1979 *Ovalipollis ovalis* Krutzsch; T. Orłowska-Zwolińska (in: Atlas...), p. 186, pl. 61, fig. 3.

Collection. — MUZ IG 487/89.

Occurrence. — Extra-Carpathian Poland (Lower Keuper — sporadical, Border Dolomite and Zbąszynek Beds — regular and common, Wielichowo Beds and Liassic — single). (TOZ)

Genus *Parillinites* Scheuring, 1970

*Parillinites vanus* Scheuring, 1970

Plate LXVI, Fig. 1

1970 *Parillinites vanus* nov. sp.; B. W. Scheuring, p. 38, pl. 7, fig. 32; pl. 8, figs. 35, 36.

1979 *Parillinites vanus* Scheuring; T. Orłowska-Zwolińska (*in: Atlas...*), p. 186, pl. 62, fig. 1.

Collection. — MUZ IG 485/27.

Occurrence. — Western and southern Poland (Border Dolomite and Lower Gypsum Beds). (TOZ)

Genus *Protohaploxypinus* (Samoilovitch, 1953)

Hart, 1964

*Protohaploxypinus pellucidus* Goubin, 1965

Plate XLIX, Figs. 1—3

1965 *Protohaploxypinus pellucidus* nov. sp.; N. Goubin, p. 1423, pl. 2, figs. 4—6.

1970 *Taeniaesporites pellucidus* (Goubin) nov. comb.; B. E. Balme, p. 373, pl. 13, figs. 8—10.

1979 *Protohaploxypinus pellucidus* Goubin; T. Orłowska-Zwolińska (*in: Atlas...*), p. 187, pl. 45, figs. 1—3.

Collection. — MUZ IG 482/33, 481/196, 481/191.

Occurrence. — Western Poland (Lower and Middle Buntsandstein — common, Rhöt — single). (TOZ)

*Protohaploxypinus samoilovichii* (Jansonius, 1962) Hart, 1964

Plate LVI, Fig. 6

1962 *Striatites samoilovichii* nov. sp.; J. Jansonius, p. 67, pl. 14, figs. 9—11.

1964 *Protohaploxypinus samoilovichii* (Jansonius) nov. comb.; G. F. Hart, p. 1181, text-fig. 18.

1979 *Striatites samoilovichii* Jansonius; T. Orłowska-Zwolińska (*in: Atlas...*), p. 187, pl. 52, fig. 6, pl. 53, fig. 1.

Collection. — MUZ IG 483/133.

Occurrence. — Western Poland (Lower Buntsandstein—Muschelkalk). (TOZ)

Genus *Protosacculina* Maliavkina, 1953

*Protosacculina jansonii* Freudenthal, 1964

Plate LIII, Figs. 2, 7; Plate LX, Fig. 10

1964 *Protosacculina jansonii* nov. sp.; T. Freudenthal, p. 228, pl. 5, figs. 3a—d.

1979 *Protosacculina jansonii* Freudenthal; Orłowska-Zwolińska (*in: Atlas...*), p. 187, pl. 49, figs. 2, 7, pl. 56, fig. 10.

Collection. — MUZ IG 483/142, 483/141, 481/79.

Occurrence. — Western Poland (Rhöt and Middle Muschelkalk). (TOZ)

Genus *Striatoabietites* Sedova, 1956

*Striatoabietites balmei* Klaus, 1964

Plate LIII, Figs. 4—6

1964 *Striatoabietites balmei* nov. sp.; W. Klaus, p. 12, pl. 2, fig. 17.

1967 *Tubantiapollenites balmei* (Klaus) nov. comb.; H. Visscher, p. 365, pl. 19, fig. 5, text-fig. 28c.

1979 *Striatoabietites balmei* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 188, pl. 49, figs. 4—6.

Collection. — MUZ IG 483/130, 481/168.

Occurrence. — Western Poland (Rhöt — regular, Muschelkalk and Lower Keuper — sporadic). (TOZ)

Genus *Succinctisporites* Leschik, 1955 emend. Mädlar, 1964  
*Succinctisporites grandior* Leschik, 1955 sensu Mädlar, 1964

Plate LIV, Figs. 1, 3

- 1964b *Succinctisporites grandior* (Leschik, 1955) emend.; K. Mädlar, p. 109, pl. 9, figs. 22, 23; pl. 10, figs. 1—3.  
 1964 *Illinites chitinooides* nov. sp.; W. Klaus, p. 12, pl. 3, fig. 25.  
 1965 *Sahnisporites thuringensis* nov. sp.; E. Schulz, p. 274, pl. 22, figs. 14—16.  
 1965 *Chordasporites singulichorda* Klaus; R. F. A. Clarke, p. 306, pl. 38, figs. 1—3.  
 1979 *Succinctisporites grandior* Leschik, sensu Mädlar; T. Orłowska-Zwolińska (*in: Atlas...*), p. 188, pl. 50, figs. 1, 3.

Collection. — MUZ IG 483/132, 483/131.

Occurrence. — Western Poland, Góry Świętokrzyskie Mts, Carpathian foreland (Rhöt, Lower Muschelkalk and Lower Keuper — common, Reed Sandstone — sporadic). (TOZ)

Genus *Taeniaesporites* Leschik, 1956 emend. Klaus, 1963  
*Taeniaesporites noviaulensis* Leschik, 1956

Plate LVI, Fig. 2

- 1956 *Taeniaesporites noviaulensis* nov. sp.; G. Leschik, p. 134, pl. 22, fig. 1.  
 1962 *Taeniaesporites novimundi* nov. sp.; J. Jansonius, p. 63, pl. 13, figs. 19—25.  
 1979 *Taeniaesporites noviaulensis* Leschik; T. Orłowska-Zwolińska (*in: Atlas...*), p. 189, pl. 52, fig. 2.

Collection. — MUZ IG 481/159.

Occurrence. — Extra-Carpathian Poland (Buntsandstein—Rhaetic — sporadic). (TOZ)

Infraturma *Disaccitrileti* Leschik, 1955

Genus *Angustisulcites* Freudenthal, 1964, emend. Visscher, 1967  
*Angustisulcites gorpü* Visscher, 1967

Plate LV, Fig. 3

- 1967 *Angustisulcites gorpü* nov. sp.; H. Visscher, p. 356, pl. 15, figs. 5, 6; pl. 16, fig. 1, text-fig. 24c.  
 1979 *Angustisulcites gorpü* Visscher; T. Orłowska-Zwolińska (*in: Atlas...*), p. 189, pl. 51, fig. 3.

Collection. — MUZ IG 481/174.

Occurrence. — Western Poland (Rhöt and Lower and Middle Muschelkalk). (TOZ)

*Angustisulcites grandis* (Freudenthal) Visscher, 1967

Plate LVI, Fig. 1

- 1964 *Falcisporites ? grandis* nov. sp.; T. Freudenthal, p. 220, pl. 5, fig. 1.  
 1967 *Angustisulcites grandis* (Freudenthal) nov. comb.; H. Visscher, p. 356, pl. 16, figs. 3, 4A, B; pl. 17, figs. 1, 2.  
 1979 *Angustisulcites grandis* (Freudenthal) Visscher; T. Orłowska-Zwolińska (*in: Atlas...*), p. 189, pl. 52, fig. 1

Collection. — MUZ IG 481/106.

Occurrence. — Western Poland (Rhöt—Lower Keuper). (TOZ)

*Angustisulcites klausii* Freudenthal, 1964

Plate LV, Figs. 1, 2

1964 *Angustisulcites klausii* nov. sp.; T. Freudenthal, p. 222, pl. 2, figs. 6a, b.1964 *Illinites melanocarpus* nov. sp.; W. Klaus, p. 123, pl. 3, fig. 29.1965 *Lueckisporites triassicus* nov. sp.; R. F. A. Clarke, p. 305, pl. 38, figs. 7—11.1979 *Angustisulcites klausii* Freudenthal; T. Orłowska-Zwolińska (*in: Atlas...*), p. 190, pl. 51, figs. 1, 2.

Collection — MUZ IG 483/130, 481/118.

Occurrence. — Western Poland (Rhöt and Lower Muschelkalk — regular and common, Middle and Upper Muschelkalk and Lower Keuper — single). (TOZ)

Genus *Triadispora* Klaus, 1964*Triadispora crassa* Klaus, 1964

Plate LVI, Figs. 3—5, 7; Plate LXI, Fig. 2

1964 *Triadispora crassa* nov. sp.; W. Klaus, p. 6, pl. 1, figs. 1, 2.1979 *Triadispora crassa* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 190, pl. 52, figs. 3—5, 7; pl. 57, fig. 2.

Collection. — MUZ IG 481/141, 483/138, 483/133, 481/163, 481/80.

Occurrence. — Extra-Carpathian Poland (Rhöt and Lower Muschelkalk — common and regular, Middle Muschelkalk, Border Dolomite and Lower Gypsum Beds — rare). (TOZ)

*Triadispora keuperiana* Orłowska-Zwolińska, 1971

Plate LXVII, Figs. 1, 3

1971 *Triadispora keuperiana* nov. sp.; T. Orłowska-Zwolińska, p. 646, pl. 6, figs. 1—4.1979 *Triadispora keuperiana* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 190, pl. 63, figs. 1, 3.

Collection. — MUZ IG 485/27 (holotype).

Occurrence. — Western Poland, Silesian-Cracow Upland (Border Dolomite and Lower Gypsum Beds). (TOZ)

*Triadispora plicata* Klaus, 1964

Plate LVII, Figs. 2, 3; Plate LXI, Fig. 4

1964 *Triadispora plicata* nov. sp.; W. Klaus, p. 4, pl. 2, fig. 15.1979 *Triadispora plicata* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 191, pl. 53, figs. 2, 3; pl. 57, fig. 4.

Collection. — MUZ IG 481/81, 481/140, 481/145.

Occurrence. — Extra-Carpathian Poland (Rhöt — rare, Middle Muschelkalk — common, Border Dolomite and Lower Gypsum Beds — rare). (TOZ)

*Triadispora verrucata* (Schulz, 1966) Scheuring, 1970

Plate LXVII, Figs. 2, 4, 6

1966 *Triadipollenites verrucatus* nov. sp.; E. Schulz, pl. 7, figs. 4—8.1970 *Triadispora verrucata* (Schulz) nov. comb.; B. W. Scheuring, p. 62, pl. 19, figs. 133, 138.1971 *Triadispora undulata* nov. sp.; T. Orłowska-Zwolińska, p. 644, pl. 5, figs. 1—6.

1979 *Triadispora verrucata* (Schulz) Scheuring; T. Orłowska-Zwolińska (*in: Atlas...*), p. 191, pl. 63, figs. 2, 4, 6.

Collection. — MUZ IG 488/66, 487/89, 486/49.

Occurrence. — Western and central Poland, Silesian-Cracow Upland, Góry Świętokrzyskie Mts (Border Dolomite — rare, upper part of Lower Gypsum Beds — very common, Reed Sandstone — single). (TOZ)

### Infraturma *Disacciatrileti* Leschik, 1955

Genus *Brachysaccus* Mädlar, 1964

*Brachysaccus ovalis* Mädlar, 1964

Plate LV, Figs. 4, 5

1964b *Brachysaccus ovalis* nov. sp.; K. Mädlar, p. 63, pl. 3, figs. 5, 6.

1979 *Brachysaccus ovalis* Mädlar; T. Orłowska-Zwolińska (*in: Atlas...*), p. 192, pl. 51, figs. 4, 5.

Collection. — MUZ IG 483/133, 483/139.

Occurrence. — Western Poland (Rhöt and Lower Muschelkalk). (TOZ)

Genus *Cedripites* Wodehouse, 1933

*Cedripites microreticulatis* Orłowska-Zwolińska, 1972

Plate LXXII, Fig. 1

1972 *Cedripites microreticulatus* nov. sp.; T. Orłowska-Zwolińska *in: W. Grodzicka-Szymanko, T. Orłowska-Zwolińska*, p. 226, pl. 5, figs. 32, 34.

1979 *Cedripites microreticulatus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 192, pl. 68, fig. 1.

Collection. — MUZ IG 487/60 (holotype).

Occurrence. — Western Poland and Silesian-Cracow Upland (Upper Keuper — rare, Jarkowo and Zbąszynek Beds — very common). (TOZ)

Genus *Microcachrydites* (Cookson, 1947) Couper, 1953

*Microcachrydites doubingeri* Klaus, 1964

Plate LIX, Fig. 8; Plate LXI, Fig. 5

1964 *Microcachrydites doubingeri* nov. sp.; W. Klaus, p. 15, pl. 3, figs. 27, 28.

1979 *Microcachrydites doubingeri* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 192, pl. 55, fig. 8; pl. 57, fig. 5.

Collection. — MUZ IG 481/131, 481/80.

Occurrence. — Western Poland (upper part of Rhöt and Lower and Middle Muschelkalk). (TOZ)

*Microcachrydites fastidiosus* (Jansonius, 1961) Klaus, 1964

Plate LIX, Figs. 1—3; Plate LXI, Figs. 1, 3

1962 *Klausipollenites fastidiosus* nov. sp.; J. Jansonius, p. 57, pl. 12, fig. 36.

1964 *Microcachrydites fastidiosus* (Jansonius) nov. comb.; W. Klaus, p. 14, pl. 3, figs. 33, 34.

1973 *Microcachrydites fastidiosus* (Jansonius) Klaus; G. Warrington, pl. 1, figs. 3, 12.

1979 *Microcachrydites fastidiosus* (Jansonius) Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 193, pl. 55, figs. 1—3; pl. 57, figs. 1, 3.

Collection. — MUZ IG 483/130, 483/132, 481/90, 481/104.

Occurrence. — Western Poland (upper part of Rhöt and Lower and Middle Muschelkalk). (TOZ)

*Microcachrydites sittleri* Klaus, 1964

Plate LIX, Figs. 5, 6

1964 *Microcachrydites sittleri* nov. sp.; W. Klaus, p. 14, pl. 3, fig. 26; pl. 4, fig. 39.

1965 *Alisporites minutosaccus* nov. sp.; R. F. A. Clarke, p. 310, pl. 35, fig. 12.

1979 *Microcachrydites sittleri* Klaus; T. Orłowska-Zwolińska (in: Atlas...), p. 193, pl. 55, figs. 5, 6.

Collection. — MUZ IG 481/130, 481/115.

Occurrence. — Western Poland (upper part of Rhöt and Lower and Middle Muschelkalk). (TOZ)

Genus *Minutosaccus* Mädlar, 1964

*Minutosaccus gracilis* (Scheuring, 1970) Orłowska-Zwolińska, 1979

Plate LXVII, Figs. 5, 7

1970 *Protodiploxypinus gracilis* nov. sp.; B. W. Scheuring, p. 70, pl. 22, figs. 175—179; pl. 23, figs. 170—187.

1971 *Minutosaccus subcarpaticus* nov. sp.; M. Pautsch, p. 41, pl. 15, fig. 2.

1979 *Minutosaccus gracilis* (Scheuring) comb. n.; T. Orłowska-Zwolińska (in: Atlas...), p. 193, pl. 63, figs. 5, 7.

Collection. — MUZ IG 483/74, 483/96.

Occurrence. — North-western Poland, Góry Świętokrzyskie Mts, Carpathian foreland (top part of Upper Muschelkalk, Lower Keuper and Lower Gypsum Beds). (TOZ)

*Minutosaccus potoniei* Mädlar, 1964

Plate LXVII, Fig. 8

1964b *Minutosaccus potoniei* nov. sp.; K. Mädlar, p. 120, pl. 12, figs. 1—3.

?1971 *Minutosaccus ornatus* nov. sp.; M. Pautsch, p. 42, pl. 15, figs. 5—6.

?1973 *Granisaccus ornatus* (Pautsch) nov. comb.; M. Pautsch, p. 139, pl. 2, figs. 2, 3.

1979 *Minutosaccus potoniei* Mädlar; T. Orłowska-Zwolińska (in: Atlas...), p. 194, pl. 63, fig. 8.

Collection. — MUZ IG 489/51.

Occurrence. — Western Poland, Góry Świętokrzyskie Mts, Carpathian foreland (Middle Muschelkalk — sporadic, top part of Upper Muschelkalk and Lower Keuper — regular and common, Border Dolomite and lower part of Lower Gypsum Beds — single). (TOZ)

Genus *Platysaccus* (Naumova, 1937) ex R. Potonié et Klaus, 1954

*Platysaccus leschiki* Hart, 1960

Plate L, Fig. 6

1960 *Platysaccus leschiki* nov. sp.; G. F. Hart, p. 11, pl. 3, figs. 37, 38.

1979 *Platysaccus leschiki* Hart; T. Orłowska-Zwolińska (in: Atlas...), p. 194, pl. 46, fig. 6.

Collection. — MUZ IG 492/89.

Occurrence. — Western Poland (Middle Buntsandstein, Rhöt, Lower Muschelkalk). (TOZ)

*Platysaccus papilionis* Potonié et Klaus, 1954

Plate L, Fig. 3, Plate LIX, fig. 7

- 1954 *Platysaccus papilionis* nov. sp.; R. Potonié, W. Klaus, p. 539, pl. 10, fig. 12.  
 1979 *Platysaccus papilionis* Potonié et Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 194, pl. 46, fig. 3.

Collection. — MUZ IG 482/36, 483/131.

Occurrence. — Extra-Carpathian Poland (Buntsandstein — common, Lower Keuper). (TOZ)

*Platysaccus triassicus* Mädlér, 1964

Plate LVIII, Fig. 3; Plate LIX, Fig. 4

- 1964b *Platysaccus triassicus* nov. sp.; K. Mädlér, p. 71, pl. 4, fig. 13.  
 1979 *Platysaccus triassicus* Mädlér; T. Orłowska-Zwolińska (*in: Atlas...*), p. 195, pl. 54, fig. 3; pl. 55, fig. 4.

Collection. — MUZ IG 483/130, 483/129.

Occurrence. — Western Poland (Rhöt). (TOZ)

Genus *Voltziaceasporites* Klaus, 1964*Voltziaceasporites heteromorpha* Klaus, 1964

Plate LVIII, Figs. 1, 2

- 1964 *Voltziaceasporites heteromorpha* nov. sp.; W. Klaus, p. 13, pl. 2, figs. 19—22.  
 1979 *Voltziaceasporites heteromorpha* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 195, pl. 54, figs. 1, 2.

Collection. — MUZ IG 483/127, 483/128.

Occurrence. — Western Poland (Rhöt — common and regular, Muschelkalk — single). (TOZ)

*Voltziaceasporites nephrosaccus* Klaus, 1964

Plate LXI, Fig. 8

- 1964 *Voltziaceasporites nephrosaccus* nov. sp.; W. Klaus, p. 13, pl. 1, fig. 11.  
 1979 *Voltziaceasporites nephrosaccus* Klaus; T. Orłowska-Zwolińska (*in: Atlas...*), p. 195, pl. 57, fig. 8.

Collection. — MUZ IG 481/103.

Occurrence. — Western Poland (Middle Muschelkalk). (TOZ)

Subturma *Polysaccites* Cookson, 1947Genus *Hexasaccites* Reinhardt, 1965*Hexasaccites muelleri* (Reinhardt et Schmitz, 1964) Reinhardt, 1965

Plate LVII, Figs. 4—6

- 1964 *Nuscoisporites muelleri* nov. sp. (Reinhardt et Schmitz); P. Reinhardt, p. 612, pl. 1, fig. 5.  
 1965 *Nuscoisporites muelleri* Reinhardt et Schmitz; P. Reinhardt, W. Schmitz, p. 23, pl. 5, figs. 5, 9.  
 1965 *Hexasaccites* n. gen. Reinhardt; P. Reinhardt, W. Schmitz, p. 27.  
 1967 *Triadispora muelleri* (Reinhardt et Schmitz) nov. comb.; H. Visscher, p. 352, pl. 12, figs. 1, 2.  
 1969 *Hexasaccites muelleri* Reinhardt et Schmitz; M. C. Adloff, J. Doubinger, p. 136, pl. 2, fig. 1.

1979 *Hexasaccites muelleri* (Reinhardt et Schmitz) Reinhardt; T. Orłowska-Zwolińska (*in: Atlas...*), p. 196, pl. 53, figs. 4—6.

Collection. — MUZ IG 481/141, 481/118.

Occurrence. — Western Poland (Rhöt and basal part of Lower Muschelkalk). (TOZ)

**Turma Aletes Ibrahim, 1933**

Subturma **Azonaletes** (Luber, 1935) Potonié et Kremp, 1954

Infraturma **Granulonapiti** Cookson, 1947

Genus *Spheripollenites* Couper, 1958 emend. Jansonius, 1962

*Spheripollenites plicatus* Orłowska-Zwolińska, 1979

Plate L, Figs. 4, 5; Plate LIV, Fig. 4

1979 *Spheripollenites plicatus* sp. n.; T. Orłowska-Zwolińska (*in: Atlas...*), p. 196, pl. 46, figs. 4, 5 (holotype); pl. 50, fig. 4.

Collection. — MUZ IG 482/20 (holotype), 483/142.

Occurrence. — Western Poland (Middle Buntsandstein and Rhöt). (TOZ)

Infraturma **Subpilonapiti** (Erdman, 1947) Vimal, 1952

Genus *Gibeosporites* Leschik, 1959

*Gibeosporites hirsutus* (Leschik, 1955) Leschik, 1959

Plate LXVIII, Fig. 4

1955 *Apiculatasporites hirsutus* nov. sp.; G. Leschik, p. 33, pl. 4, fig. 10.

1959 *Gibeosporites* (al. *Apiculatasporites*); G. Leschik, p. 59.

1979 *Gibeosporites hirsutus* (Leschik) Leschik; T. Orłowska-Zwolińska (*in: Atlas...*), pl. 197, pl. 64, fig. 4.

Collection. — MUZ IG 488/21.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TOZ)

*Gibeosporites lativerrucosus* (Leschik, 1955) Leschik, 1959

Plate LXVII, Fig. 9; Plate LXVIII, Fig. 1

1955 *Apiculatasporites lativerrucosus* nov. sp.; G. Leschik, p. 32, pl. 4, fig. 9.

1959 *Gibeosporites lativerrucosus* (Leschik, 1955) nov. comb.; G. Leschik, p. 59.

1979 *Gibeosporites lativerrucosus* (Leschik/Leschik); T. Orłowska-Zwolińska (*in: Atlas...*), p. 197, pl. 63, fig. 9; pl. 64, fig. 1.

Collection. — MUZ IG 488/25, 488/21.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TOZ)

Infraturma **Circumpollini** (Circumpoles Pflug, 1953 emend. Klaus, 1960)  
Potonié, 1966

Genus *Classopollis* (Pflug, 1953) Pocock et Jansonius, 1961

*Classopollis classoides* (Pflug, 1953) Pocock et Jansonius, 1961

Plate LXXII, Fig. 8

1953 *Classopollis classoides* nov. sp.; H. D. Pflug, p. 91, pl. 16, figs. 29—31.

- 1961 *Classopollis classoides* (Pflug) emend. Pocock et Jansonius; S. J. Pocock, J. Jansonius, p. 443, pl. 1, figs. 1—9.  
 1962 *Classopollis torosus* (Reissinger) Balme; W. G. Chaloner, p. 19, pl. 2, figs. 1, 2.  
 ?1970 *Classopollis chateauvovi* nov. sp.; Y. Reyre, p. 313, pl. 55, figs. 11, 12.  
 1979 *Classopollis classoides* (Pflug) Pocock et Jansonius; T. Orłowska-Zwolińska (in: Atlas...), p. 197, pl. 68, fig. 8.

Collection. — MUZ IG 490/15.

Occurrence. — Extra-Carpathian Poland (Jarkowo and Zbąszynek Beds — common, Wielichowo Beds — less common). (TOZ)

Genus *Corollina* Maliavkina, 1949 emend. Venkatachala et Góczán, 1964  
*Corollina meyeriana* (Klaus, 1960) Venkatachala et Góczán, 1964

Plate LXXII, Figs. 3, 6

- 1960 *Circulina meyeriana* nov. sp.; W. Klaus, p. 165, pl. 36, figs. 57—60.  
 1964 *Corollina meyeriana* (Klaus) nov. comb.; B. S. Venkatachala, F. Góczán, p. 215, pl. 3, figs. 1—15.  
 1966 *Gliscopollis meyeriana* (Klaus) nov. comb.; B. S. Venkatachala, p. 99.  
 1973 *Classopollis meyeriana* (Klaus) nov. comb.; N. J. de Jersey, p. 130, pl. 3, figs. 5—10; pl. 4, figs. 4—6.  
 1979 *Corollina meyeriana* (Klaus) Venkatachala et Góczán; T. Orłowska-Zwolińska (in: Atlas...), p. 198, pl. 68, figs. 3, 6.

Collection. — MUZ IG 490/15, 486/11a.

Occurrence. — Western Poland and Silesian-Cracow Upland (top part of Keuper — first appearances, Drawno, Jarkowo and Zbąszynek Beds — common, Wielichowo Beds and Lower Liassic — sporadic). (TOZ)

Genus *Duplicisporites* Leschik, 1955 emend. Klaus, 1960  
*Duplicisporites granulatus* Leschik, 1955 emend. Klaus, 1960

Plate LXVIII, Figs. 5, 6

- 1955 *Duplicisporites granulatus* nov. sp.; G. Leschik, p. 23, pl. 2, fig. 23.  
 1960 *Duplicisporites granulatus* Leschik; W. Klaus, p. 161, pl. 35, fig. 53.  
 1979 *Duplicisporites granulatus* Leschik emend. Klaus; T. Orłowska-Zwolińska (in: Atlas...), p. 198, pl. 64, figs. 5, 6.

Collection. — MUZ IG 486/46, 487/93.

Occurrence. — Western Poland and Silesian-Cracow Upland (Border Dolomite and Lower Gypsum Beds). (TOZ)

Genus *Granuloperculatipollis* Venkatachala et Góczán, 1964  
*Granuloperculatipollis rudis* Venkatachala et Góczán, 1964

Plate LXXII, Figs. 2, 4, 5

- 1964 *Granuloperculatipollis rudis* nov. sp.; B. S. Venkatachala, F. Góczán, p. 219, pl. 3, figs. 22—29.  
 1970 *Spiritisporites spirabilis* nov. sp.; B. W. Scheuring, p. 104, pl. 39, figs. 410—413; pl. 40, figs. 414—422.  
 1979 *Granuloperculatipollis rudis* Venkatachala et Góczán; T. Orłowska-Zwolińska (in: Atlas...), p. 199, pl. 68, figs. 2, 4, 5.

Collection. — MUZ IG 487/60, 486/38.

Occurrence. — Western Poland and Silesian-Cracow Upland (top part of Keuper — mass occurrences, Drawno, Jarkowo and Zbąszynek Beds — common, Wielichowo Beds — sporadic). (TOZ)

Genus *Praecirculina* Klaus, 1960  
*Praecirculina granifer* (Leschik, 1955) Klaus, 1960

Plate LXVIII, Figs. 2, 3

1955 *Granulatosporites granifer* nov. sp.; G. Leschik, p. 30, pl. 3, fig. 23.

1960 *Praecirculina granifer* (Leschik) nov. comb.; W. Klaus, p. 162, pl. 36, fig. 61.

1979 *Praecirculina granifer* (Leschik) Klaus; T. Orłowska-Zwolińska (in: Atlas...), p. 199, pl. 64, figs. 2, 3.

Collection. — MUZ IG 487/88.

Occurrence. — Western Poland and Silesian-Cracow Upland (Border Dolomite — Reed Sandstone). (TOZ)

Turma *Plicates* (Plicata Naumova, 1937, 1939) Potonié, 1960

Subturma *Praecolpates* Potonié et Kremp, 1954

Genus *Eucommiidites* Erdtman, 1948 emend. Couper, 1958

*Eucommiidites microgranulatus* Scheuring, 1970

Plate LXVIII, Figs. 9, 11

1970 *Eucommiidites microgranulatus* nov. sp.; B. W. Scheuring, p. 98, pl. 36, figs. 390—395.

1971 *Eucommiidites sulechoviensis* nov. sp.; T. Orłowska-Zwolińska, p. 648, pl. 5, figs. 5—8.

?1971 *Monosulcites salebrosus* nov. sp.; M. Pautsch, p. 48, pl. 18, fig. 3.

1979 *Eucommiidites microgranulatus* Scheuring; T. Orłowska-Zwolińska (in: Atlas...), p. 199, pl. 64, figs. 9, 11.

Collection. — MUZ IG 485/27, 484/28.

Occurrence. — Western Poland, Góry Świętokrzyskie Mts, Carpathian foreland (Lower Keuper — single, Border Dolomite and lower part of Lower Gypsum Beds — very common). (TOZ)

Subturma *Monocolpates* Iversen et Troels-Smith, 1950

Genus *Cycadopites* Wodehouse, 1933 ex Wilson et Webster, 1946

*Cycadopites* cf. *coxii* Visscher, 1967

Plate L, Fig. 7; Plate LIV, Fig. 2

1979 *Cycadopites* cf. *coxii* Visscher; T. Orłowska-Zwolińska (in: Atlas...), p. 200, pl. 46, fig. 7; pl. 50, fig. 2.

Collection. — MUZ IG 482/33, 481/174.

Occurrence. — Western Poland (Buntsandstein). (TOZ)

*Cycadopites* cf. *follicularis* Wilson et Webster, 1946

Plate XLIX, Fig. 7; Plate L, Fig. 2

1962 *Cycadopites* cf. *C. follicularis* Wilson et Webster, 1946; J. Jansonius, p. 80, pl. 16, figs. 16—20.

1979 *Cycadopites* cf. *follicularis* Wilson et Webster; T. Orłowska-Zwolińska (in: Atlas...), p. 200, pl. 45, fig. 7; pl. 46, fig. 2.

Collection. — MUZ IG 481/210, 482/33.

Occurrence. — Western Poland (Buntsandstein). (TOZ)

Genus *Monosulcites* Cookson et Couper, 1958

*Monosulcites punctatus* Orłowska-Zwolińska, 1966

Plate LXXII, Fig. 7

1966 *Monosulcites punctatus* nov. sp.; T. Orłowska-Zwolińska, p. 1015, pl. 9, fig. 46.

1979 *Monosulcites punctatus* Orłowska-Zwolińska; T. Orłowska-Zwolińska (*in: Atlas...*), p. 200, pl. 68, fig. 7.

Collection. — MUZ IG 494/29 (holotype).

Occurrence. — Western Poland (Wielichowo Beds and Lower Liassic). (TOZ)

### Infraturma *Sculptati* Potonié, 1970

Genus *Camerosporites* Leschik, 1955 emend. Clarke, 1965

*Camerosporites secatus* Leschik, 1955 emend. Clarke, 1965

Plate LXVIII, Figs. 7, 8

1955 *Camerosporites secatus* nov. sp.; G. Leschik, p. 40, pl. 5, fig. 11.

1965 *Camerosporites secatus* Leschik; R. F. A. Clarke, p. 313, pl. 36, figs. 10, 11; pl. 38, figs. 12, 13.

1979 *Camerosporites secatus* Leschik, emend. Clarke; T. Orłowska-Zwolińska (*in: Atlas...*), p. 201, pl. 64, figs. 7, 8.

Collection. — MUZ IG 487/89, 487/88.

Occurrence. — Western Poland, Silesian-Cracow Upland (Lower Gypsum Beds and Reed Sandstone). (TOZ)

### Turma *Jugates* (*Jugata* Erdtman, 1943) Potonié, 1960

Subturma *Tetradites* Cookson, 1947

Genus *Ricciisporites* Lundblad, 1954

*Ricciisporites tuberculatus* Lundblad, 1954

Plate LXXII, Fig. 9

1954 *Ricciisporites tuberculatus* nov. sp.; B. Lundblad, p. 40, pl. 4, figs. 8, 9.

1979 *Ricciisporites tuberculatus* Lundblad; T. Orłowska-Zwolińska (*in: Atlas...*), p. 201, pl. 68, fig. 9.

Collection. — MUZ IG 493/29.

Occurrence. — Extra-Carpathian Poland (Jarkowo and Zbąszynek Beds — single, Wielichowo Beds — mass occurrences). (TOZ)

## MEGASPORES<sup>22</sup>

**General characteristics.** Buntsandstein (RF). The Buntsandstein was hitherto regarded as the Phanerozoic series poorest in fossils. The exception was here the uppermost part of these strata, developed in lagoon-marine facies and with somewhat better paleontological record (Rhöt). A detailed monographic study of Buntsandstein megaspores has been initiated quite recently (R. Fuglewicz, 1973) to state their presence almost throughout the Polish Lowlands and, in the last years, also in the Carpathian region (R. Fuglewicz, 1979).

Rich megaspore material made possible reconstruction of sedimentary environment and paleogeographic conditions. The distribution of some species of Buntsandstein megaspores has been found to be closely related to facies conditions. Mass occurrence of smooth megaspores appears clearly limited to marine facies in the Middle and Upper Buntsandstein. For example, *Trileites polonicus*

<sup>22</sup> The systematics after R. Potonié (1956—1970).

Fuglewicz occurs in large numbers in facies of the Upper Oolite Beds, best developed in platform areas in north-eastern Poland. *Trileites validus* Fuglewicz, another species of smooth megaspores, is known from Rhöt strata only, missing in limnic ones in north-eastern Poland, in which ornamented megaspores predominate.

Buntsandstein megaspore assemblages display close connections with Gondwana. This is indicated by the records of numerous species in common (R. Fuglewicz, 1973). Moreover, the genus *Pusulospirites*, described from the Lower and Middle Buntsandstein of Poland, appears highly similar to Gondwanian genus *Talchirella*. Close connections between Europe and Gondwana in times of sedimentation of the Middle Buntsandstein are also evidenced by the occurrence of representatives of Gondwanian *Glossopteris* flora at the margin of the Góry Świętokrzyskie Mts (T. Bocheński, 1957).

Buntsandstein sections usually display several intervals of strata yielding megaspores and other fossils, and separated by barren ones. An analysis of vertical ranges of megaspores made it possible to distinguish three key assemblage zones which correspond to three phases in evolution of vegetation in the Buntsandstein epoch: the *O. eotriassicus* Zone, typical of the Lower Buntsandstein, the *T. polonicus* — *P. populosus* Zone, typical of the Middle Buntsandstein, and the *T. validus* Zone, typical of the Upper Buntsandstein. The recorded differences in quantitative and qualitative composition of megaspore assemblages made possible further subdivision of the *O. eotriassicus* Zone into two subzones: Lower *O. eotriassicus* Subzone, and Upper *O. eotriassicus* Subzone (Table 14).

The Lower Subzone is defined by the appearance of megaspores above the Barren Interval.

*The O. eotriassicus* Zone. The zone is best represented in the borehole column Otyń IG 1 (Fore-Sudetic Monocline), depth interval 793.0 — 956.0 m. Its base was delineated at the depth where first megaspores appear. Besides megaspores, there were found ostracods, phyllopoas and hystrichospheres.

*Barren interzone.* All the borehole columns displaying full sequence of the Buntsandstein reveal a series of red clayey-siltstone and sandstone rocks without megaspores, which separates the *O. eotriassicus* and *T. polonicus* — *P. populosus* zones. The extent of this barren horizon well agrees with that of the Interoolitic Beds in majority of borehole columns. The exception is here the borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), in which megaspores of the *O. eotriassicus* Zone pass the upper boundary of the Lower Oolitic Beds. The lack of megaspores in the Barren Interzone is probably due to a more arid climatic conditions, related to separation of the Central European Basin from the open sea. This episode seems very typical for the history of the Buntsandstein, presumably affecting the whole area of the basin.

*The T. polonicus* — *P. populosus* Zone. The base of that zone is defined by the first occurrence of megaspores above the Interoolitic Beds, in times of sedimentation of which the conditions were unfavourable for development of plants. This boundary coincides with the base of the Upper Oolitic Beds in almost all the studied sections in the Polish Lowlands. The exception is here the borehole column Studzianna IG 2 (Central Poland), where megaspores of that zone have been found beneath intercalations of oolitic limestones but incompleteness of core recovery should be taken into account. The top of this zone coincides with the top of the Upper Oolitic Beds in north-eastern Poland and Fore-Sudetic Monocline (borehole Gorzów Wielkopolski IG 1) and that of the *Pusulospirites* Siltstone in other parts of the monocline and at the margin of the Góry Świę-

tokrzyskie Mts. Changes in environmental conditions, reflected by differences in facies, resulted in origin of different megaspore assemblages. The *Trileites polonicus* assemblage, described in detail elsewhere (R. Fuglewicz, 1973), is known from oolitic limestones developed in a paralic facies in north-eastern Poland. The *Pusulospirites populosus* assemblage is typical of the Middle Buntsandstein developed in limnic facies. It is best developed in the *Pusulospirites* Siltstone in the borehole column Otyń IG 1 (Fore-Sudetic Monocline).

*Barren Interzone.* In all the studied sections, the *T. polonicus* — *P. populosus* and *T. validus* zones are separated by a complex of red clayey-siltstone and sandstone rocks without any megaspores. These rocks originated under paleogeographic conditions identical as in the case of the Interoolitic Beds and responsible for the extinction of flora of the *T. polonicus* — *P. populosus* Zone.

*The T. validus Zone.* The connections between the Central European Basin and the open sea have been reopened at the beginning of the Upper Buntsandstein, resulting in a change of climate to more humid and, therefore, in the onset of a third phase in development of Lower Triassic vegetation. On the basis of the recorded megaspores, there were differentiated the *T. validus* Zone, traceable almost throughout the area of Poland. The zone, characterized by 30 megaspore species (Table 14), is best represented in the borehole column Tłuszcz IG 1 (Podlasie), in which we are dealing with interfingering of strata of inland facies, rich in plant remains, and those of marine facies. The base of this zone is defined by the first occurrences of megaspores above the Barren Interzone. In several sections, it coincides with lower boundary of the Rhöt but usually it passes somewhat higher, as basal part of the Rhöt (Sub-gypsum Beds) is often developed in the red facies and, therefore, it does not yield megaspores.

Similarly as in the case of the *T. polonicus* — *P. populosus* Zone, composition of megaspore assemblages is found to depend on environmental conditions. Smooth specimens predominate in claystones and siltstones occurring in marine sequences. *Trileites validus* Fuglewicz is most typical of strata of the Rhöt facies and fairly common. *T. tenellus* Fuglewicz appears less widely distributed but locally more common than the former.

The above mentioned smooth species are occasionally found if ever in strata of the inland facies (north-eastern Poland), where ornamented megaspores predominate (R. Fuglewicz, 1973).

The megaspores of the *T. validus* Zone were found to cooccur with rich fossil assemblage, connected mainly with Rhöt strata.

Keuper and Rhaetic. (TM). In studies on the Mesozoic, we are usually dealing with megaspores unconnected with parent plants but rather dispersed in rocks. Therefore, the megaspores are mainly of stratigraphic value, giving rather limited information on the nature of vegetation or ecological conditions in a given geological period. In a few cases it became possible to separate megaspores from the fructifications identified as: *Lycostrobus scotii* Nathorst, *Selaginellites polaris* Lundblad and *Cylostrobus* Helby et Martin, and make more detailed reconstruction of their systematic position. These innumerable findings suggest that megaspores dispersae occurring in Lower Mesozoic rocks represent herbaceous and arborescent heterosporous lycopods (Lycopsidea) unknown from recent flora. They represented terrestrial plants, usually growing in swampy areas and those situated close to lacustrine and other water basins, only intermittently inundated by rivers, floods or inland seas. The lycopod plants developing at these times comprise some other forms, e.g. *Pleuromeia sternbergi* (Muenster)

## Stratigraphic ranges of selected megaspore

| Stratigraphy     |                                | Megaspore zones/subzones          |                                   |  |
|------------------|--------------------------------|-----------------------------------|-----------------------------------|--|
| Rhaetic          |                                |                                   |                                   |  |
| Keuper           |                                |                                   |                                   |  |
| Buntsandstein    | Upper                          | Muschelkalk                       |                                   |  |
|                  |                                | Rhöt                              | <i>Trileites validus</i>          |  |
|                  | Middle                         | Supra-oolitic Beds                | Barren interzone                  |  |
|                  |                                | Fusuloporites Siltstone           | <i>Trileites polonicus</i> -      |  |
|                  |                                | Upper Oolitic Beds                | <i>Fusuloporites populosus</i>    |  |
|                  | Lower                          | Inter-oolitic Beds                | Barren interzone                  |  |
|                  |                                | Lower Oolitic Beds                | <i>Otyriaporites eotriassicus</i> |  |
|                  |                                |                                   | Upper subzone                     |  |
| Sub-oolitic Beds |                                | Barren intrazone                  |                                   |  |
|                  | <i>Otyriaporites</i> Siltstone | <i>Otyriaporites eotriassicus</i> |                                   |  |
|                  |                                | Lower subzone                     |                                   |  |
|                  |                                | Barren interval                   |                                   |  |

Occurrence: ——— index species      ——— common      - - - - - sporadical

Corda and *P. rossica* Neuburg, regarded as halophytic plants which were presumably growing along coasts of saline lakes, shallow embayments and lagoons.

Long distance transport by water or wind is inferred very rarely in the case of megaspores. The megaspores were most often immediately deposited in sedimentary water basins situated in small distance from the place of vegetation of their parent plants. Relatively large size (from 200  $\mu\text{m}$  to over 1,000  $\mu\text{m}$  in size, 400  $\mu\text{m}$  at the average) of megaspores was the factor impeding transport at larger distances.



subdivision of the Rhaetic—Liassic strata in the Cracow—Wieluń Jura region (J. Znosko, 1955). Somewhat later, there were initiated systematic studies of megaspores from Rhaetic and Liassic strata formed in the Polish Lowlands, mainly in inland basin (T. Marcinkiewicz, 1962, 1969, 1971). In the last years this method was also used in biostratigraphic studies on Keuper rocks formed in vast epicontinental basin, occupying large part of the Polish Lowlands (T. Marcinkiewicz, 1978).

In the Keuper, megaspores are known from some lithological members only. They appear related to gray clay-mudstone sediments, formed in quiet sedimentary conditions. They appear in larger numbers two times: in the Lower Keuper and in lithologically similar strata of the Reed Sandstone, a middle member of the Upper Keuper. Innumerable megaspores were also found in the Lower Gypsum Beds whereas no megaspores have been hitherto found in the Upper Gypsum Beds.

The present state of knowledge of megaspores recorded in the Keuper in Poland made it possible to establish biostratigraphic subdivision, based on two marked megaspore assemblages (Table 15). Vertical ranges of these assemblages appear generally related to major lithofacies changes in the Keuper.

*The Dijkstra sporites beutleri megaspore assemblage.* Marine regression and moderate climate in the Early Keuper created conditions favourable for development of continental vegetation. This is shown by the common carbonized plant remains in the rocks, as well as the megaspores. The latter form assemblage differentiated in specific composition. *Dijkstra sporites beutleri* Reinhard, predominating quantitatively in that assemblage, is regarded as its most characteristic component. The other important component, especially from the point of view of stratigraphy, is *Maexisporites meditectatus* (Reinhardt) Kozur. The two species are accompanied by several others (Table 15), represented by smaller numbers of individuals.

The results of studies on distribution of major megaspore species in the Lower Keuper of Poland agree with those given in the German literature (P. Reinhardt, 1963; P. Reinhardt, D. Fricke, 1969; H. Kozur, 1971, 1972). The agreement is connected with differentiation of the same guide species and records of several identical accompanying ones.

*The Narkisporites harrisi megaspore assemblage.* The occurrence of that assemblage is related to lower member of the Reed Sandstone, developed in gray clay-mudstone facies. No megaspores were hitherto found in the overlying red rocks of that series.

In Poland, the majority of the studied Reed Sandstone sections are characterized by common to very common occurrence of *Narkisporites harrisi* (Reinhardt et Fricke) Kozur only. This species appeared to be good stratigraphic index for dating and correlation of the strata. Megaspore species sometimes found in these strata include *Echitriletes frickei* Kannegieser et Kozur and *Radosporites planus* (Reinhardt et Fricke) Kozur.

Attention should be also paid to the fact that the assemblage comprises species identical as those found by H. Kozur (1972) and E. Kannegieser and H. Kozur (1972) in the Reed Sandstone in the GDR.

The studies failed to show the presence of megaspores in lumpy mottled claystones of the Lower Rhaetic (Drawno and Jarkowo Beds). This is presumably due to predominance of dry and hot climate, unfavourable for development of megaspore-producing plants. Innumerable megaspores first appear in overlying Zbąszynek Beds (studies in progress). Megaspores are becoming quite frequent

Stratigraphic ranges of selected megaspore species in the Keuper and Rhaetic in the extra-Carpathian Poland (T. Marcinkiewicz) Table 15

| Keuper |                   |               | Rhaetic                            |                 | Stratigraphy                                                |
|--------|-------------------|---------------|------------------------------------|-----------------|-------------------------------------------------------------|
| Lower  | Upper             |               | Drawno, Jarkowo and Zbąszynek Beds | Wielichowo Beds |                                                             |
|        | Lower Gypsum Beds | Red Sandstone |                                    |                 | Upper Gypsum Beds                                           |
|        |                   |               |                                    |                 | <i>Dijkstra sporites beutleri</i> Reinhardt                 |
|        |                   |               |                                    |                 | <i>Maerisporites medietectatus</i> /Reinhardt/ Kozur        |
|        |                   |               |                                    |                 | <i>Tenellisporites marcinkiewiczae</i> Reinhardt et Fricke  |
|        |                   |               |                                    |                 | <i>Verrutrilletes marcinkiewiczae</i> Kozur                 |
|        |                   |               |                                    |                 | <i>Hughesisporites porlowskiae</i> Kozur                    |
|        |                   |               |                                    |                 | <i>Henrisporites triassicus</i> Kozur                       |
|        |                   |               |                                    |                 | <i>Flabellisporites crinitus</i> Marcinkiewicz              |
|        |                   |               |                                    |                 | <i>Narkisporites harrisi</i> /Reinhardt et Fricke/ Kozur    |
|        |                   |               |                                    |                 | <i>Radosporites planus</i> /Reinhardt et Fricke/ Kozur      |
|        |                   |               |                                    |                 | <i>Echitriletes frickei</i> Kannegieser et Kozur            |
|        |                   |               |                                    |                 | <i>Echitriletes sentus</i> Marcinkiewicz                    |
|        |                   |               |                                    |                 | <i>Hughesisporites gibbosus</i> /Reinhardt et Fricke/ Kozur |
|        |                   |               |                                    |                 | <i>Verrutrilletes ornatus</i> Reinhardt et Fricke           |
|        |                   |               |                                    |                 | <i>Trileites altotectatus</i> Kannegieser et Kozur          |
|        |                   |               |                                    |                 | <i>Trileites pinguis</i> /Harris/ Potonié                   |
|        |                   |               |                                    |                 | <i>Verrutrilletes utilis</i> /Marcinkiewicz/ Marcinkiewicz  |
|        |                   |               |                                    |                 | <i>Tasmanitriletes pedinacron</i> /Harris/ Jux et Kempf     |
|        |                   |               |                                    |                 | <i>Verrutrilletes litchi</i> /Harris/ Potonié               |
|        |                   |               |                                    |                 | <i>Verrutrilletes guttatus</i> Marcinkiewicz                |
|        |                   |               |                                    |                 | <i>Minerisporites ales</i> /Harris/ Potonié                 |
|        |                   |               |                                    |                 | <i>Bacutrilletes tylotus</i> /Harris/ Potonié               |
|        |                   |               |                                    |                 | <i>Maerisporites misellus</i> Marcinkiewicz                 |
|        |                   |               |                                    |                 | <i>Horstisporites cavernatus</i> Marcinkiewicz.             |
|        |                   |               |                                    |                 | <i>Horstisporites rezargenteus</i> /Harris/ Potonié         |
|        |                   |               |                                    |                 | <i>Trileites candoris</i> Marcinkiewicz *                   |
|        |                   |               |                                    |                 | <i>Trileites rectus</i> Marcinkiewicz                       |
|        |                   |               |                                    |                 | <i>Trileites stenozyematodes</i> /Harris/ Potonié           |

\* For description see T. Marcinkiewicz /in: Atlas..., 1980, p. 82/.

in the Wielichowo Beds, developed in the clay-mudstone-loamy lithofacies in the Fore-Sudetic Monocline. The latter strata, formed in limnic environment under quiet sedimentary conditions, and their facies equivalents in the Polish Lowlands, were found to yield megaspore species typical of the Upper Rhaetic. Vertical ranges of majority of them are rather limited to the Wielichowo Beds, as only a few of them are known to pass to the overlying Mechowito Beds, assigned to the Liassic. Among megaspores recorded in these strata, attention should be paid to *Trileites pinguis* (Harris) Potonié, quantitatively predominating there, and the other common one, *Verrutritetes utilis* (Marcinkiewicz) Marcinkiewicz.

The assemblage, named as the *Trileites pinguis* assemblage, comprises several elements in common with that reported from the *L. ottonis* zone (Rhaetic) in eastern Greenland by T. M. Harris (1935), the assemblage from the Ober Rät (C. A. Wicher, 1951) and the *Triletes* Beds and a part of *Praplanorbis* Beds (H. J. Will, 1969) and the *T. pinguis* assemblage from the Rhaetic of Denmark (F. Bertelsen, O. Michelsen, 1970).

**Anteturma PROXIMEGERMINANTES Potonié, 1970**

**Turma *Triletes*—Azonales (Reinsch, 1881) Potonié, 1970**

**Subturma Azonotriletes Lubert, 1935**

**Infraturma *Laevigati*, Quasilaevigati (Bennie et Kidston, 1886) Potonié, 1970**

**Genus *Trileites* (Erdtman, 1945, 1947) Potonié, 1956**

***Trileites altotectatus* Kannegieser et Kozur, 1972**

Plate LXXVI, Figs. 4, 7

1972 *Trileites altotectatus* nov. sp.; E. Kannegieser, H. Kozur, p. 186, pl. 5, fig. 2; pl. 7, fig. 2a—c.  
1979 *Trileites altotectatus* Kannegieser et Kozur; T. Marcinkiewicz (*in*: Atlas...), p. 205, pl. 72, figs. 4, 7.

Collection. — MUZ IG 507/1/76M, 507/2/76M.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TM)

***Trileites crassitectatus* Fuglewicz, 1977**

Plate LXXXIII, Figs. 1, 2

1977 *Trileites crassitectatus* sp. n.; R. Fuglewicz, pp. 408, 409, pl. 28, figs. 1—3.

Collection. — IGP UW 46 (holotype).

Occurrence. — North-eastern Poland (Rhöt). (RF)

***Trileites flexuosus* Fuglewicz, 1977**

Plate LXXXIII, Figs. 5, 6

1977 *Trileites flexuosus* sp. n.; R. Fuglewicz, p. 408, pl. 28, fig. 4, 5.

Collection. — IGP UW 45 (holotype).

Occurrence. — North-eastern Poland (Rhöt). (RF)

***Trileites grandis* Fuglewicz, 1973**

Plate LXXXIII, Figs. 7, 8

1973 *Trileites grandis* sp. n.; R. Fuglewicz, p. 417, pl. 19, fig. 9.

Collection. — IGP UW 2 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Trileites levis* Fuglewicz, 1973

Plate LXXXIII, Figs. 3, 4

1973 *Trileites levis* sp. n.; R. Fuglewicz, p. 418, pl. 19, fig. 8.

Collection. — IGP UW 4 (holotype).

Occurrence. — North-eastern and central Poland (Upper Buntsandstein). (RF)

*Trileites pinguis* (Harris, 1935) Potonié, 1956

Plate LXXIX, Figs. 4, 5

1935 *Trileites pinguis* sp. nov.; T. M. Harris, p. 166, pl. 85, fig. 3.

1956 *Trileites pinguis* (Harris) Potonié nov. comb.; R. Potonié, p. 23.

1979 *Trileites pinguis* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas...*), p. 206, pl. 75, figs. 4, 5.

Collection. — MUZ IG 506/4/76M, 506/5/76M.

Occurrence. — Extra-Carpathian Poland (Zbąszynek and Wielichowo Beds, ?lowermost Hettangian). (TM)

*Trileites polonicus* Fuglewicz, 1973

Plate LXXXIV, Figs. 1—3

1973 *Trileites polonicus* sp. n.; R. Fuglewicz, p. 418, pl. 20, figs. 3, 5, 6.

Collection. — IGP UW 6 (holotype).

Occurrence. — Extra-Carpathian Poland (Middle Buntsandstein). (RF)

*Trileites rectus* Marcinkiewicz, 1979

Plate LXXIX, Figs. 1, 3

1962 *Trileites* sp. 1; T. Marcinkiewicz, p. 472, pl. 2, figs. 1, 2.

1979 *Trileites rectus* sp. n.; T. Marcinkiewicz (*in: Atlas...*), p. 205, pl. 75, figs. 1, 3.

Collection. — MUZ IG 506/1/76M (holotype), 506/2/76M.

Occurrence. — Western and eastern Poland (Wielichowo Beds). (TM)

*Trileites sinuosus* (Dettmann, 1961) Fuglewicz, 1973

Plate LXXXV, Fig. 9

1961 *Bankisporites sinuosus* sp. n.; M. E. Dettmann, p. 74, pl. 1, figs. 9—14.

1973 *Trileites sinuosus* (Dettmann) Fuglewicz comb. nov.; R. Fuglewicz, pl. 20, fig. 4.

Collection. — IGP UW, R. Fuglewicz coll.

Occurrence. — Extra-Carpathian Poland (Middle Buntsandstein). (RF)

*Trileites stenoxysmatodes* (Harris, 1935) Potonié, 1956

Plate LXXIX, Fig. 2

1935 *Triletes stenoxysmatodes* sp. nov.; T. M. Harris, p. 167, pl. 25, fig. 6.

1956 *Trileites stenoxysmatodes* (Harris) Potonié nov. comb.; R. Potonié, p. 25.

1979 *Trileites stenoxysmatodes* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas*), p. 206, pl. 75, fig. 2.

Collection. — MUZ IG 506/111/76M.

Occurrence. — North-western Poland (Wielichowo Beds). (TM)

*Trileites tenellus* Fuglewicz, 1973

Plate LXXXV, Figs. 7, 8

1973 *Trileites tenellus* sp. n.; R. Fuglewicz, p. 420, pl. 19, fig. 4.

Collection. — IGP UW 7 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Trileites validus* Fuglewicz, 1973

Plate LXXXIV, Figs. 6, 7

1973 *Trileites validus* sp. n.; R. Fuglewicz, p. 420, pl. 21, figs. 4, 6.

Collection. — IGP UW 9 (holotype).

Occurrence. — Extra-Carpathian Poland (Rhöt). (RF)

*Trileites vulgaris* Fuglewicz, 1973

Plate LXXXIV, Figs. 4, 5

1961 *Bankisporites pinguis* (Harris) Dettmann; M. E. Dettmann, p. 74, pl. 1, figs. 1—8, text-fig. 1a.

1973 *Trileites vulgaris* sp. n.; R. Fuglewicz, p. 421, pl. 20, figs. 1, 2, 7, 8; pl. 31, figs. 2, 8.

Collection. — IGP UW 10 (holotype).

Occurrence. — Poland (Lower and Middle Buntsandstein). (RF)

Genus *Tasmanitriletes* Jux et Kempf, 1971

*Tasmanitriletes pedinacron* (Harris, 1935) Jux et Kempf, 1971

Plate LXXX, Figs. 1—3

1935 *Triletes pedinacron* sp. nov.; T. M. Harris, pp. 165, 166, pl. 27, fig. 6.

1979 *Tasmanitriletes pedinacron* (Harris) Jux et Kempf; T. Marcinkiewicz (*in*: Atlas...), p. 206, pl. 76, figs. 1—3.

Collection. — MUZ IG 506/6/76M, 506/7/76M, 506/11/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds, ?lowest Hettangian). (TM)

Infraturma *Apiculati* (Bennie et Kidston, 1886) Potonié, 1956

Genus *Maaxisporites* Potonié, 1956

*Maaxisporites magnuszewensis* Fuglewicz, 1977

Plate LXXXV, Figs. 4—6

1977 *Maaxisporites magnuszewensis* sp. n.; R. Fuglewicz, p. 409, pl. 28, figs. 6, 7.

Collection. — IGP UW 47 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (RF)

*Maaxisporites meditectatus* (Reinhardt, 1963) Kozur, 1971

Plate LXXIII, Figs. 1—3

1963 *Duosporites meditectatus* n. sp.; P. Reinhardt, p. 119, pl. 1, figs. 1—5, 9; pl. 2, fig. 1.

- 1971 *Maexisporites meditectatus* (Reinhardt) Kozur n. comb.; H. Kozur, pl. 1, fig. 2.  
 1979 *Maexisporites meditectatus* (Reinhardt) Kozur; T. Marcinkiewicz (*in: Atlas...*), p. 207, pl. 69, figs. 1—3.

Collection. — MUZ IG 507/3 — 5/76M.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (TM)

*Maexisporites misellus* Marcinkiewicz, 1962

Plate LXXIX, Figs. 6—8

- 1962 *Maexisporites misellus* n. sp.; T. Marcinkiewicz, p. 473, pl. 2, figs. 6, 7.  
 1979 *Maexisporites misellus* Marcinkiewicz; T. Marcinkiewicz (*in: Atlas...*), p. 207, pl. 75, figs. 6—8.

Collection. — MUZ IG 506/20/76M (holotype), 506/21/76M, 506/22/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds). (TM)

*Maexisporitis ooliticus* Fuglewicz, 1977

Plate LXXXVI, Figs. 5, 6

- 1977 *Maexisporites ooliticus* sp. n.; R. Fuglewicz, p. 410, pl. 29, figs. 4, 5.

Collection. — IGP UW 49 (holotype).

Occurrence. — South-western Poland (Lower and Middle Buntsandstein).

*Maexisporites parvus* Fuglewicz, 1973

Plate LXXXV, Fig. 1

- 1973 *Maexisporites parvus* sp. n.; R. Fuglewicz, p. 421, pl. 21, fig. 3a, b.

Collection. — IGP UW 11 (holotype).

Occurrence. — North-eastern Poland (Upper Buntsandstein). (RF)

*Maexisporites pyramidalis* Fuglewicz, 1973

Plate LXXXV, Figs. 2, 3

- 1973 *Maexisporites pyramidalis* sp. n.; R. Fuglewicz, p. 422, pl. 21, figs. 2a, b; pl. 31, fig. 6.

Collection. — IGP UW 12 (holotype).

Occurrence. — North-eastern Poland (Upper Buntsandstein). (RF)

*Maexisporites rotundus* Fuglewicz, 1973

Plate LXXXVI, Figs. 1, 2

- 1973 *Maexisporites rotundus* sp. n.; R. Fuglewicz, p. 423, pl. 21, figs. 5a, b.

Collection. — IGP UW 13 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Maexisporites spongiosus* Fuglewicz, 1977

Plate LXXXVI, Figs. 3, 4; Plate LXXXVII, Figs. 4, 5

- 1977 *Maexisporites spongiosus* sp. n.; R. Fuglewicz, p. 409, pl. 28, fig. 8.

Collection. — IGP UW 48 (holotype).

Occurrence. — Extra-Carpathian Poland (Rhöt). (RF)

Genus *Verrutrilletes* (van der Hammen, 1954) Potonié, 1956  
*Verrutrilletes fragilis* Fuglewicz, 1973

Plate LXXXVII, Fig. 1

1973 *Verrutrilletes fragilis* sp. n.; R. Fuglewicz, p. 423, pl. 21, figs. 1a, b.

Collection. — IGP UW 15 (holotype).

Occurrence. — North-eastern Poland (Upper Buntsandstein). (RF)

*Verrutrilletes guttatus* Marcinkiewicz, 1971

Plate LXXXI, Figs. 5—7

1971 *Verrutrilletes guttatus* sp. n.; T. Marcinkiewicz, p. 33, pl. 5, figs. 4—8; pl. 6, figs. 1—6.

1979 *Verrutrilletes guttatus* Marcinkiewicz; T. Marcinkiewicz (*in: Atlas...*), p. 208, pl. 77, figs. 5—7.

Collection. — MUZ IG 506/32/76M (holotype), 506/34/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds). (TM)

*Verrutrilletes litchi* (Harris, 1935), Potonié, 1956

Plate LXXXI, Fig. 4

1935 *Triletes litchi* sp. nov.; T. M. Harris, pl. 25.

1956 *Verrutrilletes litchi* (Harris) Potonié nov. comb.; R. Potonié, p. 29.

1979 *Verrutrilletes litchi* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas...*), p. 209, pl. 77, fig. 4.

Collection. — MUZ IG 506/29/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds). (TM)

*Verrutrilletes marcinkiewiczae* Kozur, 1973

Plate LXXIII, Figs. 4, 5; Plate LXXIV, Fig. 1

1973 *Verrutrilletes marcinkiewiczae* n. sp.; H. Kozur, p. 9, pl. 2, figs. 1—3.

1979 *Verrutrilletes marcinkiewiczae* Kozur; T. Marcinkiewicz (*in: Atlas...*), p. 207, pl. 69, figs. 4, 5; pl. 70, fig. 1.

Collection. — MUZ IG 507/6/76M, 507/7/76M, 507/11/76M.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (TM)

*Verrutrilletes ornatus* Reinhardt et Fricke, 1969

Plate LXXVIII, Figs. 1—3

1969 *Verrutrilletes ornatus* n. sp.; P. Reinhardt, D. Fricke, p. 402, pl. 1, fig. 6; pl. 3, figs. 1, 4.

1979 *Verrutrilletes ornatus* Reinhardt et Fricke; T. Marcinkiewicz (*in: Atlas...*), p. 208, pl. 74, figs. 1—3.

Collection. — MUZ IG 507/13/76M, 507/14/76M.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TM)

*Verrutrilletes preutilis* Fuglewicz, 1977

Plate LXXXVII, Figs. 2, 3, 6

1977 *Verrutrilletes preutilis* sp. n.; R. Fuglewicz, p. 410, pl. 30, figs. 3, 4.

Collection. — IGP UW 50 (holotype).

Occurrence. — Central and north-eastern Poland (Upper Muschelkalk and Lower Keuper). (RF)

*Verrutrilletes utilis* (Marcinkiewicz, 1962) Marcinkiewicz, 1971

Plate LXXX, Fig. 6; Plate LXXXI, Figs. 1—3

1951 *Megaspora* (792) Wicher; C. A. Wicher, pl. 1, figs. 3, 4.

1962 *Trileites utilis* Marcinkiewicz n. sp.; T. Marcinkiewicz, p. 471, pl. 1, figs. 1—4.

1971 *Verrutrilletes utilis* (Marcinkiewicz) Marcinkiewicz nov. comb.; T. Marcinkiewicz, pl. 3, figs. 6—8; pl. 4, figs. 1—6; pl. 5, figs. 1—3.

1979 *Verrutrilletes utilis* (Marcinkiewicz) Marcinkiewicz; T. Marcinkiewicz (*in*: Atlas...), p. 208, pl. 76, fig. 6; pl. 77, figs. 1—3.

Collection. — MUZ IG 506/24/76M (holotype), 506/25/76M, 506/26/76M, 506/28/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds, ?lowermost Hettangian). (TM)

Genus *Otymisporites* Fuglewicz, 1977

*Otymisporites eotriassicus* Fuglewicz, 1977

Plate XC, Figs. 4, 5

1977 *Otymisporites eotriassicus* sp. n.; R. Fuglewicz, p. 412, pl. 30, figs. 1, 2.

Collection. — IGP UW 52 (holotype).

Occurrence. — South-western Poland (Lower Buntsandstein). (RF)

*Otymisporites tuberculatus* Fuglewicz, 1977

Plate XC, Figs. 1, 2

1977 *Otymisporites tuberculatus* sp. n.; R. Fuglewicz, p. 413, pl. 31, figs. 1—3.

Collection. — IGP UW 53 (holotype).

Occurrence. — South-western Poland (Lower Buntsandstein). (RF)

Genus *Pusulosporites* Fuglewicz, 1973

*Pusulosporites crassus* Fuglewicz, 1973

Plate LXXXVIII, Fig. 6

1973 *Pusulosporites crassus* sp. n.; R. Fuglewicz, p. 425, pl. 23, figs. 3, 4.

Collection. — IGP UW 17 (holotype).

Occurrence. — North-eastern Poland (Middle Buntsandstein). (RF)

*Pusulosporites inflatus* Fuglewicz, 1973

Plate LXXXVIII, Figs. 1—5; Plate LXXXIX, Fig. 7

1973 *Pusulosporites inflatus* sp. n.; R. Fuglewicz, p. 426, pl. 19, figs. 1, 3, 7; pl. 31, figs. 1, 3.

1973 *Talchirella daciae* Antonescu and Taugourdeau-Lantz n. sp.; E. Antonescu, J. Taugourdeau-Lantz, p. 4, pl. 2, fig. 16.

Collection. — IGP UW 21 (holotype).

Occurrence. — Extra-Carpathian Poland (Lower and Middle Buntsandstein). (RF).

*Pusulosporites marginatus* Fuglewicz, 1973

Plate LXXXIX, Figs. 1—3

1973 *Pusulosporites marginatus* sp. n.; R. Fuglewicz, p. 426, pl. 19, fig. 6.

Collection. — IGP UW 1 (holotype).

Occurrence. — Extra-Carpathian Poland (Middle Buntsandstein). (RF)

*Pusulosporites permotriassicus* Fuglewicz, 1977

Plate LXXXIX, Figs. 4, 5

1977 *Pusulosporites permotriassicus* sp. n.; R. Fuglewicz, p. 411, pl. 29, figs. 1—3.

Collection. — IGP UW 51 (holotype).

Occurrence. — South-western Poland (Zechstein—Lower Buntsandstein). (RF)

*Pusulosporites populosus* Fuglewicz, 1973

Plate LXXXIX, Figs. 6, 8, 9

1973 *Pusulosporites populosus* sp. n.; R. Fuglewicz, p. 425, pl. 22, figs. 5—7; pl. 32, fig. 2.1973 *Talchirella dacia* n. sp.; E. Antonescu, J. Taugourdeau-Lantz, p. 4, pl. 1, figs. 1—8.

Collection. — IGP UW 19 (holotype).

Occurrence. — Fore-Sudetic Monocline, central Poland and Góry Świętokrzyskie Mts (Middle Buntsandstein). (RF)

Genus *Bacutriletes* (van den Hammen, 1954) Potonié, 1956*Bacutriletes asaphus* Fuglewicz, 1973

Plate XC, Fig. 3; Plate XCI, Fig. 1

1973 *Bacutriletes asaphus* sp. n.; R. Fuglewicz, p. 430, pl. 22, figs. 1—4.

Collection. — IGP UW 22 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Bacutriletes corynactiformis* Fuglewicz, 1977

Plate XCII, Fig. 4

1977 *Bacutriletes corynactiformis* sp. n.; R. Fuglewicz, p. 414, pl. 32, fig. 3.

Collection. — IGP UW 56 (holotype).

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (RF)

*Bacutriletes costatispinosus* Fuglewicz, 1977

Plate XCI, Figs. 2, 3; Plate XCII, Fig. 1

1977 *Bacutriletes costatispinosus* sp. n.; R. Fuglewicz, p. 413, pl. 31, figs. 4, 5.

Collection. — IGP UW 54 (holotype).

Occurrence. — Extra-Carpathian Poland (Rhöt—Lower Keuper). (RF)

*Bacutriletes globosus* Fuglewicz, 1973

Plate XCI, Fig. 4

1973 *Bacutriletes globosus* sp. n.; R. Fuglewicz, p. 431, pl. 23, fig. 1; pl. 32, fig. 1.

Collection. — IGP UW 23 (holotype).

Occurrence. — Extra-Carpathian Poland (Middle Buntsandstein). (RF)

*Bacutriletes insolitus* Fuglewicz, 1973

Plate XCI, Figs. 5, 6

1973 *Bacutriletes insolitus* sp. n.; R. Fuglewicz, p. 431, pl. 23, fig. 2; pl. 24, figs. 3, 4; pl. 31, fig. 7.

Collection. — IGP UW 24 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Bacutriletes micros* Fuglewicz, 1977

Plate XCIII, Figs. 1, 3

1977 *Bacutriletes micros* sp. n.; R. Fuglewicz, p. 415, pl. 33, figs. 1, 2, 4.

Collection. — IGP UW 57 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (RF)

*Bacutriletes pseudoreticulatus* Fuglewicz, 1977

Plate XCII, Figs. 2, 3, 5

1977 *Bacutriletes pseudoreticulatus* sp. n.; R. Fuglewicz, p. 414, pl. 32, figs. 1, 2.

Collection. — IGP UW 55 (holotype).

Occurrence. — North-eastern Poland (Rhöt). (RF)

*Bacutriletes tylotus* (Harris, 1935) Potonié, 1956

Plate LXXXII, Figs. 1, 2

1935 *Triletes tylotus* sp. nov.; T. M. Harris, pp. 162, 163, pl. 26, figs. 1, 2.

1956 *Bacutriletes tylotus* (Harris) Potonié nov. comb.; R. Potonié, p. 35.

1979 *Bacutriletes tylotus* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas...*), p. 209, pl. 78, figs. 1, 2.

Collection. — MUZ IG 506/37/76M, 506/38/76M.

Occurrence. — Extra-Carpathian Poland (Zbąszynek and Wielichowo Beds). (TM)

Genus *Radosporites* Kannegieser et Kozur, 1972  
*Radosporites planus* (Reinhardt et Fricke, 1969) Kozur, 1971

Plate LXXVIII, Figs. 4, 5

1969 *Verrutrilletes planus* n. sp.; P. Reinhardt, D. Fricke, p. 404, pl. 1, fig. 2.

1971 *Radosporites planus* (Reinhardt et Fricke) Kozur n. comb.; H. Kozur, p. 122.

1979 *Radosporites planus* (Reinhardt et Fricke) Kozur; T. Marcinkiewicz (*in: Atlas...*), p. 209, pl. 74, figs. 4, 5.

Collection. — MUZ IG 507/18/76M, 507/19/76M

Occurrence. — Southern and central Poland (Reed Sandstone). (TM)

Genus *Echitriletes* (von der Hammen, 1954) Potonié, 1956  
*Echitriletes echinatus* Fuglewicz, 1973

Plate XCV, Fig. 4

1973 *Echitriletes echinatus* sp. n.; R. Fuglewicz, p. 432, pl. 24, fig. 5; pl. 32, fig. 4.

Collection. — IGP UW 25 (holotype).

Occurrence. — Fore-Sudetic Monocline and Góry Świętokrzyskie Mts (Middle Buntsandstein). (RF)

*Echitriletes fragilispinus* Fuglewicz, 1979

Plate XCV, Fig. 3

1979 *Echitriletes fragilispinus* sp. n.; R. Fuglewicz, p. 285, pl. 4, fig. 2.

Collection. — IGP UW 76 (holotype).

Occurrence. — Fore-Sudetic Monocline (Lower Buntsandstein). (RF)

*Echitriletes frickei* Kannegieser et Kozur, 1972

Plate LXXVI, Figs. 1—3

1972 *Echitriletes frickei* n. sp.; E. Kannegieser, H. Kozur, p. 187, pl. 3, fig. 4.

1979 *Echitriletes frickei* Kannegieser et Kozur; T. Marcinkiewicz (in: Atlas...), p. 210, pl. 72, figs. 1—3.

Collection. — MUZ IG 507/23—25/76M.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TM)

*Echitriletes gracilis* Fuglewicz, 1973

Plate XCV, Figs. 1, 2

1973 *Echitriletes gracilis* sp. n.; R. Fuglewicz, p. 433, pl. 24, figs. 1, 2.

Collection. — IGP UW 29 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein—Lower Keuper). (RF)

*Echitriletes latispinosus* Fuglewicz, 1977

Plate XCIV, Figs. 1—4

1977 *Echitriletes latispinosus* sp. n.; R. Fuglewicz, p. 417, pl. 34, figs. 1, 2.

Collection. — IGP UW 60 (holotype).

Occurrence. — Central and north-eastern Poland (Upper Buntsandstein—Lower Keuper). (RF)

*Echitriletes multispinosus* Fuglewicz, 1973

Plate XCVI, Fig. 1

1973 *Echitriletes multispinosus* sp. n.; R. Fuglewicz, p. 433, pl. 26, figs. 2, 4.

Collection. — IGP UW 30 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein—Lower Keuper). (RF)

*Echitriletes pectinatus* Fuglewicz, 1977

Plate XCIII, Fig. 6

1977 *Echitriletes pectinatus* sp. n.; R. Fuglewicz, p. 416, pl. 35, figs. 1—3.

Collection. — IGP UW 59 (holotype).

Occurrence. — Fore-Sudetic Monocline (Rhöt). (RF)

*Echitriletes prerussus* Fuglewicz, 1977

Plate XCIII, Figs. 2, 4, 5

1977 *Echitriletes prerussus* sp. n.; R. Fuglewicz, p. 415, pl. 33, fig. 3; pl. 34, figs. 3—5.

Collection. — IGP UW 58 (holotype).

Occurrence. — Silesian-Cracow Upland (Lower Rhaetic). (RF)

*Echitriletes sentus* Marcinkiewicz, 1978

Plate LXXVII, Figs. 1, 2

1978 *Echitriletes sentus* sp. n.; T. Marcinkiewicz, p. 73, pl. 5, figs. 3, 4.1979 *Echitriletes sentus* Marcinkiewicz; T. Marcinkiewicz (*in*: Atlas...), p. 210, pl. 73, figs. 1, 2.

Collection. — MUZ IG 507/26/76M, 507/27/76M (holotype).

Occurrence. — Silesian-Cracow Upland, Fore Sudetic Monocline, Góry Świętokrzyskie Mts and central Poland (Reed Sandstone). (TM)

Genus *Narkisporites* Kannegieser et Kozur, 1972*Narkisporites brevispinosus* Fuglewicz, 1973

Plate XCVI, Figs. 4, 5

1973 *Narkisporites brevispinosus* sp. n.; R. Fuglewicz, p. 428, pl. 25, fig. 2.

Collection. — IGP UW 27 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Narkisporites harrisi* (Reinhardt et Fricke, 1969) Kozur, 1971

Plate LXXVI, Fig. 5; Plate LXXVII, Figs. 4, 5; Plate LXXVIII, Fig. 6

1963 *Biharisporites myrmecodes* (Harris) Potonié; P. Reinhardt, p. 120, pl. 2, figs. 7, 10.1969 *Biharisporites harrisi* nov. sp.; P. Reinhardt, D. Fricke, p. 404, pl. 1, fig. 1.1971 *Narkisporites harrisi* (Reinhardt et Fricke) Kozur nov. comb.; H. Kozur, p. 122, pl. 1, fig. 1a, b.1979 *Narkisporites harrisi* (Reinhardt et Fricke) Kozur; T. Marcinkiewicz (*in*: Atlas...), p. 210, pl. 72, fig. 5; pl. 73, figs. 4, 5; pl. 74, fig. 6.

Collection. — MUZ IG 507/28/76M, 507/30/76M, 507/31/76M.

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (TM)

*Narkisporites insignis* Fuglewicz, 1973

Plate XCIV, Fig. 5; Plate XCVI, Figs. 2, 3

1973 *Narkisporites insignis* sp. n.; R. Fuglewicz, p. 429, pl. 29, figs. 1, 3, 4.

Collection. — IGP UW 37 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

Infraturma **Murornati** Potonié et Kremp, 1954Genus *Horstisporites* Potonié, 1956*Horstisporites bertelseni* Fuglewicz, 1977

Plate XCVII, Figs. 3, 4

1970 *Horstisporites* sp. (Type N5); F. Bertelsen, O. Michelsen, p. 29, pl. 7, figs. 5, 6.

1977 *Horstisporites bertelseni* Fuglewicz sp. n.; R. Fuglewicz, p. 418, pl. 37, fig. 1.

Collection. — IGP UW 63 (holotype).

Occurrence. — Silesian-Cracow Upland (Lower Rhaetic). (RF)

*Horstisporites cavernatus* Marcinkiewicz, 1962

Plate LXXXII, Figs. 7—9

1951 *Megaspore* (798); C. A. Wicher, pl. 1, fig. 10.

1962 *Horstisporites cavernatus* Marcinkiewicz n. sp.; T. Marcinkiewicz, p. 475, pl. 3, figs. 4, 5.

1979 *Horstisporites cavernatus* Marcinkiewicz; T. Marcinkiewicz (*in: Atlas...*), p. 211, pl. 78, figs. 7—9.

Collection. — MUZ IG 506/54/75M (holotype), 506/55/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds). (TM)

*Horstisporites irregularis* Fuglewicz, 1977

Plate XCVII, Fig. 5

1977 *Horstisporites irregularis* sp. n.; R. Fuglewicz, p. 417, pl. 35, fig. 4.

Collection. — IGP UW 62 (holotype).

Occurrence. — Central and north-eastern Poland (Upper Buntsandstein—Lower Keuper). (RF)

*Horstisporites nidzicensis* Fuglewicz, 1977

Plate XCVIII, Fig. 2

1977 *Horstisporites nidzicensis* sp. n.; R. Fuglewicz, p. 418, pl. 36, fig. 2.

Collection. — IGP UW 64 (holotype).

Occurrence. — Extra-Carpathian Poland (Reed Sandstone). (RF)

*Horstisporites rexargenteus* (Harris, 1935) Potonié, 1956

Plate LXXXII, Fig. 6

1926 *Megaspore* Type 3 Harris; T. M. Harris, p. 51, text-fig. 1C, D.

1935 *Triletes rexargenteus* sp. nov.; T. M. Harris, pp. 156—158, pl. 26, fig. 13, text-fig. 51g—j.

1956 *Horstisporites rexargenteus* (Harris) Potonié nov. comb.; R. Potonié, p. 45.

1979 *Horstisporites rexargenteus* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas...*), p. 211, pl. 78, fig. 6.

Collection. — MUZ IG 506/110/76M.

Occurrence. — North-western Poland (Wielichowo Beds). (TM)

*Horstisporites sulcatus* Fuglewicz, 1973

Plate XCVII, Figs. 1, 2

1973 *Horstisporites sulcatus* sp. n.; R. Fuglewicz, p. 437, pl. 30, figs. 3, 4.

Collection. — IGP UW 36 (holotype).

Occurrence. — Central and north-eastern Poland (Middle Buntsandstein). (RF)

Genus *Bothriotriletes* Fuglewicz, 1977  
*Bothriotriletes grandis* Fuglewicz, 1977

Plate XCVIII, Fig. 1

1977 *Bothriotriletes grandis* sp. n.; R. Fuglewicz, p. 420, pl. 36, fig. 1.

Collection. — IGP UW 66 (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (RF)

Genus *Erlansonisporites* Potonié, 1956  
*Erlansonisporites licheniformis* Fuglewicz, 1977

Plate XCVIII, Figs. 4, 5

1977 *Erlansonisporites licheniformis* sp. n.; R. Fuglewicz, p. 419, pl. 37, figs. 2—4.

Collection. — IGP UW 65 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

Subturma *Lagenotriletes* Potonié et Kremp, 1954

Infraturma *Trifoliati*, Barbati Potonié, 1970

Genus *Hughesisporites* Potonié, 1956  
*Hughesisporites gibbosus* (Reinhardt et Fricke, 1969) Kozur, 1971

Plate LXXVI, Fig. 6; Plate LXXVII, Figs. 3, 6

1969 *Triletes* ? *gibbosus* n. sp.; P. Reinhardt, D. Fricke, p. 401, pl. 3, fig. 5, text-fig. 2.

1971 *Hughesisporites* ? *gibbosus* (Reinhardt et Fricke) Kozur n. comb.; H. Kozur, p. 122.

1979 *Hughesisporites gibbosus* (Reinhardt et Fricke) Kozur; T. Marcinkiewicz (*in*: Atlas...), p. 212, pl. 72, fig. 6; pl. 73, figs. 3, 6.

Collection. — MUZ IG 507/37—39/76M.

Occurrence. — Silesian-Cracow Upland and central Poland (Reed Sandstone). (TM)

*Hughesisporites inflatus* Fuglewicz, 1973

Plate XCIX, Fig. 3; Plate CII, Fig. 2

1973 *Hughesisporites inflatus* sp. n.; R. Fuglewicz, p. 441, pl. 30, fig. 1.

Collection. — IGP UW 40 (holotype).

Occurrence. — Fore-Sudetic Monocline and Góry Świętokrzyskie Mts (upper part of Middle Buntsandstein). (RF)

*Hughesisporites orlowskiae* Kozur, 1973

Plate LXXV, Figs. 5, 6

1973 *Hughesisporites orlowskiae* n. sp.; H. Kozur, p. 8, pl. 3, fig. 2.

1979 *Hughesisporites orlowskiae* Kozur; T. Marcinkiewicz (*in*: Atlas...), p. 212, pl. 71, figs. 5, 6.

Collection. — MUZ IG 507/41/76M, 507/43/76M.

Occurrence. — Silesian-Cracow Upland, western Pomerania, north-eastern Poland and Góry Świętokrzyskie Mts (Lower Keuper). (TM)

*Hughesisorites simplex* Fuglewicz, 1977

Plate XCIX, Fig. 4

1977 *Hughesisorites simplex* sp. n.; R. Fuglewicz, p. 423, pl. 40, fig. 4.

Collection. — IGP UW 71 (holotype).

Occurrence. — Fore-Sudetic Monocline (Lower Buntsandstein—Suboolitic Beds). (RF)

Genus *Flabellisporites* Marcinkiewicz, 1978*Flabellisporites crinitus* Marcinkiewicz, 1978

Plate LXXIV, Figs. 5—7; Plate LXXV, Fig. 1

1978 *Flabellisporites crinitus* sp. n.; T. Marcinkiewicz, p. 75, pl. 11, figs. 1, 2—7; pl. 12, figs. 1—3.1979 *Flabellisporites crinitus* Marcinkiewicz; T. Marcinkiewicz (in: Atlas...), p. 212, pl. 70, figs. 5—7; pl. 71, fig. 1.

Collection. — MUZ IG 507/51/76M (holotype), 507/52/76M, 507/54/76M.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (TM)

Genus *Dijkstraisorites* Potonié, 1956*Dijkstraisorites beutleri* Reinhardt, 1963

Plate LXXV, Figs. 2—4

1963 *Dijkstraisorites beutleri* n. sp.; P. Reinhardt, pp. 120, 121, pl. 2, fig. 6.1969 *Macrosporites beutleri* (Reinhardt) Reinhardt n. comb.; P. Reinhardt, D. Fricke, p. 408, pl. 2, figs. 4, 5, text-fig. 5.1971 *Dijkstraisorites beutleri* Reinhardt; H. Kozur, pl. 1, fig. 3.1979 *Dijkstraisorites beutleri* Reinhardt; T. Marcinkiewicz (in: Atlas...), p. 213, pl. 71, figs. 2—4.

Collection. — MUZ IG 507/44/76M, 507/47/76M.

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (TM)

*Dijkstraisorites capillatus* Fuglewicz, 1977

Plate C, Figs. 4, 7

1977 *Dijkstraisorites capillatus* sp. n.; R. Fuglewicz, p. 421, pl. 38, fig. 3; pl. 39, fig. 1; pl. 40, fig. 3.

Collection. — IGP UW 69 (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (RF)

Genus *Tenellisporites* Potonié, 1956*Tenellisporites marcinkiewiczae* Reinhardt et Fricke, 1969

Plate LXXIV, Figs. 2—4

1963 *Dijkstraisorites beutleri* n. sp.; P. Reinhardt, pp. 120, 121, pl. 1, figs. 6—8; pl. 2, figs. 2—5; text-fig. 3.1969 *Tenellisporites marcinkiewiczae* n. sp.; P. Reinhardt, D. Fricke, p. 409, pl. 3, fig. 2.1979 *Tenellisporites marcinkiewiczae* Reinhardt et Fricke; T. Marcinkiewicz (in: Atlas...), p. 213, pl. 70, figs. 2—4.

Collection. — MUZ IG 507/55—57/76M.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (TM)

**Turma *Triletes*—Zonales** (Bennie et Kidston, 1886) Potonié, 1970Subturma *Zonotriletes* Waltz, 1935Infraturma *Zonati* Potonié et Kremp, 1954Genus *Minerisporites* Potonié, 1956*Minerisporites ales* (Harris, 1935) Potonié, 1956

Plate LXXXII, Figs. 3–5

1935 *Triletes ales* sp. nov.; T. M. Harris, p. 163, pl. 25, figs. 2, 8, 9, 11.1956 *Minerisporites ales* (Harris) Potonié nov. comb.; R. Potonié, p. 67.1979 *Minerisporites ales* (Harris) Potonié; T. Marcinkiewicz (*in: Atlas*), p. 214, pl. 78, figs. 3–5.

Collection. — MUZ IG 506/86—88/76M.

Occurrence. — Extra-Carpathian Poland (Wielichowo Beds). (TM)

Genus *Henrisporites* Potonié, 1956*Henrisporites triassicus* Kozur, 1973

Plate LXXIII, Figs. 6–8

1973 *Henrisporites ? triassicus* n. sp.; H. Kozur, pp. 7, 8, pl. 3, fig. 1a, b.1979 *Henrisporites triassicus* Kozur; T. Marcinkiewicz (*in: Atlas*)..., p. 214, pl. 69, figs. 6–8.

Collection. — MUZ IG 507/35/76M, 507/36/76M.

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk and Lower Keuper). (TM)

Genus *Nathorstisporites* Jung, 1958*Nathorstisporites invenustus* Fuglewicz, 1977

Plate C, Figs. 2, 6

1977 *Nathorstisporites invenustus* sp. n.; R. Fuglewicz, p. 422, pl. 40, figs. 1, 2.

Collection. — IGP UW 70 (holotype).

Occurrence. — North-eastern Poland (Lower Keuper). (RF)

Genus *Triangulatisporites* (Potonié et Kremp, 1954) Karczewska, 1976*Triangulatisporites makowskii* (Fuglewicz, 1973) Karczewska, 1976

Plate C, Fig. 1; Plate CI, Fig. 2; Plate CII, Fig. 1

1973 *Makrosporites makowskii* sp. n.; R. Fuglewicz, p. 439, pl. 29, fig. 5; pl. 31, fig. 5.1976 *Triangulatisporites makowskii* (Fuglewicz) Karczewska comb. n.; J. Karczewska, p. 343.

Collection. — IGP UW 38 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Buntsandstein). (RF)

*Triangulatisporites reticulatus* Fuglewicz, 1977

Plate CI, Fig. 3

1977 *Triangulatisporites reticulatus* sp. n.; R. Fuglewicz, p. 421, pl. 38, fig. 4.

Collection. — IGP UW 68 (holotype).

Occurrence. — South-western Poland (Lower Buntsandstein—Suboolitic Beds). (RF)

*Triangulatisporites tuberculatus* Fuglewicz, 1977

Plate CI, Fig. 1

1977 *Triangulatisporites tuberculatus* sp. n.; R. Fuglewicz, p. 420, pl. 38, figs. 1, 2.

Collection. — IGP UW 67 (holotype).

Occurrence. — North-eastern Poland (Rhöt). (RF)

## Anteturma VARIEGERMINANTES Potonié, 1970

## Turma Aletes, Kryptaperturates Potonié, 1970

## Subturma Appendiciferentes Potonié, 1970

## Kryptaperturates, Varia Potonié, 1970

Genus *Aneuletes* Harris, 1961*Aneuletes acrochordonodes* Fuglewicz, 1977

Plate XCIX, Figs. 1, 2

1977 *Aneuletes acrochordonodes* sp. n.; R. Fuglewicz, p. 424, pl. 40, fig. 5.

Collection. — IGP UW 73 (holotype).

Occurrence. — Extra-Carpathian Poland (Upper Muschelkalk—Lower Keuper). (RF)

*Aneuletes clavatus* Fuglewicz, 1977

Plate XCIX, Fig. 5; Plate CII, Figs. 3, 5

1977 *Aneuletes clavatus* sp. n.; R. Fuglewicz, p. 424, pl. 41, fig. 1.

Collection. — IGP UW 74 (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (RF)

*Aneuletes pomeranus* Fuglewicz, 1977

Plate XCVIII, Fig. 3; Plate CII, Figs. 4, 6

1977 *Aneuletes pomeranus* sp. n.; R. Fuglewicz, p. 425, pl. 41, figs. 2, 5.

Collection. — IGP UW 75 (holotype).

Occurrence. — Extra-Carpathian Poland (Lower Keuper). (RF)

*Aneuletes rotundus* Fuglewicz, 1973

Plate C, Figs. 3, 5

1973 *Aneuletes rotundus* sp. n.; R. Fuglewicz, p. 443, pl. 19, figs. 2, 5; pl. 31, fig. 4.

Collection. — IGP UW 42 (holotype).

Occurrence. — Extra-Carpathian Poland (Rhöt—Lower Keuper). (RF)

## MACROFLORA

## Class CYANOPHYTA

**General characteristics.** (ZK). Blue-green algae took part in formation of oncoïd and microoncoïd coatings. Oncoïds of the *Otonosia* and *Nubecularites* morphotypes are known from the Križna Ladinian (Z. Kotański, 1965), and

stromatolitic coatings, presumably formed with contribution of blue-green algae, are especially common in the Ladinian of the upper sub-tatric series (Z. Kortański, 1973b).

*Girvanella minuta* Wethered and *Rothpletzella munthei* (Rothpletz) have been found to occur as components of oncolitic covers in the high-tatric Rhaetian (A. Radwański, 1968), where oncoids are especially common. *Girvanella minuta* Wethered is also known from the Križna Rhaetian (lower sub-tatric series — A. Gaździcki, 1974).

## Class CHLOROPHYTA

### Order Siphonales

#### Family Dasycladaceae

**General characteristics.** (ZK). In Poland, Dasycladaceae, also known as diploporae, are known from the Tatra Mts and Upper Silesia only. In the latter area, they are of rock-forming importance but usually very badly preserved, often in the form of moulds of axial channel and a part of pores (C. Pastwa-Leszczyńska, S. Śliwiński, 1960). In turn, forms occurring in the former area are excellently preserved and easy to identify in thin sections (Z. Kortański, 1963).

In the Tatra Triassic, the recorded species are of stratigraphic value, giving the basis for subdivision into stages, especially in the case of the Middle Triassic (Anisian and Ladinian). Their occurrence is limited to organodetrital limestones and dolomites, sugar-like in macroscopic appearance. The specimens rarely occur *in situ*, being usually redeposited on smaller or larger distance. Therefore, they are usually concentrated in layers built of coarse-grained material. In such layers, the specimens are strongly crushed and with corroded calcareous walls of tubes whereas those almost uncrushed are sporadic. Crushed fragments sometimes display thin microoncolitic cover, usually formed in the place of deposition. Moreover, algal detritus deposited on a hardground or stromatolitic cover (built with contribution of blue-green algae), may be sometimes found (Z. Kortański, 1973b).

By analogy to environmental requirements of modern Dasycladaceae such as *Acetabularia* and *Dasycladus* it may be stated that Triassic species were living attached to bedrock, in the form of meadows at 1—2 m depths in very shallow and clear water. During heavy storms, they were torn off of the bedrock and transported and deposited in deeper parts of the basin, often at depths of some tens of meters. Deposition at such depths is indicated by the fact that stromatolitic covers, on which the detritus is often found, have been formed with some contribution of blue-green algae, generally characterized by such bathymetric requirements.

Fossil Dasycladaceae presumably lived in littoral zone at the very shore, in proximity of low tide line, in areas where tides were not very large and the shore fairly steep. Moreover, they could dwell subaqueous shoals (M. Mišik, 1968). It may be supposed that their environmental requirements were also fairly strict in relation to water chemistry and temperature. They lived in very warm (tropical) seas with normal to somewhat increased salinity. Even the smallest oscillations of the above three factors have been immediately reflected in changes in specific com-

position of algal assemblages, determining the existence and pattern of phyto-geographic provinces.

The hypothesis of existence of separate *Diplopore* reefs should be rejected completely. In the best case the organisms were forming meadows and small build-ups and the cooccurrence of several Dasycladaceae species in a single thin section suggests that we are dealing here with assemblages comprising several species. When mechanically crushed, fragments of these algae have been transported and redeposited in the same way as other components of clastic (organodetrital) rocks. *Diplopore* rocks are always well stratified and they display graded bedding of the detrital material. Huge mountain massifs such as those of the Tatra Mts display stratification partly obscured due to dolomitization in sea with somewhat increased salinity. This process has taken place soon after deposition of algal detritus. Huge thickness of rocks of that type, formed in shallow sea, was due to high rates of both sea-floor subsidence and sedimentation of calcareous algae, presumably growing in masses in neighbouring areas, where environmental conditions were excellent for their development. Recently attention was paid to relation of individual Dasycladaceae species to definite parts of reef complexes (P. H. Toscheck, 1968).

Differences in composition of Dasycladaceae flora gives the basis for reconstruction of some phyto-geographic provinces. The differentiation is especially well visible in the Tatra Mts, where there were recorded marked differences in algal assemblages of the high-tatric, lower sub-tatric (Križna), middle sub-tatric (Vepor and Choč) and upper sub-tatric (Stražov) series (Table 16).

Guide Dasycladaceae of the Middle and Upper Anisian (Pelsonian—Illyrian) include *Physoporella praealpina* Pia, *Ph. pauciforata* (Gümbel) Steinmann, *Diplopore annulatissima* Pia, *D. helvetica* Pia and *D. hexaster* (Pia) Pia. In the Tatra Mts, they are known to occur in masses in the high-tatric series (Z. Kotański in: M. Bac, K. Grochocka, 1965; J. Piotrowski, 1965; M. Bac, 1971; Z. Kotański, 1967; J. Bystrický, J. Veizer, 1965), some units of the Križna series, including the borehole column Zakopane (Z. Kotański, 1973b) and the Uplaz scale of the Vepor series (Z. Kotański, 1965). The presence of this assemblage in all the above series suggests that the southern Tethyan province was extending far to the north in the Middle and Late Ladinian.

In the Silesian-Cracow Upland Dasycladaceae are recorded in the same substages of the Anisian and the specific composition of the assemblages is very similar, except for some endemic species. The differences are, however, apparent as they seem to be due to misidentifications, related to different mode of preservation of the material in the *Diplopore* Dolomites and Ore-bearing Dolomites (in which Dasycladaceae are usually washed out and their presence is shown by voids only).

Dasycladaceae of the Silesian-Cracow Upland require a thoughtful revision. Old identifications cannot be treated as reliable, except for those made by J. Pia (1920, 1931): *Diplopore annulata* (Schafhäutl), *D. annulatissima* Pia and *Oligoporella elegans* (Assmann) Pia. The flora recently found in core material from the vicinities of Zawiercie made it possible to differentiate two assemblages in the *Diplopore* Dolomites. A lower assemblage, comprising physoporellae, still belongs to the Pelsonian, and the upper, comprising both these algae and *Diplopore annulatissima* Pia — to the Illyrian. The latter also comprises *D. annulata* (Schafhäutl) which would suggest its Fassanian age. However, the assemblage comprising both physoporellae and *D. annulatissima* Pia is well known to be typical of the Upper Anisian and there is growing evidence for cooccurrence of the latter

Stratigraphic ranges of calcareous algae in the Middle Triassic in the Silician-Cracow Upland and Tatra Mts (Z. Kotański)

| Stratigraphy |                                   | Tatric series                                                                                                                                                                                                                           |                                                                                                                                                                  |                                                                                                                                 |                                                                                                                                               | Silesian-Cracow Upland |                            |                                                                                                                                                                                                                                                                                                                                          |  |                |  |  |  |  |
|--------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|--|--|--|--|
| Stage        | Substage                          | Upper sub-tatric<br>/Stražov/                                                                                                                                                                                                           | Middle sub-tatric<br>/Choč and Vepor/                                                                                                                            | Lower sub-tatric<br>/Križna/                                                                                                    | High-tatric                                                                                                                                   |                        |                            |                                                                                                                                                                                                                                                                                                                                          |  |                |  |  |  |  |
| Ladinian     | Lango-<br>bardian                 | <i>Clypeina</i> sp.                                                                                                                                                                                                                     | Lack in Poland                                                                                                                                                   | <i>Poikiloporella</i> sp.<br><i>Diplopora annulata</i><br>/Schafhäütl/<br><i>D. uniostralis</i> Pia<br><i>Teutloporella</i> sp. | <i>Poikiloporella</i> sp.                                                                                                                     | Beds                   | Bor-<br>szowl-<br>ice      |                                                                                                                                                                                                                                                                                                                                          |  |                |  |  |  |  |
|              | Fassanian                         | <i>Teutloporella herculea</i><br>/Stoppani/ Pia<br><i>T. aequalis</i> /Gümbel/ Pia<br><i>T. tenuis</i> Pia<br><i>Diplopora annulata</i><br>/Schafhäütl/<br><i>Griphoporella</i> sp.<br><i>Macroporella</i> sp.<br><i>Actaularia</i> sp. |                                                                                                                                                                  | <i>Poikiloporella</i> sp.                                                                                                       |                                                                                                                                               |                        |                            |                                                                                                                                                                                                                                                                                                                                          |  |                |  |  |  |  |
| Anisian      | Upper<br>Illyr-<br>ian            | <i>Physoporella</i> sp.                                                                                                                                                                                                                 | <i>Diplopora annulatissima</i><br>Pia<br><i>Physoporella pauciforata</i><br>/Gümbel/ Steinmann<br><i>Ph. praecipua</i> Pia<br><i>Ph. dissita</i> /Gümbel/<br>Pia | <i>Physoporella pauciforata</i><br>/Gümbel/ Steinmann<br><i>Ph. praecipua</i> Pia<br><i>Ph. dissita</i> /Gümbel/<br>Pia         | <i>Diplopora annulatissima</i> Pia<br><i>Physoporella praecipua</i> Pia<br><i>Ph. dissita</i> /Gümbel/ Pia<br><i>Ph. minutula</i> /Gümbel/Pia | Beds                   | <i>Diplopora Dolomites</i> | <i>Diplopora annulata</i><br>/Schafhäütl/<br><i>D. annulatissima</i> Pia<br><i>Physoporella pauciforata</i><br>/Gümbel/ Steinmann<br><i>Ph. praecipua</i> Pia<br><i>Ph. dissita</i> /Gümbel/ Pia<br><i>Ph. minutula</i> /Gümbel/ Pie<br><i>Oligoporella elegans</i><br>/Assmann/ Pia<br><i>Physoporella</i> sp.<br><i>Actaularia</i> sp. |  |                |  |  |  |  |
|              | Middle<br>Pelson-<br>ian          |                                                                                                                                                                                                                                         |                                                                                                                                                                  |                                                                                                                                 |                                                                                                                                               |                        |                            |                                                                                                                                                                                                                                                                                                                                          |  |                |  |  |  |  |
|              | Lower<br>Bithyn-<br>ian<br>Aegean |                                                                                                                                                                                                                                         |                                                                                                                                                                  |                                                                                                                                 |                                                                                                                                               |                        |                            |                                                                                                                                                                                                                                                                                                                                          |  | Lack in Poland |  |  |  |  |

species and *D. annulata* (Schafhäütl). The whole Dasycladaceae assemblage from the Silesian-Cracow Upland appears clearly similar to the high-tatric one from the Tatra Mts and both of them may be treated as belonging to the Briançonnais-Prealpine-high-tatric-Upper Silesian-Balkan province (Z. Kortański, G. A. Catalov, 1973).

Taking into account the nature of the assemblage of calcareous algae it should be stated that phytogeographic provinces were at that time the same as the zoogeographic. The species *Aciculella bacillum* Pia, recorded in the Lower Pelsonian of the Góry Świętokrzyskie Mts (Łukowa Beds) and Upper Silesia (Góraždze Beds), indicates wide connections between the epicontinental Muschelkalk sea and the Tethys from the earliest Pelsonian (A. Gaździcki, W. R. Kowalski, 1974). *Acicularia* sp., often identified with *Aciculella bacillum* Pia, is known from the Karchowice Beds. The migration of flora from the Tethys to Upper Silesia continued in the Late Pelsonian, resulting in mass development of physoporellae in the latter area. The connections with open ocean were the best in the Illyrian, making possible migration of other representatives of physoporellae and appearance of *Diplopora* (*D. annulatissima* Pia). At that time there also appeared some endemic species such as *Oligoporella elegans* (Assmann) Pia. The presence of *Diplopora annulata* (Schafhäütl) shows that the connections still existed at the turn of the Anisian and Ladinian. The Ladinian displays increase in water salinity, responsible for extinction of Dasycladaceae in the Upper Silesia.

Dasycladaceae are unknown from the Fassanian of the high-tatric series in the Tatra Mts, also because of increased salinity. *Poikiloporella*, sporadically found in that series, is of the Langobardian age.

In the Zakopane Regle of the lower sub-tatric (Križna) series species of the genus *Diplopora* clearly predominate whereas those of *Teutloporella* and *Poikiloporella* are sporadic. The Križna flora still belongs to the Briançonnais province but influences of more southern zones of the Tethys are already very clear. The Ladinian of the middle sub-tatric (Choč) series is unknown in Poland but the studies carried out in Slovakia showed East-Alpine nature of its Dasycladaceae flora.

*Teutloporella* are very common in the Wetterstein Dolomite (Ladinian) of the upper sub-tatric (Stražov) series: *T. herculea* (Stoppani) Pia, *T. aequalis* (Gümbel) Pia and *T. tenuis* Pia. In these strata, *Diplopora annulata* (Schafhäütl), *Griphoporella* sp., *Macroporella* sp. and *Acicularia* sp. are markedly less numerous (Z. Kortański, 1973b). The assemblage is Fassanian in age. Upper part of the Wetterstein Dolomite yields specimens of a new genus of Dasycladaceae, resembling *Clypeina* from the Jurassic. The strata belong to the Langobardian and, possibly, Carnian. Large-sized *Teutloporella*, predominating in the upper sub-tatric series, make the facies clearly Mediterranean and reef-related in character. The reefs were of the coral-sponge-red algae type and teutloporellae were there related to the near-reef environment, and diploporae — to that of lagoons.

In the sub-tatric Rhaetian of the Tatra Mts there were found Dasycladaceae of the genus *Acicularia* (A. Gaździcki, 1974), and in the high-tatric Rhaetian — questionable ?*Nipponophycus* (A. Radwański, 1968). These green algae, formerly even regarded as bryozoans (F. Rabowski, 1959), were of subordinate importance there.

Protococceaceae plant spores: *Globochaete alpina* Lombard and *G. tatrica* Radwański occur in the high-tatric (A. Radwański, 1968) and lower sub-tatric (A. Gaździcki, 1974) Rhaetian.

Genus *Teutloporella* Pia, 1912  
*Teutloporella herculea* (Stoppani) Pia, 1912

Plate CIV, Figs. 1, 2e, 4, 5

- 1920 *Teutloporella herculea* Stopp.; J. Pia, p. 40, pl. 2, figs. 16—18.  
 1964 *Teutloporella herculea* (Stopp.); J. Bystrický, pp. 89—91, pl. 2, figs. 1—4.  
 1979 *Teutloporella herculea* (Stoppani) Pia; Z. Kotański (*in: Atlas...*), p. 218, pl. 80, figs. 1, 2e, 4, 5.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (Wetterstein Dolomite in upper sub-tatric series only — Lower Ladinian). Species characteristic of southern Tethyan zone. (ZK)

*Teutloporella aequalis* (Gümbel) Pia, 1920

Plate CIV, Fig. 3

- 1912 *Teutloporella herculea* (Stopp.); J. Pia, p. 37, pl. 2, fig. 27; pl. 3, figs. 1, 2.  
 1920 *Teutloporella aequalis* (Gümbel); J. Pia, p. 39.  
 1964 *Teutloporella aequalis* (Gümbel) Pia; J. Bystrický, p. 92, pl. 3, figs. 2—4.  
 1979 *Teutloporella aequalis* (Gümbel) Pia; Z. Kotański (*in: Atlas...*), p. 219, pl. 80, fig. 3.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (Wetterstein Dolomite in the upper sub-tatric series only — Fassanian). Species characteristic for most southern part of the Tethys. (ZK)

Genus *Oligoporella* Pia, 1912  
*Oligoporella elegans* (Assmann, 1926) Pia, 1931

Plate CV, Figs. 22—25

- 1926 *Diploporella elegans* Assmann; P. Assmann, p. 504.  
 1931 *Oligoporella elegans* (Assmann) Pia; J. Pia, pp. 273, 274, pl. 21, figs. 3—6.

Collection. — Naturhistorisches Museum in Wien, J. Pia coll.

Occurrence. — Upper Silesia (*Diploporella* Dolomites — Illyrian). The species known from the Upper Silesia only. The species *O. prisca*, the closest to it, is very common in the Anisian in the Tethyan region. (ZK)

Genus *Physoporella* Steinmann, 1903  
*Physoporella praealpina* Pia, 1920

Plate CIII, Figs. 1a, b, 2a, b, f, 3, 10, 16, Plate CV, Figs. 14—16; Plate CVI, Figs. 1—5, 7, 8, 9a

- 1920 *Physoporella praealpina* Pia; J. Pia, p. 53, pl. 3, figs. 1—9.  
 1973 *Physoporella praealpina* Pia; Z. Kotański, G. A. Čatalov, pp. 190—192, pl. 6, figs. 1—12; pl. 7, figs. 1—19.  
 1979 *Physoporella praealpina* Pia; Z. Kotański (*in: Atlas...*), p. 219, pl. 79, figs. 1a, b, 2a, b, f, 3, 10, 16.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (mainly sub-tatric series — Pelsonian—Illyrian), Upper Silesia (*Diploporella* Dolomites — Pelsonian—Illyrian). The species is especially characteristic for outer zone of the Tethys and Paratethys, which forms the Briançonnais-Prealpine-high-tatric-Upper Silesian-Balkan province. (ZK)

*Physoporella dissita* (Gümbel) Pia, 1912

Plate CIII, Figs. 2c, 5, 6; Plate CV, figs. 17—19

1912 *Physoporella dissita* (Gümbel); J. Pia, p. 45, pl. 6, figs. 1—4.1973 *Physoporella dissita* (Gümbel) Pia; Z. Kotański, G. A. Čatolov, pp. 192, 193, pl. 8, figs. 1—23.1979 *Physoporella dissita* (Gümbel) Pia; Z. Kotański (*in: Atlas...*), p. 219, pl. 79, figs. 2c, 5, 6.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (mainly high-tatric series — Pelsonian—Illyrian), Upper Silesia (*Diplopora Dolomites* — Pelsonian—Illyrian). The species is characteristic for outer zone of the Tethys and Paratethys, which forms the Briançonnais—Prealpine—high-tatric—Upper Silesian province. (ZK)*Physoporella minutula* (Gümbel) Pia, 1912

Plate CIII, Figs. 11, 12; Plate CV, figs. 20, 21

1912 *Physoporella minutula* (Gümbel); J. Pia, p. 45, pl. 6, figs. 5—12.1973 *Physoporella minutula* (Gümbel) Pia; Z. Kotański, G. A. Čatolov, pp. 194, 195, pl. 9, figs. 1—35.1979 *Physoporella minutula* (Gümbel) Pia; Z. Kotański (*in: Atlas...*), p. 220, pl. 79, figs. 11, 12.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (high-tatric series — Pelsonian—Illyrian), Upper Silesia (*Diplopora Dolomites* — Pelsonian—Illyrian). (ZK)*Physoporella pauciforata* (Gümbel) Steinmann, 1912

Plate CVI, Fig. 9b

1912 *Physoporella pauciforata* (Gümbel) Steinmann; J. Pia, p. 51, pl. 3, figs. 10—15.1964 *Physoporella pauciforata* var. *pauciforata* Bystrický; J. Bystrický, pp. 118—121, pl. 13, figs. 1—6; pl. 14, figs. 4, 5b, 6.1973 *Physoporella pauciforata* var. *pauciforata* Bystrický; Z. Kotański, G. A. Čatolov, pp. 195, 196, pl. 10, figs. 1—6.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (high-tatric and lower and middle sub-tatric series — Pelsonian—Illyrian), Upper Silesia (*Diplopora Dolomites* — Pelsonian—Illyrian). The species is widely distributed in the Tethys, being also recorded in the Paratethys. (ZK)Genus *Diplopora* Schafhäütl, 1863*Diplopora annulatissima* Pia, 1920

Plate CIII, Figs. 1c, 2d, e, 7—9; Plate CV, Figs. 8—13

1920 *Diplopora annulatissima* Pia; J. Pia, p. 67, pl. 4, figs. 11—16.1931 *Diplopora annulatissima* Pia; J. Pia, p. 273, pl. 21, figs. 1, 2.1964 *Diplopora annulatissima* Pia; J. Bystrický, p. 137, pl. 24, figs. 4, 5; pl. 25, figs. 1—4; pl. 26, figs. 1—4; pl. 27, figs. 1—4; pl. 28, figs. 1—4.1979 *Diplopora annulatissima* Pia; Z. Kotański (*in: Atlas...*), p. 220, pl. 79, figs. 1c, 2d, e, 7—9.

Collection. — MUZ IG, Z. Kotański coll.

Occurrence. — Tatra Mts (mainly high-tatric series — Illyrian), Upper Silesia (uppermost *Diplopora Dolomites* — Illyrian—Fassanian). The species is

especially characteristic for northern zone of the Tethys and Paratethys, which forms the Prealpine-high-tatric-Upper Silesian province, but it also occurs in southern zone of the Tethys. (ZK)

*Diplopora hexaster* (Pia) Pia, 1920

Plate CIII, Figs. 13—15

1920 *Diplopora hexaster* (Pia); J. Pia, p. 64, pl. 3, figs. 26—32.

1965 *Diplopora hexaster* (Pia); Pia; J. Bystrický, J. Veizer, p. 15, pl. 4, fig. 4.

1979 *Diplopora hexaster* (Pia) Pia; Z. Kotoński (in: Atlas...), p. 221, pl. 79, figs. 13—15.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts (high-tatric series — Pelsonian—Illyrian). (ZK)

*Diplopora annulata annulata* Bystrický, 1964

Plate CIV, Fig. 13; Plate CV, Figs. 1, 2

1920 *Diplopora annulata* var. *septemtrionalis* Pia; J. Pia, p. 78, pl. 5, figs. 14—17, 20, 23, 35.

1964 *Diplopora annulata* (Schafh.) Schafh. var. *annulata* Bystrický; J. Bystrický, p. 140, pl. 29, figs. 1—4.

1979 *Diplopora annulata annulata* Bystrický; Z. Kotoński (in: Atlas...), p. 221, pl. 80, fig. 13.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts (lower sub-tatric Križna series — Fassanian), Upper Silesia (uppermost part of *Diplopora Dolomites* — Illyrian—Fassanian). (ZK)

*Diplopora annulata dolomitica* Pia, 1920

Plate CIV, Figs. 2a—d, 10—12, 14

1920 *Diplopora annulata* var. *dolomitica*; J. Pia, p. 36, pl. 6, figs. 14—16.

1964 *Diplopora annulata* (Schafh.) Schafh. var. *dolomitica* (Pia) Pia; J. Bystrický, p. 142, pl. 29, fig. 5; pl. 30, figs. 1—6; pl. 6, figs. 14—16.

1979 *Diplopora annulata dolomitica* Pia; Z. Kotoński (in: Atlas...), p. 221, pl. 80, figs. 2a—d, 10—12, 14.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts (lower sub-tatric Križna series and upper sub-tatric Stražov series — Fassanian). This variety is fairly common in the Tethyan region, especially the southern zone, and its lack in the northernmost, high-tatric, Briançonnais and Prealpine zone is highly characteristic. (ZK)

*Diplopora uniserialis* Pia, 1920

Plate CIV, Figs. 6—9

1920 *Diplopora uniserialis* Pia; J. Pia, p. 59, pl. 5, figs. 1—8.

1979 *Diplopora uniserialis* Pia; Z. Kotoński (in: Atlas...), p. 222, pl. 80, figs. 6—9.

Collection. — MUZ IG, Z. Kotoński coll.

Occurrence. — Tatra Mts (lower sub-tatric Križna series — Fassanian). The species is characteristic for the outer part of the Tethys (Briançonnais and Prealpine zone in western Alps), missing in the high-tatric series, Paratethys, as well as more southern parts of the Tethys. (ZK)

Genus *Aciculella* Pia, 1927

*Aciculella bacillum* Pia, 1927

Plate CV, Figs. 26, 27

1930 *Aciculella bacillum* Pia; J. Pia, pp. 179, 180, fig. 1c, pl. 4, figs. 7, 8, 9?

1964 *Aciculella* sp.; J. Bystrický, pl. 31, figs. 6, 7.

1974 *Aciculella bacillum* Pia; A. Gaździcki, W. R. Kowalski, pp. 27—31, pl. 1, figs. 1—8.

Collection. — ZPAL, A. Gaździcki coll.

Occurrence. — Góry Świętokrzyskie Mts (Łukowa Beds), Upper Silesia (Góraždze Beds — lowermost Pelsonian). This species and other forms assigned to the genus *Aciculella* are widely distributed in the Anisian and Ladinian as well as the Rhaetian in the Tatra Mts and other parts of the Tethys. (ZK)

### Class RHODOPHYTA

Red algae are of marked rock-forming importance in the Triassic of the Tatra Mts, especially in the Wetterstein Dolomite (Ladinian) of upper sub-tatric nappe (Z. Kotański, 1973b). In the high-tatric Rhaetian, they occurred in the form of real algal scrubs, developing along with colonial corals, calcareous sponges and hydrozoans some encrustations and build-ups. The encrustations were bored by various organisms and subjected to destruction by waving (A. Radwański, 1968). In the Križna (lower sub-tatric) Rhaetian, there were found red algae *Solenopora* sp. and ?*Pycnoporidium eomesozoicum* (Flügel) (see A. Gaździcki, 1974). (ZK)

### Classes PTERIDOPHYTA and SPERMATOPHYTA

**General characteristics.** (MRe). Macroflora of the Triassic is still poorly known as it is rare throughout the world and usually represented by innumerable species. Some remarks given in the literature suggest presence of some floral localities in Poland. Only a few of these localities were studied, e.g. the *Glossopteridium czarnockii* Bocheński locality in the Buntsandstein of the Góry Świętokrzyskie Mts (T. Bocheński, 1957), Rhaetian flora in the Tomanowa Beds in the Tomanowa Valley, Tatra Mts (M. Raciborski, 1891b), Rhaetian flora in the vicinities of Wieluń and Kluczbork (H. R. Göppert, 1836, 1845a, b; F. A. Roemer, 1870; W. Gothan, 1909) and the *Lepidopteris ottonis* (Goepfert) Schimper locality in the Rhaetian of the Fore-Sudetic Monocline (M. Piwocki, 1970).

In the light of the latest studies, flora from the vicinities of Ostrowiec, described as Rhaetian by M. Raciborski (1891a, 1892a), is dated at the Liassic. Moreover, plants found in the Woźniki Limestones appear insufficiently characteristic to forejudge Rhaetian age of these strata.

Triassic flora display features intermediate between those of the Paleozoic and Mesozoic. It was the time of extinction of plants related to Paleozoic ones (except for some innumerable specialized ones) and the beginning of development of those typical of the Mesozoic. The flora comprises representatives of some families and genera which survived till the present without any major changes; e.g. horsetails (*Equisetum*) and ferns of the families Marattiaceae, Dipteridaceae and Matoniaceae. The most common elements of the Triassic flora include horsetails, seed ferns, cycads, bennettites and conifers.

In the class Pteridophyta, horsetails (Sphenopsida) are most common. They are impoverished in relation to the Paleozoic, being represented by the genera: *Neocalamites*, with free leaves, *Schizoneura*, with groups of several leaves united to one another, and *Equisetum*, with leaves united to a tubular sheath. Old species of *Equisetum* were characterized by large diameter of stem and those with stem about 1 cm in diameter, i.e. species affined to *E. muensteri* (Sternberg) Schimper, have not appeared until the Rhaetian.

In Poland, *Equisetum chalubinskii* Raciborski, *E. ?bunburyanum* Zigno and *Schizoneura hoerensis* (Hisinger) Schimper = *Neocalamites hoerensis* (Schimper) Halle have been described from the Rhaetian of the Tatra Mts (M. Raciborski, 1891b), *Calamites lehmanianus* Goepfert = *Neocalamites hoerensis* (Schimper) Halle — from coeval strata in the above area (M. Raciborski, 1891b) and vicinities of Kluczbork (F. A. Roemer, 1870) and the Lower Keuper of the Góry Świętokrzyskie Mts, and *Equisetum* sp. — from the Lower Buntsandstein (J. Czarnocki, 1925).

Of lycopods (Lycopsidea), special attention should be paid to the last giants — *Pleuromeia*, attaining 2 m in height. In Poland, J. Czarnocki (1931) reported *Pleuromeia* cf. *sternbergi* (Münster) Corda from the Middle Buntsandstein of the Góry Świętokrzyskie Mts. Plants resembling recent *Isoetes* have been found in the Keuper in the borehole column Studzianna 1.

Lower Triassic ferns (Pteropsida) such as *Asterotheca* of the family Marattiaceae and *Neuropteridium*, appear closer to Carboniferous forms than Upper Triassic ferns. The majority of new forms have not appeared until late Middle Triassic. This is the case of *Dictyophyllum*, *Clathropteris*, *Camptopteris* of the family Dipteridaceae, *Danaeopsis*, *Marattiopsis* of Marattiaceae and *Phlebopteris* of Matoniaceae. These families, widely distributed in the Jurassic, are known to occur at present in subtropical and tropical zones.

In Poland, *Clathropteris platyphylla* Brogniart = *C. meniscoides* Brogniart *Cladophlebis roesserti* Presl, *Dictyophyllum* aff. *dunkeri* Nathorst and *Pecopteris lobata* Oldham et Morris have been described from the Rhaetian of the Tatra Mts (M. Raciborski, 1891b) and *Clathropteris muensteriana* Schenk = *C. meniscoides* Brogniart — from the Rhaetian of the vicinities of Kluczbork (F. A. Roemer, 1870).

Among Spermatophyta, an important role in the Triassic has been played by seed ferns (Pteridospermopsida), which share in floral spectrum was equal 20—30%. The family Peltaspermaeae was most important. Its best known representative is *Lepidopteris*, several species of which have been reported from floral assemblages in both northern and southern hemispheres.

A special attention should be paid to *Lepidopteris ottonis* (Goepfert) Schimper, first described from the Rhaetian of the vicinities of Wieluń, under the name *Alethopteris ottonis* Goepfert (H. R. Göppert, 1836; W. Gothan, 1909). This species has been reported several times from the vicinities of Kluczbork in the last century (H. R. Göppert, 1845b; F. A. Roemer, 1870), and recently from the vicinities of Rawicz (M. Piwocki, 1970). It is regarded as guide species for the Rhaetian in Europe, being also known from Greenland.

The oldest remains of bennetites (Bennettitopsida) are known from the Keuper but specialized fructifications of the genera *Sturianthus* and *Westerheimia* show that this group had to appear much earlier. Large-leaved forms of *Anomozamites*, *Pterophyllum* and *Zamites* are typical of Late Triassic floras.

In Poland, there have been described *Pterophyllum braunianum* Goepfert, *P. carnallianum* Goepfert and *P. muensteri* Goepfert (H. R. Göppert, 1845a).

Conifers (Coniferopsida) have passed a stage of accelerated evolution at the turn of the Paleozoic and Mesozoic. Pollen spectra show that this resulted in origin of various plant forms in the Triassic. Only some of these forms are known from findings of cones or branches with leaves but even these appear insufficiently known for reconstruction of their affinities and relations to modern conifers. This is the case of cones and scales of *Cycadocarpidium* and branches of *Podozamites*, with leaves with several parallel nerves, regarded as related and known

to occur from the base of the Keuper upwards. Systematic position also remains debatable in the case of *Palyssia* and *Stachyotaxus* which are characterized by similar stratigraphic ranges. The two genera, similarly as the majority of Triassic conifers, had scale-like or needle-like leaves with a single nerve. In some of them, seed scales were subdivided into several lobes; e.g. in Early Triassic *Voltzia*, Keuper *Tricranolepis* and Rhaetian *Hirmerella* (= *Cheirolepis*). The scales of cones of *Araucarites charcoti* Harris from the Rhaetian of Greenland are the earliest remains assigned to the modern family Araucariaceae.

In Poland, *Palyssia brauni* Endlicher and *Widringtonites* sp. have been described from the Rhaetian of the Tatra Mts (M. Raciborski, 1891b), *Voltzia* sp. — from the Lower Buntsandstein of the Góry Świętokrzyskie Mts (J. Czarnocki, 1931), and *Voltzia krapitzensis* Kunisch — from the Muschelkalk of Lower Silesia (M. Raciborski, 1912).

The systematic position of *Glossopteridium czarnockii* Bocheński from the Buntsandstein of the Góry Świętokrzyskie Mts (T. Bocheński, 1957), still remains disputable.

The recent studies (I. A. Dobruskina, 1970; P. D. W. Barnard, 1973) showed that three paleofloristic areas may be differentiated in the Triassic. The first of them, equatorial, was related to subtropical or moderate warm climatic conditions, comprising floras of Poland and the majority of other areas from similar geographic latitudes. Areas of Siberia, stretching north of the above ones, and those of Gondwana, stretching to the south, were presumably situated in zones of moderate climate.

Two types of Triassic floras are differentiated; Early Triassic one, closer to the Paleozoic, and the Late Triassic, closer to the Jurassic. Floras of the latter type attained worldwide distribution in the end of the Triassic, and peak in their development — in the Rhaetian. *Pleuromeia* is regarded as guide form for the Lower Triassic in the Euroamerican region (I. A. Dobruskina, 1970), and *Schizoneura* (*S. paradoxa* Schimper et Mougeot) and *Voltzia* (*V. heterophylla* Brogniart) for the European province (P. D. W. Barnard, 1973). *Lepidopteris ottonis* (Goepert) Schimper is regarded as guide species for the Rhaetian of Europe and Greenland.

# EXPLANATIONS AND PLATES

## FAUNA—INVERTEBRATES

### Foraminiferida

#### PLATE I

- Figs. 1, 2. *Hyperammina proneptis* Schleicher,  $\times 80$ , side view, borehole Nidzica IG 1 (NE Poland), depth 2115.0 m; MUZ IG 6219/73/F; Lower Buntsandstein
- Fig. 3. *Ammodiscus inaequalis* Styk — holotype,  $\times 80$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.5 m; MUZ IG 6222/73/F; Lower Muschelkalk
- Figs. 4—6. *Lituotuba indistincta* (Trifonova),  $\times 80$ , side view, borehole Żebrak IG 1 (Podlasie), depth 993.1 m; MUZ IG 6226/73/F; Lower Muschelkalk
- Figs. 7, 8. *Trochamminoides antis* Styk, 7 — holotype,  $\times 100$ , side view, borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 230.0 m; MUZ IG 6201/72/F; 8 —  $\times 150$ ; Lower Muschelkalk
- Fig. 9. *Orthovertella flexuosa* Styk — holotype,  $\times 80$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.2 m; MUZ IG 6204/72/F; Lower Muschelkalk
- Fig. 10. *Nodosaria raibliana* Gümbel,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.0 m; MUZ IG 6208/73/F; Lower Muschelkalk
- Fig. 11. *Nodosaria subprimitiva* Gerke,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 256.6 m; MUZ IG 6233/73/F; Lower Muschelkalk
- Fig. 12. *Geinitzinita oberhauseri* Sellier de Civrieux et Dessauvagine,  $\times 90$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6236/73/F; Lower Muschelkalk
- Fig. 13. *Pachyphloides klebelsbergi* (Oberhauser),  $\times 80$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 257.5 m; MUZ IG 6238/73/F; Lower Muschelkalk
- Fig. 14. *Pachyphloides triangularis* Styk — holotype,  $\times 80$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6211/72/F; Lower Muschelkalk
- Fig. 15. *Astaculus dobroviensis* Styk — holotype,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6210/72/F; Lower Muschelkalk
- Fig. 16. *Astaculus kopiki* Styk — paratype,  $\times 50$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6241a/73/F; Lower Muschelkalk
- Fig. 17. *Astaculus velum* Kristan-Tollmann,  $\times 80$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6244/73/F; Lower Muschelkalk
- Fig. 18. *Dentalina cassiana* Gümbel,  $\times 60$ , side view, borehole Olszyny IG 1 (NE Poland), depth 1302.5 m; MUZ IG 6247/73/F; Lower Muschelkalk
- Fig. 19. *Dentalina excelens* Styk — holotype,  $\times 100$ , side view, borehole Olszyny IG 1 (NE Poland), depth 1302.5 m; MUZ IG 6253/73/F; Lower Muschelkalk
- Fig. 20. *Dentalina gerkei* Styk — holotype,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6213/72/F; Lower Muschelkalk
- Fig. 21. *Dentalina gladioides gladioides* Gerke,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 256.6 m; MUZ IG 6258/73/F; Lower Muschelkalk
- Fig. 22. *Dentalina hoi* Trifonova,  $\times 90$ , side view, borehole Olszyny IG 1 (NE Poland); depth 1302.5 m; MUZ IG 6261/73/F; Lower Muschelkalk
- Fig. 23. *Dentalina transmontana* Gümbel,  $\times 100$ , side view, borehole Olszyny IG 1 (NE Poland), depth 1302.5 m; MUZ IG 6264/73/F; Lower Muschelkalk
- Fig. 24. *Dentalina vadaszi* Oberhauser,  $\times 100$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 257.0 m; MUZ IG 6267/73/F; Lower Muschelkalk
- Fig. 25. *Marginulina grazynae* Styk — holotype,  $\times 100$ , side view, borehole Żebrak IG 1 (Podlasie), depth 1012.8 m; MUZ IG 6270/73/F; Lower Muschelkalk

- Fig. 26. *Marginulinopsis pozaryskii* Styk — holotype,  $\times 100$ , side view, borehole Olszyny IG 1 (NE Poland), depth 1302.5 m; MUZ IG 6273/73/F; Lower Muschelkalk
- Fig. 27. *Pseudonodosaria bieleckae* Styk — holotype,  $\times 90$ , side view, borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 230.4 m; MUZ IG 6279/73/F; Lower Muschelkalk
- Fig. 28. *Pseudonodosaria levifracta* (Kristan-Tollmann),  $\times 100$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 257.2 m; MUZ IG 6282/73/F; Lower Muschelkalk
- Fig. 29. *Pseudonodosaria obconica* (Reuss),  $\times 100$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6285/73/F; Lower Muschelkalk
- Fig. 30. *Pseudonodosaria polyarthra* (Kristan-Tollmann),  $\times 100$ , frontal view, borehole Olszyny IG 1 (NE Poland), depth 1302.5 m; MUZ IG 6288/73/F; Lower Muschelkalk
- Fig. 31. *Vaginulinopsis eocomma* Kristan-Tollmann,  $\times 60$ , side view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6276/73/F; Lower Muschelkalk
- Fig. 32. *Ramulina subcylindrica* Styk — holotype,  $\times 80$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 257.0 m; MUZ IG 6214/72/F; Lower Muschelkalk
- Fig. 33. *Spirillina oberhauseri* Styk — holotype,  $\times 70$ , frontal view, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.0 m; MUZ IG 6217/72/F; Lower Muschelkalk
- Fig. 34. *Oberhauserella* cf. *mesotriassica* (Oberhauser),  $\times 100$ , a — ventral side, b — dorsal side, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.0 m; MUZ IG 6350/73/F; Lower Muschelkalk
- Fig. 35. *Kollmannita* cf. *ladinica* (Oberhauser),  $\times 100$ , ventral side, borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.0 m; MUZ IG 6297/73/F; Lower Muschelkalk
- Figs. 1—35 — photos by J. Modrzejewska

## PLATE II

- Fig. 1. *Glomospira densa* (Pantić),  $\times 80$ , Strzelce Opolskie (Upper Silesia) (in: A. Gaździcki et al., 1975); IGP UW; Górażdże Beds (Pelsonian)
- Fig. 2. *Glomospirella grandis* (Salaj),  $\times 80$ , Górażdże (Upper Silesia) (in: A. Gaździcki et al., 1975); IGP UW; Górażdże Beds (Pelsonian)
- Fig. 3. "*Turritelletta*" *mesotriassica* Koehn-Zaninetti,  $\times 90$ , Wielkie Koryciska Valley (Tatra Mts) (in: A. Gaździcki and K. Zawidzka, 1973); IGP UW; Partnach Beds (Illyrian)
- Fig. 4. *Trochammina almtalensis* Koehn-Zaninetti,  $\times 70$ , Wielkie Koryciska Valley (Tatra Mts) (in: A. Gaździcki and K. Zawidzka, 1973); IGP UW; Partnach Beds (Illyrian)
- Fig. 5. *Endothyra salaji* Gaździcki — holotype,  $\times 200$ , Zajaczków (Góry Świętokrzyskie Mts) (in: A. Gaździcki et al., 1975); IGP UW; Ceratites Beds (Fassanian)
- Fig. 6. *Agathammina judicariensis* Premoli Silva,  $\times 80$ , Strzelce Opolskie (Upper Silesia) (in: A. Gaździcki et al., 1975); IGP UW; Górażdże Beds (Pelsonian)
- Fig. 7. ?*Meandrospira deformata* Salaj,  $\times 200$ , Wolica (Góry Świętokrzyskie Mts) (in: A. Gaździcki et al., 1975); IGP UW; Łukowa Beds (Lower Anisian)
- Fig. 8. *Meandrospira dinarica* Kochansky-Devidé and Pantić,  $\times 130$ , Strzelce Opolskie (Upper Silesia) (in: A. Gaździcki et al., 1975); IGP UW; Górażdże Beds (Pelsonian)
- Fig. 9. *Glomospirella pokornyii* (Salaj),  $\times 80$ , Chochołowska Valley (Tatra Mts); ZPAL F.XXVIII/26—14; Norovica Formation (Rhaetian)
- Fig. 10. *Mesodiscus comesozoicus praecursor* (Gaździcki) — holotype,  $\times 200$ , Wolica (Góry Świętokrzyskie Mts) (in: A. Gaździcki et al., 1975); IGP UW; Łukowa Beds (Pelsonian)
- Fig. 11. *Aulotortus pragsoides* (Oberhauser),  $\times 35$ , Strzelce Opolskie (Upper Silesia) (in: A. Gaździcki et al., 1975); IGP UW; Górażdże Beds (Pelsonian)
- Fig. 12. *Aulocoma permoldiscoides* (Oberhauser),  $\times 50$ , Chochołowska Valley (Tatra Mts); ZPAL F.XXVIII/26—II—5; Norovica Formation (Rhaetian)
- Fig. 13. *Glomospirella friedli* Kristan-Tollmann,  $\times 80$ , Lejowa Valley (Tatra Mts) (in: A. Gaździcki, 1974); IGP UW; Fatra Formation (Rhaetian)
- Fig. 14. *Aulotortus gascheti* (Koehn-Zaninetti and Brönnimann),  $\times 60$ , Lejowa Valley (Tatra Mts); ZPAL F.XXVIII/18—38; Fatra Formation (Rhaetian)
- Fig. 15. *Triasina hantkeni* Majzon,  $\times 55$ , Chochołowska Valley (Tatra Mts) (in: A. Gaździcki and K. Zawidzka, 1973); IGP UW; Norovica Formation (Rhaetian)
- Fig. 16. *Aulotortus sinuosus* Weynschenk,  $\times 40$ , Chochołowska Valley (Tatra Mts); ZPAL F.XXVIII/26—II—5; Norovica Formation (Rhaetian)

## Hyalospongea

## PLATE III

- Fig. 1. *Tremadictyon roemerii* (Eck) — holotype,  $\times 1$ , Tarnowice (Upper Silesia); Karchowice Beds

Figs. 2, 3. *Tremadictyon roemeri* (Eck) = *Tremadictyon roemeri* Rauff,  $\times 1$ , Kamień Śląski (Upper Silesia); Middle Muschelkalk

Figs. 1—3 after P. Assmann (1937)

### Anthozoa

#### PLATE IV

Fig. 1. *Phacelostylophyllum lejowae* (Roniewicz) — holotype,  $\times 5$ , transversal section, northern part of Lejowa Valley (Tatra Mts); ZPAL H.VI/121; sub-tatric Choč series

Fig. 2. *Retiophyllia paraclathrata* Roniewicz — holotype,  $\times 15$ , transversal section of young individual, Mt. Mały Kopieniec (Tatra Mts); ZPAL H.VI/123; sub-tatric Križna series

Fig. 3. *Retiophyllia clathrata* (Emmrich),  $\times 3$ , transversal section, Mt. Mała Świnica (Tatra Mts); ZPAL H.VI/140; sub-tatric Križna series

Fig. 4. *Stylophyllum gracile* Roniewicz — holotype,  $\times 2.5$ , transversal section, Tatra Mts; ZPAL VI/137; high-tatric series

Fig. 5. *Retiophyllia sellae* (Stoppani),  $\times 5$ , transversal section, Mt. Mała Świnica (Tatra Mts); ZPAL H.VI/57; sub-tatric Križna series

#### PLATE V

Fig. 1. *Phacelostylophyllum robustum* Roniewicz — holotype,  $\times 3$ , transversal section, northern part of Chochołowska Valley (Tatra Mts); ZPAL H.VI/129; sub-tatric Choč series

Fig. 2. *Phacelostylophyllum medium* Roniewicz — holotype,  $\times 6$ , transversal section of one individual from a colony, Chochołowska Valley — pass at Kulawiec (Tatra Mts); ZPAL H.VI/1; high-tatric series

Fig. 3. *Astraeomorpha crassisepta* Reuss,  $\times 3$ , transversal section, northern part of Chochołowska Valley (Tatra Mts); ZPAL H.VI/96; sub-tatric Choč series

Fig. 4. *Rhaetiastraea tatraca* Roniewicz — holotype,  $\times 3.5$ , transversal section, Chochołowska Valley — pass at Kulawiec (Tatra Mts); ZPAL H.VI/12; high-tatric series

Fig. 5. *Pamiroseris rectilamellosa* (Winkler),  $\times 5$ , transversal section, Mt. Mała Świnica (Tatra Mts); ZPAL H.VI/51; sub-tatric Križna series

#### PLATE VI

##### *Pamiroseris silesiaca* (Beyrich)

Fig. 1. Transversal section of corals,  $\times 9$ , Kamień Śląski (Upper Silesia); thin section UJ 7/1; Karchowice Beds

Fig. 2. Longitudinal section of fragment of colony,  $\times 9$ , Kamień Śląski (Upper Silesia); thin section UJ 7/2; Karchowice Beds

Fig. 3. Imprint of upper surface of colony,  $\times 2$ , borehole Zawiercie ZMZ-14 (Upper Silesia), depth 42 m; specimen UJ 34P3; *Diplopora* Dolomites

Fig. 4. a — imprint of upper surface of colony,  $\times 2$ , Stare Gliny near Olkusz (Silesian-Cracow Upland); b — the same fragment,  $\times 6.5$ ; specimen UJ 34P4; *Diplopora* Dolomites

### Polychaetia

#### PLATE VII

Figs. 1, 3, 4. *Delosites varidentatus* Kozur emend. Zawidzka,  $\times 170$ , Górażdże (Upper Silesia) (in: K. Zawidzka, 1971a); 1a — apparatus in ventral view; 1b — the apparatus in dorsal view; 3a — *MI* in dorsal view; 3b — *MI* in ventral view; 4a — *MII* in dorsal view; 4b — *MII* in ventral view; IGP UW, K. Zawidzka coll.; Pelsonian

Fig. 2. *Elleriprion mamillatus* Zawidzka,  $\times 120$ , *MI* in dorsal view, Wierchlesie (Upper Silesia) (in: K. Zawidzka, 1975b), IGP UW 137/71; Pelsonian

Figs. 5, 8. *Praelumbrinereis zawidzkae* Kozur, Górażdże (Upper Silesia) (in: K. Zawidzka, 1975b); 5 — *MI* in ventral view,  $\times 120$ , no. 0165; 8 — *MII* in dorsal view,  $\times 100$ , IGP UW 25/71; Pelsonian

Fig. 6. *Elleriprion kozuri* Zawidzka,  $\times 120$ , Górażdże (Upper Silesia) (in: K. Zawidzka, 1975b); a — *MI* in dorsal view; b — *MI* in ventral view; IGP UW 0165/57; Lower Muschelkalk

Fig. 7. *Kielanoprion longidentatus* Zawidzka,  $\times 120$ , Wierchlesie (Upper Silesia) (in: K. Zawidzka, 1975b); a — fragment of apparatus in dorsal view, IGP UW 32/71, b — the same fragment, ventral view; Illyrian

## PLATE VIII

- Figs. 1, 2. *Serpula schimischowensis* Assmann, Szymiszów (Upper Silesia) (*in*: P. Assmann, 1937); Karchowice Beds  
 Figs. 3, 4. *Serpula simplex* Assmann, 3 — Szymiszów (Upper Silesia) (*in*: P. Assmann, 1937), Karchowice Beds; 4 — Tarnowice (Upper Silesia); ZGI Berlin X3313—14; Ore-bearing Dolomites  
 Fig. 5. *Salmacina incerta* Assmann — holotype,  $\times 2.5$ , Szymiszów (Upper Silesia); ZGI Berlin X3310; Karchowice Beds  
 Figs. 1—5 reproduced by R. Ufnal

## Articulata

## PLATE IX

- Fig. 1. *Punctospirella fragilis* (Schlotheim), Wilkowice (Upper Silesia) (*in*: P. Assmann, 1937); Wilkowice Beds  
 Fig. 2. *Mentzelia mentzeli* (Dunker), Tarnowice (Upper Silesia); ZGI Berlin X3010—12; Karchowice Beds  
 Fig. 3. *Hirsutella hirsuta* (Alberti),  $\times 3$ , Wolica (Góry Świętokrzyskie Mts); MUZ IG 1362/II/1; *P. striatum* Beds  
 Fig. 4. *Zeilleria edlingeri* (Assmann) — holotype, Mikulczyce (Upper Silesia); ZGI Berlin X3319; Karchowice Beds  
 Fig. 5. *Zeilleria ulrici* (Assmann) — holotype,  $\times 2$ , Tarnowice (Upper Silesia); ZGI Berlin X3326; Gogolin Beds  
 Fig. 6. *Zeilleria subcircularis* (Assmann) — holotype,  $\times 2$ , Kamień Śląski (Upper Silesia) (*in*: P. Assmann, 1937); Middle Muschelkalk  
 Figs. 7—10. *Coenothyris vulgaris* (Schlotheim),  $\times 1$ , 7a—c — ZPAL Bp. XXI/19/II/1, Strzelce Opolskie (Upper Silesia); Lower Muschelkalk; 8a—c — MUZ IG 1362/II/27, Wolica (Góry Świętokrzyskie Mts), *P. striatum* Beds; 9a, b — MUZ IG 1362/II/46, Skrzelczyce (Góry Świętokrzyskie Mts); Upper Muschelkalk; 10a—c — MUZ IG 1362/II/45, Jarugi (Góry Świętokrzyskie Mts); Upper Muschelkalk  
 Fig. 11. *Decurtella decurtata* (Girard), Mikulczyce (Upper Silesia) (*in*: P. Assmann, 1937); Karchowice Beds

Figs. 1, 2, 4—6, 11 reproduced by R. Ufnal  
 Figs. 3, 7—10 — photos by D. Oleksiak

## Bivalvia

## PLATE X

- Fig. 1. ?*Ctenodonta rugosa* Assmann — holotype,  $\times 2$ , Strzelce Opolskie (Upper Silesia); ZGI Berlin X3329; Górażdże Beds  
 Fig. 2. ?*Arca crassa* Assmann — holotype, Kamień Śląski (Upper Silesia) (*in*: P. Assmann, 1937); Middle Muschelkalk  
 Fig. 3. *Macrodontella lamellosa* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3093; Ore-bearing Dolomites  
 Fig. 4. ?*Pteria tenuilineata* (Assmann) — holotype, Chorzów (Upper Silesia); ZGI Berlin X3348; Upper Gogolin Beds  
 Fig. 5. ?*Pteria nuda* (Assmann) — holotype, Szymiszów (Upper Silesia); ZGI Berlin X3349; Karchowice Beds  
 Fig. 6. *Aviculomyalina lata* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3067—68; Karchowice Beds  
 Fig. 7. *Gervillia elegans* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3061; Ore-bearing Dolomites  
 Fig. 8. *Gervillia murchisoni* Geinitz,  $\times 3$ , borehole Dobrze Miasto 1 (NE Poland), depth 1355.4 m; MUZ IG 1433/II/2; Middle Buntsandstein, Lidzbark Formation  
 Fig. 9. *Hoernesia socialis* (Schlotheim),  $\times 1$ , borehole Żebrak IG 1 (Podlasie), depth 993.1 — 999.1 m, MUZ IG 1368/II/68; *L. striata* Beds  
 Fig. 10. *Lima acutecostata* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3355; Karchowice Beds  
 Fig. 11. *Lima dunkeri* Assmann — holotype,  $\times 2$ , Tarnowice (Upper Silesia); ZGI Berlin X3357; Ore-bearing Dolomites

- Fig. 12. *Plagiostoma angustestriatum* (Assmann) — holotype, Góraźdże (Upper Silesia) (*in*: P. Assmann, 1937); Góraźdże Beds
- Fig. 13. *Plagiostoma striatum* (Schlotheim), Ruda (Góry Świętokrzyskie Mts); MUZ IG 1209/II/37; Lower Muschelkalk
- Fig. 14. *Plagiostoma striatum* (Schlotheim),  $\times 1$ , Wolica (Góry Świętokrzyskie Mts); MUZ IG 1209/II/45; Lower Muschelkalk
- Fig. 15. *Plagiostoma striatum* (Schlotheim),  $\times 1$ , Wolica (Góry Świętokrzyskie Mts); MUZ IG 1209/II/44; Lower Muschelkalk
- Fig. 16. *Plagiostoma striatum* (Schlotheim),  $\times 1$ , Lesica (Góry Świętokrzyskie Mts); MUZ IG 1209/II/33; Upper Muschelkalk
- Fig. 17. *?Eopecten albertii* (Goldfuss),  $\times 1$ , Pierzchnica (Góry Świętokrzyskie Mts); MUZ IG 1209/II/21; Rhöt
- Fig. 18. *Entolium discites* (Schlotheim),  $\times 1$ , Majków (Góry Świętokrzyskie Mts); MUZ IG 1209/II/6; Upper Muschelkalk
- Fig. 19. *Pleuronectites laevigatus* Schlotheim,  $\times 1$ , Nietulisko (Góry Świętokrzyskie Mts); MUZ IG 1209/II/25; Upper Muschelkalk
- Figs. 1—7, 10—12 reproduced by R. Ufnal  
Figs. 8, 9, 13—19 — photos by D. Oleksiak

## PLATE XI

- Fig. 1. *Pecten crameri* Assmann — holotype,  $\times 2$ , Szymiszów (Upper Silesia); ZGI Berlin X3365; Karchowice Beds
- Fig. 2. *Pecten michaeli* Assmann — holotype, Mokrzyń (Upper Silesia) (*in*: P. Assmann, 1915); Gogolin Beds
- Fig. 3. *Pecten picardi* Assmann — holotype,  $\times 2$ , Szymiszów (Upper Silesia); ZGI Berlin X3371/1—2; Góraźdże Beds
- Fig. 4. *Prospodylus ernesti* Assmann — holotype, Góraźdże (Upper Silesia) (*in*: P. Assmann, 1937); Góraźdże Beds
- Fig. 5. *Enantiostreon difformae* (Schlotheim),  $\times 1$ , Drugnia (Góry Świętokrzyskie Mts); MUZ IG 1209/II/56; Upper Muschelkalk
- Fig. 6. *Myoconcha beyrichi* Noetling — holotype, Lower Silesia (*in*: F. Noetling, 1880); ZGI Berlin X3079; Lower Muschelkalk
- Fig. 7. *Myoconcha beyrichi* Noetling; Tarnowice (Upper Silesia); ZGI Berlin X3080; Ore-bearing Dolomites
- Fig. 8. *Myoconcha bicostata* Assmann — holotype, Zyglin (Upper Silesia) (*in*: P. Assmann, 1937); Gogolin Beds
- Fig. 9. *Modiolus mathildis* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3085; Karchowice Beds
- Fig. 10. *Myophoria vulgaris* (Schlotheim),  $\times 1$ , Nietulisko (Góry Świętokrzyskie Mts); MUZ IG 1209/II/115; Upper Muschelkalk
- Fig. 11. *Myophoria pes anseris* (Schlotheim),  $\times 1$ , borehole Jarkowo Geo 1 (western Pomerania), depth 1155.5 m; MUZ IG 1368/II/191, Lower Keuper
- Fig. 12. *Lyriomyophoria elegans* (Dunker),  $\times 2$ , Parszów (Góry Świętokrzyskie Mts); MUZ IG 1209/II/112; Upper Muschelkalk
- Fig. 13. *Lyriomyophoria elegans* (Dunker) — neotype?, Tarnowice (Upper Silesia); ZGI Berlin X3109—10; Ore-bearing Dolomites
- Fig. 14. *Costatoria costata* (Zenker),  $\times 1$ , borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 1043 m; MUZ IG 1368/II/192; Rhöt
- Fig. 15. *Neoschizodus laevigatus* (Ziethen), borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 820 m; MUZ IG 1368/II/193; Lower Muschelkalk
- Fig. 16. *Uniomites albertii* (Assmann) — holotype, Wilkowice (Upper Silesia) (*in*: P. Assmann, 1915); Upper Muschelkalk
- Figs. 1—4, 7—9, 13, 16 reproduced by R. Ufnal  
Figs. 5, 10—12, 14, 15 — photos by D. Oleksiak

## PLATE XII

- Fig. 1. *?Curionia gastrochaena* (Dunker): a — *in*: W. Dunker (1851), b — *in*: P. Assmann (1937), Upper Silesia; Lower Muschelkalk
- Fig. 2. *Schafhaeutlia rugosa* (Assmann) — holotype, Tarnowice (Upper Silesia) (*in*: P. Assmann, 1937); Karchowice Beds
- Fig. 3. *Schafhaeutlia silesiaca* Assmann — holotype, Szymiszów (Upper Silesia); ZGI Berlin X3338; Góraźdże Beds

- Fig. 4. *Schafhaeutlia subovata* Assmann — holotype, Strzelce Opolskie (Upper Silesia); ZGI Berlin X3342/1—2; Górażdże Beds
- Fig. 5. *Unionites lettica* (Quenstedt),  $\times 1$ , borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 536.5 m; MUZ IG 1368/II/190; Reed Sandstone
- Fig. 6. *Unionites posterus* (Deffner et Fraas),  $\times 1.5$ , borehole Książ IG 2 (Fore-Sudetic Monocline), depth 789.5 (in: R. Dadlez, J. Kopik, 1963); MUZ IG 763/II/1; Jarków Series
- Fig. 7. *Pleuromya pulchra* Assmann — holotype, Łabędy (Upper Silesia) (in: P. Assmann, 1915); Middle Muschelkalk
- Fig. 8. *Pleuromya brevis* Assmann — holotype, Karchowice (Upper Silesia); ZGI Berlin X3139; Karchowice Beds
- Fig. 9. *Pleuromya elegans* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3138; Ore-bearing Dolomites
- Fig. 10. *Pleuromya rugosa* Ahlburg — holotype,  $\times 1$ , Lendziny (Upper Silesia) (in: J. Ahlburg, 1906); Rhöt
- Fig. 11. *Pleuromya rugosa* Ahlburg, Lendziny (Upper Silesia) (in: P. Assmann, 1937); Rhöt
- Fig. 12. *Pleuromya sensistriata* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3137; Ore-bearing Dolomites
- Fig. 13. *Pleuromya pseudoelongata* Assmann — holotype, Szymiszów (Upper Silesia) (in: P. Assmann, 1937); Karchowice Beds
- Figs. 2—4, 7—13 reproduced by R. Ufnal  
Figs. 5, 6 — photos by D. Oleksiak

## PLATE XIII

- Fig. 1. *Daonella (Daonella) lommeli* (Wissmann), a —  $\times 1$ , b —  $\times 2$  Wielkie Koryciska (Tatra Mts) (in: Z. Kotański, 1973a); MUZ IG, Z. Kotański coll.; Anisian/Ladinian, Partnach Beds, upper sub-tatric series
- Fig. 2. *Daonella (Daonella) tyrolensis parthanensis* (Schafhäutl),  $\times 1$ , Wielkie Koryciska (Tatra Mts); MUZ IG, Z. Kotański coll.; Anisian/Ladinian, Partnach Beds, upper sub-tatric series
- Fig. 3. *Rhaetomegalodon tatricus* Gaździcki — holotype,  $\times 1$ , Mt. Mały Kopieniec (Tatra Mts) (in: A. Gaździcki, 1974); IGP UW, A. Gaździcki coll.; Lower Rhaetian
- Fig. 4. *Conchodon goeteli* Gaździcki — holotype,  $\times 1$ , Mały Kopieniec (Tatra Mts) (in: A. Gaździcki, 1974); IGP UW, A. Gaździcki coll.; Lower Rhaetian, lower sub-tatric series

## PLATE XIV

- Fig. 1. *Chlamys winkleri swinicensis* (Goetel) — holotype,  $\times 1$ , Mt. Mała Swinica (Tatra Mts) (in: W. Goetel, 1917); Rhaetian
- Fig. 2. *Chlamys favri tatrica* (Goetel) — holotype,  $\times 2$ , Mt. Mały Kopieniec (Tatra Mts) (in: W. Goetel, 1917); Rhaetian
- Fig. 3. *Pholadomya* sp. A,  $\times 1$ , Rusinowa Jaworzyńska (Tatra Mts) (in: W. Goetel, 1917); Rhaetian
- Fig. 4. *Placunopsis kuźniari* Goetel — holotype,  $\times 2$ , Rusinowa Jaworzyńska (Tatra Mts) (in: W. Goetel, 1917); Rhaetian
- Fig. 5. *Protocardia rhaetica longistriata* Goetel — holotype,  $\times 2$ , Mt. Mały Kopieniec (Tatra Mts) (in: W. Goetel, 1917); Rhaetian
- Fig. 6. *Conchodon infraliasicus* Stoppani,  $\times 1$ , Mt. Mały Kopieniec (Tatra Mts); IGP UW, A. Gaździcki coll.; Fatra Formation (Rhaetian)
- Figs. 1—5 — ING PAN Cracow, W. Goetel collection.

## Scaphopoda

## PLATE XV

- Fig. 1. *Dentalium quadrangulum* Assmann — holotype,  $\times 1$ , Górażdże (Upper Silesia) (in: P. Assmann, 1937); ZGI Berlin X3421; Górażdże Beds
- Figs. 2—4. *Dentalium regium* Assmann; 2 — holotype, ZGI Berlin X3418/1—2, 3, 4 — in: P. Assmann (1937); Górażdże (Upper Silesia); Górażdże Beds
- Fig. 5. *Dentalium regulare* Ahlburg — holotype,  $\times 1$ , Upper Silesia (in: J. Ahlburg, 1906); ZGI Berlin X3545; *Diplopora* Dolomites
- Figures reproduced by R. Ufnal

## Gastropoda

## PLATE XVI

- Fig. 1. *Worthenia depressa* Assmann — holotype, Upper Silesia; ZGI Berlin X3153; Gogolin Beds
- Fig. 2. *Worthenia brancoi* Ahlburg — holotype,  $\times 2$ , Strzelce Opolskie (Upper Silesia) (*in*: J. Ahlburg, 1906); ZGI Berlin X3157; Górażdże Beds
- Fig. 3. *Worthenia conica* Assmann — holotype, Strzelce Opolskie (Upper Silesia); ZGI Berlin X3381; Górażdże Beds
- Fig. 4. *Worthenia ecki* Assmann — holotype, Izbicko (Upper Silesia); ZGI Berlin X3152; *Diplopora* Dolomites
- Fig. 5. *Worthenia excelsior* Assmann — holotype, Bytom (Upper Silesia) (*in*: P. Assmann, 1924); Rhöt
- Fig. 6. *Worthenia globosa* Ahlburg — holotype,  $\times 2$ , Łędziny (Upper Silesia) (*in*: J. Ahlburg, 1906); Rhöt
- Fig. 7. *Worthenia lata* Assmann — holotype, Repty (Upper Silesia) (*in*: P. Assmann, 1924); *Diplopora* Dolomites
- Fig. 8. *Worthenia michaeli* Ahlburg — holotype,  $\times 2$ , Łędziny (Upper Silesia) (*in*: J. Ahlburg, 1906); Upper Buntsandstein
- Fig. 9. *Worthenia multicaudata* Assmann — holotype,  $\times 2$ , Tarnowice (Upper Silesia) (*in*: P. Assmann, 1924); Karchowice Beds
- Fig. 10. *Worthenia picardi* Assmann — holotype, Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); Górażdże Beds
- Fig. 11. *Worthenia pura* Assmann — holotype, Tarnowice (Upper Silesia) (*in*: P. Assmann, 1924); Ore-bearing Dolomites
- Fig. 12. *Worthenia silesiaca* Ahlburg — holotype,  $\times 2$ , Łędziny (Upper Silesia) (*in*: J. Ahlburg, 1906); Rhöt
- Fig. 13. *Worthenia tornquisti* Assmann — holotype, Repty (Upper Silesia) (*in*: P. Assmann, 1924); *Diplopora* Dolomites
- Fig. 14. *Euomphalus planus* Assmann — holotype,  $\times 2$ , Mikulczyce (Upper Silesia); ZGI Berlin X3167; Karchowice Beds
- Fig. 15. *Euomphalus granulatus* Assmann — holotype,  $\times 2$ , Łabędy (Upper Silesia) (*in*: P. Assmann, 1924); Karchowice Beds
- Fig. 16. *Euomphalus pulcher* Assmann — holotype, Izbicko (Upper Silesia); ZGI Berlin X3168; *Diplopora* Dolomites
- Fig. 17. *Euomphalus semiplanus* Assmann — holotype, Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); Górażdże Beds
- Fig. 18. *Euomphalus lottneri* Eck — holotype,  $\times 1$ , Upper Silesia (*in*: H. Eck, 1865); Lower and Middle Muschelkalk
- Figs. 1, 3—5, 7, 9—11, 13—17 — presumably natural size (except for Figs. 9, 14, 15)  
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## PLATE XVII

- Fig. 1. *Coelocentrus silesiacus* Ahlburg — holotype,  $\times 2$ , Granice (Upper Silesia) (*in*: J. Ahlburg, 1906); *Diplopora* Dolomites
- Fig. 2. *Coelocentrus silesiacus* Ahlburg — neotype, Repty (Upper Silesia); *Diplopora* Dolomites
- Fig. 3. *Coelocentrus horridus* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3171; Ore-bearing Dolomites
- Fig. 4. *Scurria tenuistriata* Assmann — holotype, Tarnowice (Upper Silesia); Ore-bearing Dolomites
- Fig. 5. *Hologyra eyerichi* (Noetling) — holotype, Raciborowice (Lower Silesia) (*in*: F. Noetling, 1880); Lower Muschelkalk
- Fig. 6. *Hologyra alta* Ahlburg — holotype,  $\times 2$ , Łędziny (Upper Silesia) (*in*: J. Ahlburg, 1906); Rhöt
- Fig. 7. *Neritaria lendzinensis* Ahlburg — holotype,  $\times 1$ , Łędziny (Upper Silesia) (*in*: J. Ahlburg, 1906); Rhöt
- Fig. 8. *Fossariopsis plana* Ahlburg — holotype,  $\times 2$ , Granice (Upper Silesia) (*in*: J. Ahlburg, 1906); *Diplopora* Dolomites
- Fig. 9. *Turbo toriniaeformis* Noetling — holotype,  $\times 1$ , Raciborowice (Lower Silesia) (*in*: F. Noetling, 1880); Lower Muschelkalk
- Fig. 10. *Murchisonia (Cheilotoma) silesiaca* (Eck) — holotype,  $\times 2$ , Mikulczyce (Upper Silesia); Karchowice Beds

- Fig. 11. *Murchisonia (Cheilotoma) graetzi* Assmann — holotype,  $\times 2$ , Repty (Upper Silesia); ZGI Berlin X3166; *Diplopora* Dolomites
- Fig. 12. *Loxonema (Zygopleura) noduliferum* (Dunker),  $\times 2.5$ , Tarnowice (Upper Silesia); Ore-bearing Dolomites
- Fig. 13. *Loxonema (Zygopleura) granietzense* Ahlburg — holotype,  $\times 2$ , Granice (Upper Silesia) (*in: J. Ahlburg, 1906*); *Diplopora* Dolomites
- Fig. 14. *Loxonema (Zygopleura) planki* Assmann — holotype, Górażdże (Upper Silesia); Górażdże Beds
- Fig. 15. *Loxonema (Zygopleura) tenuicostatum* Assmann — holotype,  $\times 2$ , Tarnowice (Upper Silesia); ZGI Berlin X3200; Ore-bearing Dolomites
- Fig. 16. *Loxonema (Zygopleura) granulosum* Assmann — holotype,  $\times 2.5$ , Chorzów (Upper Silesia); ZGI Berlin X3201; Gogolin Beds
- Fig. 17. *Loxonema (Zygopleura) nitidum* Assmann — holotype,  $\times 2$ , Miechowice (Upper Silesia); ZGI Berlin X3199; *Diplopora* Dolomites
- Fig. 18. *Loxonema (Zygopleura) sophie* Assmann — holotype,  $\times 1$ , Kamień (Upper Silesia); *Diplopora* Dolomites
- Fig. 19. *Loxonema simplex* Assmann — holotype,  $\times 1$ , Górażdże (Upper Silesia); ZGI Berlin X3395; Górażdże Beds
- Fig. 20. *Loxonema mestwerdti* Assmann — holotype,  $\times 2$ , Granice (Upper Silesia); *Diplopora* Dolomites
- Fig. 21. ?*Loxonema peracutum* Assmann — holotype, Górażdże (Upper Silesia); Górażdże Beds
- Fig. 22. ?*Katosira alta* Assmann — holotype, Górażdże (Upper Silesia); Górażdże Beds
- Fig. 23. ?*Coelochrysalis acuminata* Assmann — holotype,  $\times 1$ , Mikulczyce (Upper Silesia); ZGI Berlin X3255; Karchowice Beds
- Fig. 24. ?*Coelochrysalis pyramidata* Assmann — holotype,  $\times 1$ , Tarnowice (Upper Silesia); Karchowice Beds
- Fig. 25. *Omphaloptycha ahlburgi* Assmann — holotype,  $\times 1$ , Granice (Upper Silesia); Middle Muschelkalk
- Fig. 26. *Omphaloptycha schmidti* Assmann — holotype,  $\times 5$ , Łędziny (Upper Silesia); Rhöt
- Fig. 27. *Omphaloptycha submersa* Assmann — holotype,  $\times 3$ , Granice (Upper Silesia); *Diplopora* Dolomites
- Fig. 28. *Omphaloptycha assmanni* Schmidt,  $\times 1$ , Granice (Upper Silesia); Lower Muschelkalk
- Fig. 29. *Omphaloptycha assmanni* Schmidt — holotype,  $\times 2$ , Upper Silesia (*in: J. Ahlburg, 1906*); Lower Muschelkalk
- Fig. 30. *Omphaloptycha acuminata* Assmann — holotype,  $\times 2$ , Granice (Upper Silesia); *Diplopora* Dolomites
- Figs. 2, 4, 10, 12, 14, 18, 20—22, 24—28, 30 *in: P. Assmann (1937)*; Figs. 2—5, 14, 21, 22 — presumably natural size

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#### PLATE XVIII

- Fig. 1. *Omphaloptycha hertae* Assmann — holotype,  $\times 1$ , Górażdże (Upper Silesia); ZGI Berlin X3409/1—2; Górażdże Beds
- Fig. 2. *Omphaloptycha turriculata* Assmann — holotype, Górażdże (Upper Silesia); ZGI Berlin X3411/1—3; Górażdże Beds
- Fig. 3. *Omphaloptycha kittli* Assmann — holotype,  $\times 1$ , Granice (Upper Silesia); *Diplopora* Dolomites
- Fig. 4. *Trypanostylus altus* Assmann — holotype, Górażdże (Upper Silesia); ZGI Berlin X3403; Górażdże Beds
- Fig. 5. *Trypanostylus erectus* Assmann — holotype,  $\times 1$ , Strzelce Opolskie (Upper Silesia); Górażdże Beds
- Fig. 6. *Trypanostylus pseudoscalatus* Assmann — holotype,  $\times 2$ , Chorzów (Upper Silesia); Ore-bearing Dolomites of Lower Muschelkalk
- Fig. 7. *Trypanostylus silesiacus* Assmann — holotype,  $\times 0.5$ , Tarnowice (Upper Silesia); ZGI Berlin X3223; Ore-bearing Dolomites
- Fig. 8. *Trypanostylus gracilis* Assmann — holotype,  $\times 2$ , Jemielnica (Upper Silesia); *Diplopora* Dolomites
- Fig. 9. *Trypanostylus modestus* Assmann — holotype,  $\times 2$ , Mikulczyce (Upper Silesia); Karchowice Beds
- Fig. 10. *Pustulifer acuticarinatus* (Assmann) — holotype,  $\times 1$ , Kamień Śląski (Upper Silesia); *Diplopora* Dolomites
- Fig. 11. *Pustulifer silesiacus* (Assmann) — holotype,  $\times 1$ , Dąbrówka Wielka (Upper Silesia); Middle Muschelkalk

- Fig. 12. *Protorcula brevis* Assmann — holotype,  $\times 2$ , Tarnowice (Upper Silesia); Ore-bearing Dolomites
- Fig. 13. *Spirostylus extractus* Assmann — holotype,  $\times 2$ , Tarnowice (Upper Silesia); Ore-bearing Dolomites
- Fig. 14. *Tretospira fusiformis* Ahlburg — holotype,  $\times 3$ , Granice (Upper Silesia) (*in*: J. Ahlburg, 1906); *Diplopora* Dolomites
- Fig. 15. ?*Provermicularia grundeyi* Assmann — holotype,  $\times 2$ , Kamień Śląski (Upper Silesia); ZGI Berlin X3415; *Diplopora* Dolomites
- Fig. 16. *Promathildia pauciornata* Assmann — holotype,  $\times ?$ , Strzelce Opolskie (Upper Silesia); ZGI Berlin X3417; Górażdże Beds
- Fig. 17. *Promathildia tenuicarinata* Assmann — holotype,  $\times 3$ , Granice (Upper Silesia); *Diplopora* Dolomites
- Fig. 18. *Promathildia pulchra* Assmann — holotype,  $\times 2$ , Jemielnica (Upper Silesia); *Diplopora* Dolomites
- Fig. 19. *Promathildia nympa* Assmann — holotype,  $\times 5$ , Mikulczyce (Upper Silesia); *Diplopora* Dolomites
- Fig. 20. *Promathildia elegans* Assmann — holotype,  $\times 2$ , Mikulczyce (Upper Silesia); *Diplopora* Dolomites
- Fig. 21. *Natica minima* Assmann — holotype,  $\times 8$ , Łędziny (Upper Silesia); Rhöt
- Fig. 22. *Natica minima* Assmann,  $\times 8$ , Łędziny (Upper Silesia); Rhöt
- Fig. 23. ?*Naticella parva* (Assmann) — holotype,  $\times 2$ , Kamieniec (Upper Silesia); Karchowice Beds
- Fig. 24. *Amauropsis silesiaca* (Ahlburg) — holotype,  $\times 2$ , Łędziny (Upper Silesia); Rhöt
- Fig. 25. ?*Fusus praecursor* Assmann — holotype,  $\times 1$ , Tarnowice (Upper Silesia); ZGI Berlin X3264; Ore-bearing Dolomites
- Fig. 26. *Actaeonina gracilis* Assmann — holotype, Łędziny (Upper Silesia); Rhöt
- Figs. 3, 5, 6, 8—13, 17—24, 26 *in*: P. Assmann (1937); Figs. 2, 4 — presumably natural size

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### Nautilida

#### PLATE XIX

- Fig. 1. *Pleuronautilus planki* Assmann — holotype, Górażdże (Upper Silesia); ZGI Berlin X3424/1—4; Górażdże Beds
- Fig. 2. *Temnocheilus postdolomiticus* Assmann — holotype, Szymiszów (Upper Silesia); ZGI Berlin X3423; Karchowice Beds
- Fig. 3. *Nautilus goraszdzensis* Assmann — holotype,  $\times 0.5$ , Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); Górażdże Beds
- Fig. 4. *Nautilus pseudobrembanus* Assmann — holotype, Tarnowice (Upper Silesia); ZGI Berlin X3277; Gogolin Beds
- Fig. 5. *Nautilus cf. tintoretti* Mojsisovics,  $\times 1.5$ , Wielkie Koryciska (Tatra Mts) (*in*: Z. Kotański, 1973d); MUZ IG, Z. Kotański coll.; Upper Anisian, Partnach Beds, upper sub-tatric series

Figs. 1, 2, 4 — presumably natural size

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### Ammonitida — Ceratitina

#### PLATE XX

- Fig. 1. *Silesiacrochordiceras damesi* (Noetling) — holotype,  $\times 0.53$ , Raciborowice (Lower Silesia) (*in*: F. Noetling, 1880); Lower Muschelkalk
- Fig. 2. *Ceratites* (*Progonoceratites*) *cf. pulcher angustus* Wenger,  $\times 1$ , Piekoszów (Góry Świętokrzyskie Mts); MUZ IG 1363/II/17; *Ceratites* Beds
- Fig. 3. *Beneckeia buchi* (Alberti),  $\times 1$ , Młodzawy (Góry Świętokrzyskie Mts); MUZ IG 1363/II/86; *P. striatum* Beds
- Figs. 4, 5. *Semiornites lennanus* (Mojsisovics), Wielkie Koryciska (Tatra Mts); MUZ IG, Z. Kotański coll.; Illyrian, Partnach Beds, upper sub-tatric series
- Fig. 6. *Dinarites* (*Ceratites*) *cf. hoerichi* (Salomon), Wielkie Koryciska (Tatra Mts); MUZ IG, Z. Kotański coll.; Illyrian, Partnach Beds, upper sub-tatric series
- Fig. 1 — reproduced by R. Ufnal; Figs. 2, 3 — photos by D. Oleksiak

## PLATE XXI

- Fig. 1. *Ceratites (Acanthoceratites) compressus* Philippi,  $\times 1$ , Wincentów (Góry Świętokrzyskie Mts); MUZ IG 1363/II/8; *Ceratites* Beds  
 Fig. 2. *Ceratites (Acanthoceratites) evolutus* Philippi,  $\times 1$ , Bliżyn (Góry Świętokrzyskie Mts); MUZ IG 1363/II/14; *Ceratites* Beds  
 Fig. 3. *Ceratites (Acanthoceratites) evolutus* Philippi,  $\times 1$ , Skrzelczyce (Góry Świętokrzyskie Mts); MUZ IG 1363/II/9; *Ceratites* Beds

Photos by D. Oleksiak

## PLATE XXII

- Fig. 1. *Ceratites (Acanthoceratites) spinosus* Philippi,  $\times 0.4$ , Bliżyn (Góry Świętokrzyskie Mts); MUZ IG 1363(II)22; *Ceratites* Beds  
 Fig. 2. *Ceratites (Acanthoceratites) spinosus* Philippi,  $\times 0.1$ , Bliżyn (Góry Świętokrzyskie Mts); MUZ IG 1363(II)16; *Ceratites* Beds  
 Fig. 3. *Ceratites goradzensis* Assmann — holotype, presumably  $\times 1$ , Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); ZGI Berlin X3431; Górażdże Beds  
 Figs. 1, 2 — photos by D. Oleksiak; Fig. 3 — reproduced by R. Ufnal

## PLATE XXIII

- Fig. 1. *Balatonites nobilis* Assmann — holotype, Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); ZGI Berlin X3433; Górażdże Beds  
 Fig. 2. *Balatonites zimmermanni* Rassmuss,  $\times 1$ , Raciborowice (Lower Silesia) (*in*: H. Rassmuss, 1913); ZGI Berlin X5641; Lower Muschelkalk  
 Fig. 3. *Balatonites zimмери* Rassmuss,  $\times 1$ , Raciborowice (Lower Silesia) (*in*: H. Rassmuss, 1913); Lower Muschelkalk

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## PLATE XXIV

- Fig. 1. *Ceratites mirabilis* Assmann — holotype,  $\times 1$ , Górażdże (Upper Silesia) (*in*: P. Assmann, 1937); ZGI Berlin  $\times 3430/1-3$ ; Górażdże Beds  
 Fig. 2. *Balatonites quaternonotatus* Rassmuss — holotype,  $\times 1$ , Raciborowice (Lower Silesia) (*in*: H. Rassmuss, 1913); Lower Muschelkalk

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## Malacostraca

## PLATE XXV

- Fig. 1. *Pemphix silesiacus* Assmann — holotype, Tarnowice (Upper Silesia) (*in*: P. Assmann, 1937); Karchowice Beds  
 Fig. 2. *Lissocardia silesiaca* Meyer — lectotype, Tarnowice (Upper Silesia) (*in*: H. Förster, 1967); Karchowice Beds  
 Fig. 3. *Aspidogaster limicola* (König), c.  $\times 2$ , borehole Olszyny IG 1 (NE Poland), depth 1305.0 m; MUZ IG 1356/II/1 (*in*: A. Szyperko-Śliwczynska, 1976); Lower Muschelkalk

Reproduced by R. Ufnal; Figs. 1, 2 — presumably natural size

## Ostracoda

## PLATE XXVI

- Figs. 1, 2. *Judahella tsorfatia* Sohn, 1 — right side,  $\times 200$ , 2a — right side,  $\times 80$ , 2b — dorsal side,  $\times 80$ , borehole Warszawa IG 1, depth 2111.0 m; MUZ IG 6038/73/O; Lower Muschelkalk  
 Fig. 3. *Paracypris pusilla* (Kozur),  $\times 60$ , right side, borehole Żebrak IG 1 (Podlasie), depth 993.0; MUZ IG 6061/73/O; Lower Muschelkalk  
 Fig. 4. *Bythocypris aequalis* (Kozur),  $\times 110$ , right side, borehole Żebrak IG 1 (Podlasie), depth 1012.0 m; MUZ IG 6300/73/O; Lower Muschelkalk

- Fig. 5. *Darwinula acmayica* Schleipher,  $\times 130$ , right side, borehole Tluszcz IG 1 (Podlasie), depth 1385.0 m; MUZ IG 6069/73/O; Rhöt
- Fig. 6. *Darwinula globosa* (Duff),  $\times 110$ , right side, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1223.0 m; MUZ IG 6085/73/O; Lower Rhaetic
- Fig. 7. *Darwinula goldapi* Styk — holotype,  $\times 50$ , left side, borehole Goldap IG 1 (NE Poland), depth 814.0 m; MUZ IG 6007/72/O; Buntsandstein
- Fig. 8. *Darwinula infera* Schleipher,  $\times 60$ , left side, borehole Olszyny IG 1 (NE Poland), depth 1325.0; MUZ IG 6090/73/O; Rhöt
- Fig. 9. ?*Clinocypris vasiljevi* Schleipher, right side,  $\times 110$ , borehole Bartoszyce IG 1 (NE Poland), depth 1163.0 m; MUZ IG 6066/73/O; Lower Buntsandstein
- Fig. 10. ?*Darwinula dreyeri* Kozur,  $\times 90$ , right side, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1219.0 m; MUZ IG 6075/73/O; Lower Rhaetic
- Fig. 11. *Darwinula adducta* Lubimova,  $\times 50$ , right side, borehole Nidzica IG 1 (NE Poland), depth 2035.8 m; MUZ IG 6072/73/O; Lower Buntsandstein
- Figs. 2, 3, 7, 8, 11 — photos made J. Modrzejewska; Figs. 1, 4—6, 9, 10 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXVII

- Fig. 1. *Darwinula liassica* (Brodie),  $\times 50$ , right side, borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 297.0 m; MUZ IG 6099/73/O; Keuper
- Fig. 2. *Darwinula hiptschakensis* Schleipher,  $\times 60$ , left side, borehole Olszyny IG 1 (NE Poland), depth 1325.0 m; MUZ IG 6096/73/O; Rhöt
- Fig. 3. ?*Darwinula* cf. *quadrata* Mischina,  $\times 110$ , right side, borehole Bartoszyce IG 1 (NE Poland), depth 1182.0 m; MUZ IG 6109/73/O; Lower Buntsandstein
- Fig. 4. *Darwinula* cf. *regia* Mischina,  $\times 110$ , left side, borehole Bartoszyce IG 1 (NE Poland), depth 1182.0 m; MUZ IG 6112/73/O; Lower Buntsandstein
- Fig. 5. *Darwinula* (*Paradarwinula*) *spinosa* Kozur,  $\times 110$ , left side, borehole Książ IG 1 (Fore-Sudetic Monocline), depth 579.5 m; MUZ IG 5555/73/O; Lower Rhaetic
- Fig. 6. *Darwinula wandae* Styk — holotype, a — left side,  $\times 110$ , b — left side,  $\times 50$ , borehole Trzebyczka 96 TN (Silesian-Cracow Upland); MUZ IG 6004/72/O; Lower Rhaetic
- Figs. 1, 2, 6b — photos made by J. Modrzejewska; Figs. 3, 4a, b, 5, 6a — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXVIII

- Fig. 1. *Rhombocythere tenuistriata* (Kozur), a — right side,  $\times 120$ , b — right side, c — dorsal side, d — ventral side,  $\times 40$ , borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1226.0 m; MUZ IG 6019/72/O; Lower Rhaetic
- Fig. 2. *Monoceratina kozuri* Styk, left side,  $\times 200$ , borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6012/72/O; Lower Muschelkalk
- Fig. 3. *Monoceratina paula* Styk, right side,  $\times 200$ , borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6017/72/O; Lower Muschelkalk
- Fig. 4. *Rhombocythere nodosa* Kozur, a — right side,  $\times 100$ , b — right side,  $\times 40$ , c — ventral side,  $\times 60$ , borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1226.0 m; MUZ IG 6127/73/O; Lower Rhaetic
- Figs. 1b, c, d, 4b, c — photos made by J. Modrzejewska; Figs. 1a, 2, 3, 4a — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXIX

- Figs. 1, 2. *Monoceratina spinosa* (Kozur), 1 — right side,  $\times 200$ , 2 — dorsal side,  $\times 60$ , borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 261.0 m; MUZ IG 6136/73/O; Lower Muschelkalk
- Figs. 3—5. *Cytherissinella crista* (Schleipher), 3a — right side, 3b — dorsal side,  $\times 60$ , 4 — left side, female specimen,  $\times 180$ , 5 — right side, male specimen,  $\times 150$ , borehole Olszyny IG 1 (NE Poland), depth 1325.0 m; MUZ IG 6137/73/O; Rhöt
- Figs. 6—8. ?*Lutkevichinella germanica* (Wienholz et Kozur), 6 — left side,  $\times 100$ , 7 — right side,  $\times 110$ , 8 — right side,  $\times 50$ , borehole Wysoka 69 TN (Silesian-Cracow Upland), depth 102.0 m; MUZ IG 6118—6121/73/O; Reed Sandstone
- Fig. 9. *Lutkevichinella mazurensis* Styk — holotype, left side,  $\times 150$ , borehole Bartoszyce IG 1 (NE Poland), depth 1182.0 m; MUZ IG 6020/72/O; Lower Buntsandstein
- Figs. 3a, b, 8 — photos made by J. Modrzejewska; Figs. 1, 2, 4, 5, 7, 10 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXX

- Figs. 1—3. *?Lutkevichinella pusilla* Diebel, 1 — left side,  $\times 240$ , 2 — right side,  $\times 240$ , 3 — left side,  $\times 60$ , borehole Dobrów 24 (Góry Świętokrzyskie Mts), depth 251.0 m; MUZ IG 6150—6152/73/O; Lower Muschelkalk
- Figs. 4—6. *?Lutkevichinella rectagona* (Gründel), 4 — left side, 5 — right side,  $\times 180$ , 6 — left side,  $\times 60$ , borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 297.0 m; MUZ IG 6161/73/O; Lower Keuper
- Figs. 7, 8. *?Lutkevichinella simplex oblonga* Kozur, 7 — left side,  $\times 150$ , 8 — right side,  $\times 60$ , borehole Wysoka 69 TN (Silesian-Cracow Upland), depth 102.0 m; MUZ IG 6159, 6160/73/O; Reed Sandstone
- Figs. 9, 10. *Simeonella brotzenorum alpina* Bunza et Kozur, 9 — left side,  $\times 60$ , 10 — right side,  $\times 150$ , borehole Trzebyczka 96 TN (Silesian-Cracow Upland), depth 65.0 m; MUZ IG 6153, 6154/73/O; Reed Sandstone
- Figs. 3, 6, 8, 9 — photos made by J. Modrzejewska; Figs. 1, 2, 4, 5, 7, 10 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXI

- Figs. 1, 2. *?Cultella levis* Kozur, 1 — left side,  $\times 180$ , 2 — left side,  $\times 60$ , borehole Ostrów Mazowiecka IG 1 (NE Poland), depth 1155.2 m; MUZ IG 6560, 6561/73/O; Lower Muschelkalk
- Figs. 3—5. *Gemmanella ingerslebensis* (Beutler et Gründel), 3 — right side,  $\times 50$ , 4 — right side,  $\times 100$ , 5 — left side,  $\times 100$ , borehole Pasłek IG 1 (NE Poland), depth 1048.0 m; MUZ IG 6170—6172/73/O; Lower Keuper
- Figs. 6—8. *Gemmanella schweyeri* Schneider, 6 — left side,  $\times 110$ , 7 — right side,  $\times 50$ , 8 — right side,  $\times 110$ , borehole Żebrak IG 1 (Podlasie), depth 977.0 m; MUZ IG 6186—6188/73/O; Upper Muschelkalk
- Figs. 2, 3, 7 — photos made by J. Modrzejewska; Figs. 1, 4, 5, 6, 8 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXII

- Figs. 1, 2. *Glorianella culta* Starozhilova, 1 — left side,  $\times 200$ , 2 — left side,  $\times 50$ , borehole Koniemiłoty 2 (Góry Świętokrzyskie Mts), depth 288.2 m; MUZ IG 6192, 6193/73/O; Rhöt
- Figs. 3—6. *Glorianella thuringensis* (Beutler et Gründel), 3a — left side, 3b — right side, female specimen,  $\times 150$ , 4a — ventral side, 4b — dorsal side, 5 — right side,  $\times 50$ , 6 — right side, male specimen,  $\times 100$ , borehole Gostyń IG 1 (NW Poland), depth 2124.0 m; MUZ IG 6500—6504/73/O; Lower Keuper
- Figs. 2, 4a, b, 5 — photos made by J. Modrzejewska; Figs. 1, 3a, b, 6 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXIII

- Figs. 1, 2. *Pulviella marinae* Starozhilova, 1 — right side,  $\times 200$ , 2 — right side,  $\times 130$ , borehole Ostrów Mazowiecka IG 1 (NE Poland), depth 1160.0 m; MUZ IG 6512, 6513/73/O; Rhöt
- Fig. 3. *Pulviella aralsorica* Schleipher, right side,  $\times 180$ , borehole Tluszcz IG 1 (Podlasie), depth 1380.0 m; MUZ IG 6506/73/O; Rhöt
- Fig. 4. *Pulviella ovalis* Schneider, a — left side, b — right side,  $\times 180$ , borehole Koniemiłoty (Góry Świętokrzyskie Mts), depth 288.2 m; MUZ IG 6515/73/O; Rhöt
- Figs. 5, 6. *Pulviella petersbergensis* (Diebel), 5 — left side,  $\times 110$ , 6 — right side,  $\times 50$ , borehole Żebrak IG 1 (Podlasie), depth 982.6 m; MUZ IG 6521, 6522/73/O; Upper Muschelkalk
- Fig. 6 — photo made by J. Modrzejewska; Figs. 1—5 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXIV

- Figs. 1, 2. *Pulviella petersbergensis* (Diebel), 1 — left side,  $\times 150$ , 2 — ventral side,  $\times 50$ , borehole Żebrak IG 1 (Podlasie), depth 982.6 m; MUZ IG 6523, 6524/73/O; Upper Muschelkalk
- Fig. 3. *Pulviella piriformis* (Beutler et Gründel), a — ventral side, b — right side,  $\times 60$ , borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 297.0 m; MUZ IG 6527/73/O; Lower Keuper
- Fig. 4. *Pulviella vulgaris* (Beutler et Gründel), a — right side, b — left side,  $\times 110$ , borehole

- Dobrow 24 (Góry Świętokrzyskie Mts), depth 203.4 m; MUZ IG 6530/73/O; Lower Keuper
- Fig. 5. *Pulviella silesia* (Stryk), left side,  $\times 110$ , borehole Trzebyczka 96 TN (Silesian-Cracow Upland), depth 22.5 m; MUZ IG 6003/72/O; Lower Rhaetic
- Fig. 6. *Speluncella alata* (Beutler et Gründel), right side,  $\times 180$ , borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 302.7 m; MUZ IG 6533/73/O; Lower Keuper
- Figs. 2, 3a, b — photos made by J. Modrzejewska; Figs. 1, 4—6 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXV

- Figs. 1, 2. *Speluncella alata* (Beutler et Gründel), 1 — left side,  $\times 110$ , 2a — dorsal side,  $\times 50$ , 2b — ventral side,  $\times 50$ , borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 302.7 m; MUZ IG 6534, 6535/73/O; Lower Keuper
- Figs. 3—5. *Speluncella spinosa* Schneider, 3 — right side,  $\times 110$ , 4 — right side,  $\times 100$ , 5a — left side,  $\times 40$ , 5b — dorsal side,  $\times 40$ , borehole Żebrak IG 1 (Podlasie), depth 982.6 m; MUZ IG 6543—6545/73/O; Upper Muschelkalk
- Fig. 6. *Speluncella tumida* (Gründel),  $\times 60$ , a — left side, b — dorsal side, c — ventral side, borehole Gacki 4 (Góry Świętokrzyskie Mts), depth 321.6 m; MUZ IG 6548/73/O; Lower Keuper
- Figs. 7—9. *Timiriasevia rhaetica* (Anderson), 7 — ventral side,  $\times 40$ , 8 — dorsal side,  $\times 50$ , 9 — right side,  $\times 110$ , borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1178.8 m; MUZ IG 6537—6539/73/O; Lower Rhaetic
- Figs. 2, 5—8 — photos made by J. Modrzejewska; Figs. 1, 3, 4, 9 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## PLATE XXXVI

- Figs. 1, 2. *Hungarella gemma* Stryk, 1a — right side,  $\times 50$ , 1b — dorsal side,  $\times 50$ , 2 — left side,  $\times 200$ , borehole Sichów Mały 2 (Góry Świętokrzyskie Mts), depth 341.0 m; MUZ IG 6025/72/O, 6026/72/O; Rhät — Lower Muschelkalk
- Figs. 3, 4. *Hungarella semirobundata* Stryk, 3a — right side,  $\times 240$ , 3b — left side,  $\times 240$ , 4 — left side,  $\times 70$ , Plaza Wapiennik (Silesian-Cracow Upland); MUZ IG 6024/72/O, 6028/73/O; Lower Muschelkalk
- Figs. 5—7. *Cytherelloidea picardi* (Sohn), 5 — inner side of right valve, 6 — right side,  $\times 60$ , 7 — right side,  $\times 150$ , borehole Dobrow 24 (Góry Świętokrzyskie Mts), depth 257.0 m; MUZ IG 6554—6556/73/O; Lower Muschelkalk
- Figs. 1, 4—6 — photos made by J. Modrzejewska; Figs. 2, 3, 7 — SEM photos made in the Zoological Museum in Hamburg by D. Keyser

## Crinoidea, Holothurioidea

## PLATE XXXVII

- Fig. 1. *Encrinus aculeatus* Meyer, Kamień Śląski (Upper Silesia) (in: P. Assmann, 1937); Middle Muschelkalk
- Fig. 2. *Encrinus robustus* Assmann — holotype, Góraźdze (Upper Silesia) (in: P. Assmann, 1937); Góraźdze Beds
- Fig. 3. *Encrinus spinosus* Michael, Kamień Śląski (Upper Silesia) (in: P. Assmann, 1937); Middle Muschelkalk
- Fig. 4. *Entrochus silesiacus* Beyrich,  $\times 8$ , Wolica (Góry Świętokrzyskie Mts); MUZ IG 1364/II/1; *P. striatum* Beds
- Fig. 5. *Priscopedatus mostleri* Stefanov — holotype,  $\times 115$ ; Wielkie Koryciska (Tatra Mts); (in: K. Zawidzka, 1971b); IGP UW THC 6—2; ?Illyrian
- Fig. 6. *Acanthocheelia spiniperforata* Zawidzka — holotype,  $\times 115$ , Wielkie Koryciska (Tatra Mts) (in: K. Zawidzka, 1971b); IGP UW THPc-5; ?Illyrian
- Fig. 7. *Theelia zapfei* Kozur et Mostler — holotype,  $\times 115$ , Dziewkowice (Upper Silesia) (in: H. Kozur, H. Mostler, 1970a); *Terebratula* Beds
- Fig. 8. *Priscopedatoides protrusus* Kozur et Mostler — holotype,  $\times 115$ , Dziewkowice (Upper Silesia) (in: H. Kozur, H. Mostler, 1970a); *Terebratula* Beds
- Fig. 9. *Priscopedatus quadratus* Kozur et Mostler — holotype,  $\times 115$ , Dziewkowice (Upper Silesia) (in: H. Kozur, H. Mostler, 1970a); *Terebratula* Beds

- Fig. 10. *Priscopedatus kotlickii* Kozur et Mostler — holotype,  $\times 115$ , Dziewkowice (Upper Silesia) (in: H. Kozur, H. Mostler, 1970a); *Terebratula* Beds  
 Fig. 11. *Priscopedatus elliptiferus* Zawadzka — holotype,  $\times 115$ , Wielkie Koryciska (Tatra Mts) (in: K. Zawadzka, 1971b); IGP UW THO 3—1; ?Illyrian  
 Fig. 12. *Dadocrinus grundeyi* Langenhan,  $\times 0.7$ , Zawrat Kasprowy (Tatra Mts); MWG UW, J. Lefeld coll.; Lower Anisian, high-tatric series

## Echinoidea, Ophiurida

## PLATE XXXVIII

- Fig. 1. *Cidaris transversa* Meyer, Upper Silesia (in: H. Meyer, 1851); Lower Muschelkalk  
 Fig. 2. *Cidaris subnodosa* Meyer, Upper Silesia (in: H. Meyer, 1851); Lower Muschelkalk  
 Fig. 3. *Cidaris ecki* Assmann: a, c —  $\times 2$ , Kamieniec, Górazdże Beds; b, d, e —  $\times 2$ , Brosławice, Górazdże Beds, f — Ptakowice, Upper Gogolin Beds (Upper Silesia) (in: P. Assmann, 1937)  
 Fig. 4. *Cidaris longispira* Assmann; a —  $\times 2$ , Tarnowice, Ore-bearing Dolomites; b, c — Kamień Śląski, Middle Muschelkalk; d —  $\times 2$ , Kamień Śląski, Middle Muschelkalk; Upper Silesia (in: P. Assmann, 1937)  
 Fig. 5. *Cidaris remifera* Assmann — holotype, Kamionek (Upper Silesia) (in: P. Assmann, 1937); Górazdże Beds  
 Fig. 6. *Aspidura similis* Eck — holotype,  $\times 5$ , a — upper side, b — lower side, Chorzów (Upper Silesia) (in: H. Eck, 1865); Lower Gogolin Beds

## Ophiurida

## PLATE XXXIX

- Fig. 1. *Ophioderma squamosum* (Picard),  $\times 1$ , accumulation of skeletons, Wojkowice Kościelne (Upper Silesia); IG UŚ, J. Liszkowski coll.; *Diplopora* Dolomites  
 Fig. 2. *Ophioderma squamosum* (Picard),  $\times 5$ , Wojkowice Kościelne (Upper Silesia); IG UŚ, J. Liszkowski coll.; *Diplopora* Dolomites

## Conodontophorida

## PLATE XL

- Figs. 1, 2. *Neospathodus kockeli* (Tatge), Obice (Góry Świętokrzyskie Mts); Łukowa Beds (Pelsonian)  
 Fig. 3. *Neospathodus kockeli* (Tatge), Mt. Góra Świętej Anny (Upper Silesia); Karchowice Beds (Pelsonian)  
 Fig. 4. *Neospathodus germanicus* Kozur, Stare Chęciny (Góry Świętokrzyskie Mts); Łukowa Beds (Pelsonian)  
 Fig. 5. *Neospathodus germanicus* Kozur, Obice (Góry Świętokrzyskie Mts); Łukowa Beds (Pelsonian)  
 Fig. 6. *Neospathodus kockeli* (Tatge), Wolica (Góry Świętokrzyskie Mts); Łukowa Beds (Pelsonian)  
 Fig. 7. *Gondolella aegaea* (Bender), Wolica (Góry Świętokrzyskie Mts); Wavy Beds (Lower Anisian)  
 Fig. 8. *Celsigondolella watznaueri praecursor* (Kozur), Stare Chęciny (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 9. *Celsigondolella watznaueri praecursor* (Kozur), Pierzchnica (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 10. *Gondolella haslachensis haslachensis* Tatge, Pierzchnica (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 11. *Gondolella haslachensis haslachensis* Tatge, borehole Twaróg 13 (Upper Silesia); Boruszowice Beds (Fassanian)  
 Fig. 12. *Gondolella haslachensis trammeri* Kozur, Pierzchnica (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 13. *Gondolella momburgensis media* Kozur, Stare Chęciny (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)

- Fig. 14. *Gondolella momburgensis momburgensis* Tatge, Stare Chęciny (Góry Świętokrzyskie Mts); *E. discites* Beds (Fassanian)  
 Fig. 15. *Gondolella aegaea* (Bender), Wolica (Góry Świętokrzyskie Mts; Łukowa Beds (Lower Anisian)  
 Fig. 16. *Gondolella excelsa* (Mosher), Szymiszów (Upper Silesia); Karchowice Beds (Illyrian)  
 Fig. 17. *Gondolella navicula* Huckriede, Wolica (Góry Świętokrzyskie Mts); *P. striatum* Beds (Pelsonian)  
 Fig. 18. *Gondolella excelsa* (Mosher), Wolica (Góry Świętokrzyskie Mts); *P. striatum* Beds (Pelsonian)  
 Figs. 1—18 —  $\times 100$ , IGP UW, J. Trammer, K. Zawadzka collections

## PLATE XLI

- Figs. 1, 2. *Gondolella excelsa* (Mosher), Szymiszów (Upper Silesia); Karchowice Beds (Illyrian)  
 Fig. 3. *Chirodella dinoides* (Tatge), a — top side, b — side view, Wolica (Góry Świętokrzyskie Mts); Łukowa Beds (Lower Anisian)  
 Fig. 4. *Gondolella haslachensis haslachensis* Tatge, Lesica (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 5. *Chirodella polonica* Kozur et Mostler, Wolica (Góry Świętokrzyskie); *P. striatum* Beds (Pelsonian)  
 Fig. 6. *Gondolella haslachensis haslachensis* Tatge, Stare Chęciny (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 7. *Ozarkodina tortilis* Tatge, Wolica (Góry Świętokrzyskie Mts); *P. striatum* Beds (Pelsonian)  
 Fig. 8. *Pollognathus sequens* (Kozur), Pierzchnica (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 9. *Neohindeodella nevadensis* (Müller), Wolica (Góry Świętokrzyskie Mts); Wavy Beds (Fassanian)  
 Fig. 10. *Neohindeodella nevadensis* (Müller), form transitional to *N. triassica triassica* (Müller), Strzelce Opolskie (Upper Silesia); *Terebratula* Beds (Pelsonian)  
 Fig. 11. *Pollognathus germanicus* (Kozur), Stare Chęciny (Góry Świętokrzyskie Mts); *Ceratites* Beds (Fassanian)  
 Fig. 12. *Diplododella meissneri* (Tatge), Wolica (Góry Świętokrzyskie Mts); Łukowa Beds (Pelsonian)  
 Fig. 13. *Cornudina pandodontata* (Budurov), Wolica (Góry Świętokrzyskie Mts); Łukowa Beds (Lower Anisian)  
 Figs. 1—13 —  $\times 100$ , IGP UW, J. Trammer, K. Zawadzka collections

## PLATE XLII

- Fig. 1. *Cornudina neospathoides* Zawadzka — holotype,  $\times 100$ , Mt. Furkaska (Tatra Mts) (*in*: K. Zawadzka, 1972); IGP UW T25y; Anisian  
 Figs. 2, 3. *Gondolella excelsa* (Mosher),  $\times 100$ , Mt. Furkaska and Wielkie Koryciska Valley (Tatra Mts) (*in*: K. Zawadzka, 1972); IGP UW; Anisian—Ladinian  
 Fig. 4. *Ozarkodina budurovi* Zawadzka — holotype,  $\times 100$ , Wielkie Koryciska Valley (Tatra Mts) (*in*: K. Zawadzka, 1972); IGP UW T23A; Anisian—Ladinian  
 Fig. 5. *Neospathodus tatricus* Zawadzka — holotype,  $\times 100$ , Mt. Furkaska (Tatra Mts) (*in*: K. Zawadzka, 1972); IGP UW T55y; Anisian  
 Fig. 6. *Gondolella navicula* Huckriede,  $\times 100$ , Mt. Furkaska and Wielkie Koryciska Valley (Tatra Mts) (*in*: K. Zawadzka, 1972); IGP UW; Anisian—Ladinian  
 Fig. 7. *Misikella* sp. A,  $\times 200$ , Chochołowska Valley (Tatra Mts) (*in*: A. Gaździcki, 1978b); ZPAL C.X/9; Norovica Formation (Rhaetian)  
 Fig. 8. *Misikella posthernsteini* Kozur et Mock,  $\times 200$ , Chochołowska Valley (Tatra Mts) (*in*: A. Gaździcki, 1978b); ZPAL C.X/7; Norovica Formation (Rhaetian)

# FLORA

## Acritarcha

### PLATE XLIII

- Figs. 1—4. *Baltisphaeridium aciculatum* Orłowska-Zwolińska, ×1200; 1 — borehole Połczyn IG 1 (western Pomerania), depth 1621.5 m; MUZ IG 483/107; Lower Keuper, 2 — holotype, borehole Połczyn IG 1 (western Pomerania), depth 1614.3 m; MUZ IG 483/104; Lower Keuper, 3 — shape of spines; 4 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1726.5 m; MUZ IG 481/56; Upper Muschelkalk
- Figs. 5—9. *Michrystridium recurvatum* Valensi f. *brevispinosa* Valensi; ×1000, 5 — borehole Połczyn IG 1 (western Pomerania); depth 1628.0 m; MUZ IG 483/124; Upper Muschelkalk; 6 — specimen with opening at the surface, borehole Połczyn IG 1 (western Pomerania), depth 1622.5 m; MUZ IG 483/116; Upper Muschelkalk; 7 — shape of spines; 8 — specimen with breakage at its margin, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1713.0 m; MUZ IG 481/25; Lower Keuper; 9 — specimen with opening at the surface, borehole Połczyn IG 1 (western Pomerania), depth 1622.5 m; MUZ IG 483/116, Upper Muschelkalk
- Figs. 10—12. *Baltisphaeridium debilispinum* Wall et Downie, ×1000; 10 and 12 — borehole CW-62, Zawiercie (Silesian-Cracow Upland), depth 158.0 m; MUZ IG 487/94; Upper Muschelkalk; 11 — shape of spines
- Figs. 13—16. *Michrystridium inconspicuum* (Deflandre) Deflandre, ×1000; 13 and 14 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2172.3 m, MUZ IG 481/229a; Middle Buntsandstein; 15 — shape of spines; 16 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2018.3 m; MUZ IG 481/164; Rhöt
- Figs. 17—19. *Baltisphaeridium longispinosum* (Eisenack) Eisenack, ×1000, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1718.4 m; 17 — MUZ IG 481/38; 19 — MUZ IG 481/37; Upper Muschelkalk, 18 — shape of process with internal cavity
- Plates XLIII—XLVI — photos made by D. Oleksiak

### PLATE XLIV

- Figs. 1, 2. ?*Veryhachium irregulare* Jekhowsky, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 498.5; 1 — MUZ IG 482/19; 2 — MUZ IG 482/18; Middle Buntsandstein
- Figs. 3, 4. *Veryhachium hyalodermum* (Cookson) Schaarschmidt, 3 — borehole Połczyn IG 1 (western Pomerania), depth 1631.6 m, MUZ IG 483/126; Upper Muschelkalk; 4 — borehole Książ IG 1 (Fore-Sudetic Monocline), depth 1438.0 m, MUZ IG 484/71; Lower Keuper
- Figs. 5, 6. *Veryhachium reductum* (Deunff) Jekhowsky f. *breve* Jekhowsky, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1866.1 m: 5 — MUZ IG 481/109, 6 — MUZ IG 481/110; Lower Muschelkalk
- Fig. 7. ?*Veryhachium irregulare* Jekhowsky, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 498.5 m, MUZ IG 482/19; Middle Buntsandstein
- Figs. 8, 9. *Veryhachium reductum* (Deunff) Jekhowsky f. *trispinosoides* Jekhowsky, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), 8 — depth 1726.5 m, MUZ IG 481/58; 9 — depth 1718.4 m, MUZ IG 481/38; Upper Muschelkalk
- Fig. 10. *Veryhachium dualispinum* Wall, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1716.0 m, MUZ IG 481/26; Upper Muschelkalk
- Figs. 11, 12. *Dictyotidium reticulatum* Schulz, 11 — borehole Książ IG 2 (Fore-Sudetic Monocline), depth 1438.0 m, MUZ IG 484/71; Lower Keuper, 12 — borehole Połczyn IG 1 (western Pomerania), depth 1628.0 m, MUZ IG 483/124; Upper Muschelkalk
- Plate XLIV — all specimens ×1000

## PLATE XLV

- Figs. 1—4. *Leiosphaeridia* Eisenack emend. Downie et Sarjeant,  $\times 1000$ ; Fore-Sudetic Monocline, 1 — borehole Gorzów Wielkooolski IG 1, depth 1720.8 m, MUZ IG 481/45, Upper Muschelkalk; 2 and 3 — borehole Gorzów Wielkopolski IG 1, depth 1866.1 m, MUZ IG 481/109, Lower Muschelkalk; 4 — borehole Środa IG 2, depth 1957.0 m, MUZ IG 492/39, Upper Muschelkalk
- Figs. 5, 6. *Tasmanites* sp. A,  $\times 750$ , 5 — borehole Środa IG 2 (Fore-Sudetic Monocline), depth 1957.0 m, MUZ IG 492/38; 6 — borehole Polczyn IG 1 (western Pomerania), depth 1628.0 m, MUZ IG 483/123, Upper Muschelkalk

## PLATE XLVI

- Figs. 1, 3. *Crassosphaera* cf. *hexagonalis* Wall; specimen in two optical sections,  $\times 1000$ , borehole Polczyn IG 1 (western Pomerania), depth 1622.5 m, MUZ IG 483/117; Upper Muschelkalk
- Figs. 2, 5. *Crassosphaera triassica* Orlowska-Zwolińska,  $\times 1000$ ; 2 — holotype, 2 and 5 — borehole Polczyn IG 1 (western Pomerania), depth 1625.7 m, MUZ IG 483/119; Upper Muschelkalk
- Figs. 4, 6. *Tasmanites* sp. B, specimen in two optical sections,  $\times 750$ , borehole Polczyn IG 1 (western Pomerania), depth 1622.5 m, MUZ IG 483/117; Upper Muschelkalk

## Miospores

## PLATE XLVII

- Figs. 1—3. *Cyclotriletes microgranifer* Mädlér, borehole Otyń IG 1 (Fore-Sudetic Monocline), 1 — depth 491.3 m, MUZ IG 482/12; 2 — depth 560.0 m, MUZ IG 482/36; 3 — depth 506.2 m, MUZ IG 482/26; Middle Buntsandstein
- Fig. 4. *Cyclotriletes oligo-granifer* Mädlér, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 491.3 m, MUZ IG 482/11; Middle Buntsandstein
- Figs. 5, 6. *Punctatisporites triassicus* Schulz, borehole Otyń IG 1 (Fore-Sudetic Monocline), 5 — depth 498.5 m, MUZ IG 482/18; 6 — depth 491.3 m, MUZ IG 482/12; Middle Buntsandstein
- Fig. 7. *Cyclovertriletes presselensis* Schulz, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 498.5 m, MUZ IG 482/17; Middle Buntsandstein
- Plates XLVII—LXXII — photos made by D. Oleksiak;  $\times 1000$ , otherwise stated

## PLATE XLVIII

- Fig. 1. *Cyclovertriletes presselensis* Schulz, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 498.1 m, MUZ IG 482/19; Middle Buntsandstein
- Figs. 2, 4. *Cyclovertriletes presselensis* Schulz, specimen in two optical sections, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 481.9 m, MUZ IG 482/11; Middle Buntsandstein
- Figs. 3, 5—8. *Densoisporites neburgii* (Schulz) Balme, Fore-Sudetic Monocline, 3 — borehole Środa IG 2, depth 2393.5 m, MUZ IG 492/80; 5 — borehole Środa IG 2, depth 2401.0 m, MUZ IG 492/102; 6 — borehole Gorzów Wielkopolski IG 1, depth 2101.5 m, MUZ IG 481/191; 7 — borehole Otyń IG 1, depth 509.2 m, MUZ IG 482/28; 8 — borehole Otyń IG 1, depth 491.9 m, MUZ IG 482/11; Middle Buntsandstein
- Figs. 9, 10. *Densoisporites playfordi* (Balme) Dettmann; borehole Środa IG 2 (Fore-Sudetic Monocline), 9 — depth 2384.0 m, MUZ IG 492/68; 10 — depth 2401.0 m, MUZ IG 492/101; Middle Buntsandstein

## PLATE XLIX

- Figs. 1—3. *Protohaploxypinus pellucidus* Goubin, Fore-Sudetic Monocline, 1 — borehole Otyń IG 1, depth 559.0 m, MUZ IG 482/33; 2 — borehole Gorzów Wielkopolski IG 1, depth 2105.1 m, MUZ IG 481/196; 3 — Gorzów Wielkopolski IG 1, depth 2101.5 m, MUZ IG 481/191; Middle Buntsandstein
- Figs. 4, 5. *Endosporites papillatus* Jansoni, central part of spore, borehole Otyń IG 1 (Fore-

- Sudetic Monocline), 4 — depth 559.0 m, MUZ IG 482/33; 5 — depth 560.0 m, MUZ IG 482/35; Middle Buntsandstein
- Fig. 6. *Endosporites papillatus* Jansonius, specimen with partly preserved exoexine, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 559.0 m, MUZ IG 482/34; Middle Buntsandstein
- Fig. 7. *Cycadopites* cf. *follicularis* Wilson et Webster, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2125.1 m; MUZ IG 481/210; Middle Buntsandstein

## PLATE L

- Fig. 1. *Lunatisporites puntii* Visscher, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2100.3 m; MUZ IG 481/189; Middle Buntsandstein
- Fig. 2. *Cycadopites* cf. *follicularis* Wilson et Webster, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 559.0 m, MUZ IG 482/33; Middle Buntsandstein
- Fig. 3. *Platysaccus papilionis* Potonié et Klaus, ×500, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 560.0 m, MUZ IG 482/36; Middle Buntsandstein
- Figs. 4, 5. *Spheripollenites plicatus* Orłowska-Zwolińska — holotype, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 503.1 m, MUZ IG 482/20; Middle Buntsandstein
- Fig. 6. *Platysaccus leschiki* Hart, ×600, borehole Środa IG 2 (Fore-Sudetic Monocline), depth 2398.0 m, MUZ IG 492/89; Middle Buntsandstein
- Fig. 7. *Cycadopites* cf. *coxii* Visscher, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 559.0 m, MUZ IG 482/33; Middle Buntsandstein

## PLATE LI

- Fig. 1. *Cyclotriletes microgranifer* Mädlér, borehole Polczyn IG 1 (western Pomerania), depth 1868.9 m, MUZ IG 483/144; Rhöt
- Figs. 2, 3. *Cyclotriletes triassicus* Mädlér, specimen in two optical sections, borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133; Rhöt
- Fig. 4. *Cyclotriletes triassicus* Mädlér, borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133; Rhöt
- Figs. 5, 6. *Apiculatisporis plicatus* (Visscher) Orłowska-Zwolińska, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), 5 — depth 2010.0 m, MUZ IG 481/156; 6 — depth 1972.8 m, MUZ IG 481/129; Rhöt

## PLATE LII

- Figs. 1, 2. *Verrucosiporites pseudomorulae* Visscher, borehole Polczyn IG 1 (western Pomerania), 1 — distal area, depth 1867.5 m, MUZ IG 483/141, Rhöt; 2 — laterally flattened specimen, partly visible proximal and distal sides, depth 1861.4 m, MUZ IG 483/135, Rhöt
- Figs. 3, 4. *Aratrisporites tenuispinosus* Playford, 3 — borehole Polczyn IG 1 (western Pomerania), depth 1867.5 m, MUZ IG 483/140; 4 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1972.8 m, MUZ IG 481/131; Rhöt
- Fig. 5. *Kraeuselisporites cuspidus* Balme, borehole Polczyn IG 1 (western Pomerania), depth 1756.0 m, MUZ IG 483/127; Rhöt
- Fig. 6. *Verrucosiporites thuringiacus* Mädlér, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2018.3 m; MUZ IG 481/164; Rhöt

## PLATE LIII

- Fig. 1. *Verrucosiporites thuringiacus* Mädlér, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2019.6 m, MUZ IG 481/166; Rhöt
- Fig. 2. *Protosacculina jansonii* Freudenthal, borehole Polczyn IG 1 (western Pomerania), depth 1868.9 m, MUZ IG 483/142; Rhöt
- Fig. 3. *Kraeuselisporites ullrichi* Reinhardt et Schmitz, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1032.0 m, MUZ IG 481/169; Rhöt
- Figs. 4, 5. *Striatoabietites balmei* Klaus, specimen in two optical sections, borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, MUZ IG 483/130; Rhöt
- Fig. 6. *Striatoabietites balmei* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2032.0 m, MUZ IG 481/168; Rhöt
- Fig. 7. *Protosacculina jansonii* Freudenthal, borehole Polczyn IG 1 (western Pomerania), depth 1867.5 m, MUZ IG 483/141; Rhöt

## PLATE LIV

- Fig. 1. *Succinctisporites grandior* Leschik sensu Mädlar,  $\times 750$ , borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, MUZ IG 483/132; Rhöt
- Fig. 2. *Cycadopites* cf. *coxii* Visscher, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2043.4 m, MUZ IG 481/174; Rhöt
- Fig. 3. *Succinctisporites grandior* Leschik sensu Mädlar,  $\times 750$ , borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, MUZ IG 483/131; Rhöt
- Fig. 4. *Spheripollenites plicatus* Orłowska-Zwolińska, borehole Polczyn IG 1 (western Pomerania), depth 1868.9 m, MUZ IG 483/142; Rhöt
- Fig. 5. *Lunatisporites puntii* Visscher,  $\times 750$ , borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133; Rhöt
- Fig. 6. *Spheripollenites* sp., borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2018.3 m, MUZ IG 481/163; Rhöt

## PLATE LV

- Figs. 1, 2. *Angustisulcites klausii* Freudenthal, 1 — borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, MUZ IG 483/130, Rhöt; 2 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1966.6 m, MUZ IG 481/118; Rhöt
- Fig. 3. *Angustisulcites gorpilii* Visscher, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2043.4 m; MUZ IG 481/174; Rhöt
- Fig. 4. *Brachysaccus ovalis* Mädlar,  $\times 500$ , borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133; Rhöt
- Fig. 5. *Brachysaccus ovalis* Mädlar,  $\times 750$ , borehole Polczyn IG 1 (western Pomerania), depth 1867.5 m, MUZ IG 483/139; Rhöt

## PLATE LVI

- Fig. 1. *Angustisulcites grandis* (Freudenthal) Visscher,  $\times 500$ , borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1800.4 m, MUZ IG 481/106; Middle Muschelkalk
- Fig. 2. *Taeniaesporites noviaulensis* Leschik, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2012.8 m, MUZ IG 481/159; Rhöt
- Figs. 3—5. *Triadispora crassa* Klaus,  $\times 1000$ ; Rhöt: 3 — borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1980.0 m, MUZ IG 481/141; 4 — borehole Polczyn IG 1 (western Pomerania), depth 1865.2 m, MUZ IG 483/138; 5 — borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133
- Fig. 6. *Protohaploxylinus samoilovichii* (Jansonius) Hart, borehole Polczyn IG 1 (western Pomerania), depth 1861.4 m, MUZ IG 483/133; Rhöt
- Fig. 7. *Triadispora crassa* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2018.3 m, MUZ IG 481/163; Rhöt

## PLATE LVII

- Fig. 1. *Protohaploxylinus* cf. *samoilovichii* (Jansonius) Hart, borehole Polczyn IG 1 (western Pomerania), depth 1867.5 m, MUZ IG 483/141; Rhöt
- Figs. 2, 3. *Triadispora plicata* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), 2 — depth 1980.0 m, MUZ IG 481/140, Rhöt; 3 — depth 1982.9 m, MUZ IG 481/145; Rhöt
- Fig. 4. *Hexasaccites muelleri* (Reinhardt et Schmitz) Reinhardt, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1980.0 m, MUZ IG 481/141; Rhöt
- Figs. 5, 6. *Hexasaccites muelleri* (Reinhardt et Schmitz) Reinhardt, specimen in two optical sections, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1966.0 m, MUZ IG 481/118, ? Lower Muschelkalk/?Upper Rhöt

## PLATE LVIII

- Figs. 1, 2. *Voltziaceasporites heteromorpha* Klaus, borehole Polczyn IG 1 (western Pomerania), depth 1756.0 m, 1 — MUZ IG 483/127; 2 — MUZ IG 483/128; Rhöt
- Fig. 3. *Platysaccus triassicus* Mädlar, borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m; MUZ IG 483/130; Rhöt

## PLATE LIX

- Figs. 1—3. *Microcachrydites fastidiosus* (Jansonius) Klaus, borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, 1 — MUZ IG 483/130, 2 — MUZ IG 483/132, 3 — MUZ IG 483/132; Rhöt
- Fig. 4. *Platysaccus triassicus* Mädlér, borehole Polczyn IG 1 (western Pomerania), depth 1756.0 m, MUZ IG 483/129; Rhöt
- Figs. 5, 6. *Microcachrydites sitleri* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), 5 — depth 1972.8 m, MUZ IG 481/130; Rhöt; 6 — depth 1958.3 m, MUZ IG 481/115; Lower Muschelkalk
- Fig. 7. *Platysaccus papilionis* Potonié et Klaus, borehole Polczyn IG 1 (western Pomerania), depth 1757.5 m, MUZ IG 483/131; Rhöt
- Fig. 8. *Microcachrydites doubingeri* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1972.8 m, MUZ IG 481/131; Rhöt

## PLATE LX

- Figs. 1, 2. *Apiculatisporis plicatus* (Visscher) Orłowska-Zwolińska, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), 1 — depth 1774.5 m, MUZ IG 481/91; 2 — depth 1774.3 m, MUZ IG 481/90; Middle Muschelkalk
- Figs. 3—5. *Perotrilites minor* (Mädlér) Antonescu et Taugourdeau-Lantz, specimen in three optical sections, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/79; Middle Muschelkalk
- Fig. 6. *Kraeuselisporites cuspidus* Balme, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/79; Lower Muschelkalk
- Fig. 7. *Aratrisporites fimbriatus* (Klaus) Playford et Dettmann, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/80; Middle Muschelkalk
- Fig. 8. *Perotrilites minor* (Mädlér) Antonescu et Taugourdeau-Lantz, proximal side, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/80; Middle Muschelkalk
- Fig. 9. *Perotrilites minor* (Mädlér) Antonescu et Taugourdeau-Lantz, distal side, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/81; Middle Muschelkalk
- Fig. 10. *Protosacculina jansonii* Freudenthal, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/79; Middle Muschelkalk

## PLATE LXI

- Fig. 1. *Microcachrydites fastidiosus* (Jansonius) Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1800.4 m, MUZ IG 481/104; Middle Muschelkalk
- Fig. 2. *Triadispora crassa* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/80; Middle Muschelkalk
- Fig. 3. *Microcachrydites fastidiosus* (Jansonius) Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1774.5 m, MUZ IG 481/90; Middle Muschelkalk
- Fig. 4. *Triadispora plicata* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/81; Middle Muschelkalk
- Fig. 5. *Microcachrydites doubingeri* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, MUZ IG 481/80; Middle Muschelkalk
- Fig. 6, 7. *Tsugaepollenites oriens* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1767.5 m, 6 — MUZ IG 481/80; 7 — MUZ IG 481/81; Middle Muschelkalk
- Fig. 8. *Voltziaceasporites nephrosaccus* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1800.4 m, MUZ IG 481/103; Middle Muschelkalk
- Fig. 9. *Tsugaepollenites oriens* Klaus, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 1774.5 m, MUZ IG 481/90; Middle Muschelkalk

## PLATE LXII

- Fig. 1. *Todisporites cinctus* (Maliavkina) Orłowska-Zwolińska, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 84.0 m, MUZ IG 485/37; Lower Keuper
- Fig. 2. *Todisporites cinctus* (Maliavkina) Orłowska-Zwolińska, partly corroded surface of exine,

- borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1596.7—1602.7 m, MUZ IG 489/107; Lower Keuper
- Fig. 3. *Aulisporites astigmus* (Leschik) Klaus, borehole Trzebyczka TN 96 (Silesian-Cracow Upland), depth 83.3—83.4 m, MUZ IG 487/63; Reed Sandstone
- Fig. 4. *Aulisporites astigmus* (Leschik) Klaus, broken specimen, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1212.7—1213.0 m, MUZ IG 489/1; Reed Sandstone
- Figs. 5, 6. *Anapiculatisporites telephorus* (Pautsch) Klaus, specimen in two optical sections, borehole Karlino 1 (western Pomerania), depth 1536.0 m, MUZ IG 488/77; Lower Keuper
- Fig. 7. *Apiculatisporites parvispinosus* (Leschik) Schulz, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 488/20; Reed Sandstone
- Fig. 8. *Apiculatisporites firmus* (Leschik) Orłowska-Zwolińska, borehole Płońsk IG 2 (central Poland), depth 2632.9 m, MUZ IG 488/3; Reed Sandstone
- Fig. 9. *Rogalskapisporites cicatricosus* (Rogalska) Danzė-Corsin et Laveine, borehole Płońsk IG 2 (central Poland), depth 2636.4 m; MUZ IG 488/36; Reed Sandstone
- Fig. 10. *Apiculatisporites parvispinosus* (Leschik) Schulz, borehole Płońsk IG 2 (central Poland), depth 2641.1 m, MUZ IG 488/47; Reed Sandstone
- Figs. 11, 12. *Annulispora microannulata* de Jersey, 11 — borehole Drawno geo 2 (western Pomerania), depth 1521.5 m, MUZ IG 491/117; 12 — borehole Wągrowiec IG 1 (western Poland), depth 1726.3 m, MUZ IG 486/43; Reed Sandstone

## PLATE LXIII

- Figs. 1, 2. *Keuperisporites baculatus* Schulz,  $\times 750$ ; 1 — borehole Solec 60 (Góry Świętokrzyskie Mts), depth 116.0 m, MUZ IG 489/153; 2 — fragments of exine with processes, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 670.0 m, MUZ IG 485/84; Lower Keuper
- Fig. 3. *Conbaculatisporites longdonensis* Clarke, borehole CW 61, Zawiercie (Silesian-Cracow Upland), depth 137.0 m, MUZ IG 487/89; Lower Gypsum Beds
- Figs. 4, 5. *Leschikisporis aduncus* (Leschik) Potonié; 4 — asymmetric trilete mark, borehole Wysoka TN 88 (Upper Silesia), depth 136.5—136.8 m, MUZ IG 487/66; Reed Sandstone; 5 — single mark, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1363.8—1370.1, MUZ IG 489/37; Lower Keuper
- Fig. 6. *Nevesisporites lubricus* Orłowska-Zwolińska — holotype, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1380.0 m, MUZ IG 489/47; Lower Keuper
- Figs. 7, 8. *Camarozonosporites (Camarozonosporites) rudis* (Leschik) Klaus, 7 — distal side, borehole Drawno geo 2 (western Pomerania), depth 1521.5 m, MUZ IG 491/117; 8 — lateral view, proximo-distal side, borehole CW-44, Zawiercie (Silesian-Cracow Upland), depth 80.0 m, MUZ IG 487/82; Reed Sandstone
- Fig. 9. *Camarozonosporites (Camarozonosporites) laevigatus* Schulz, borehole Płońsk IG 2 (central Poland), depth 2635.9 m, MUZ IG 488/28; Reed Sandstone

## PLATE LXIV

- Figs. 1, 2. *Echinitosporites iliacooides* Schulz et Krutzsch, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 635.7 m, MUZ IG 485/30; Border Dolomite
- Fig. 3. *Aratrisporites paraspinosus* Klaus, borehole Wojslawice CW 61 (Silesian-Cracow Upland), depth 133.0—134.0 m, MUZ IG 487/87; Reed Sandstone
- Figs. 4, 5. *Aratrisporites coryliseminis* Klaus, borehole Sulechów IG 1 (Fore-Sudetic Monocline), 4 — depth 684.0 m, MUZ IG 485/38, 5 — depth 684.0, MUZ IG 485/40; Lower Keuper
- Fig. 6. *Aratrisporites paraspinosus* Klaus, fragment of exine with spines, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 537.9 m, MUZ IG 485/12; Reed Sandstone
- Figs. 7, 8. *Aratrisporites granulatus* (Klaus) Playford et Dettmann, 7 — borehole Książ IG 2 (Fore-Sudetic Monocline), depth 1410.0 m, MUZ IG 484/57; 8 — borehole Polczyn IG 1 (western Pomerania), depth 1631.6 m, MUZ IG 483/125; Lower Keuper
- Figs. 9, 10. *Aratrisporites scabratus* Klaus, 9 — borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 670.0 m, MUZ IG 485/35; 10 — borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1374.0 m, MUZ IG 489/44; Lower Keuper
- Fig. 11. *Aratrisporites fimbriatus* (Klaus) Playford et Dettmann, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 684.0 m, MUZ IG 485/38; Lower Keuper

## PLATE LXV

- Fig. 1. *Heliosaccus dimorphus* Mädler,  $\times 750$ , borehole Biały Bór 7 (western Pomerania), depth 1434.0—1435.0 m, MUZ IG 488/72; Lower Keuper

- Fig. 2. *Heliosaccus dimorphus* Mädler,  $\times 500$ , air saccus without central body, borehole Biały Bór 7 (western Pomerania), depth 1434.0—1435.0 m, MUZ IG 488/72; Lower Keuper
- Fig. 3. *Ovalipollis ovalis* Krutzsch, borehole Wojślawice CW 61 (Silesian-Cracow Upland), depth 137.0—137.8 m; MUZ IG 487/89; Lower Gypsum Beds

## PLATE LXVI

- Fig. 1. *Parillinites vanus* Scheuring, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 630.0 m, MUZ IG 485/27; Border Dolomite
- Fig. 2. *Infernopollenites sulcatus* (Pautsch) Scheuring, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 630.0 m, MUZ IG 485/27; Border Dolomite

## PLATE LXVII

- Figs. 1. 3. *Triadispora keuperiana* Orłowska-Zwolińska — holotype, specimen in two optical sections, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 630.0 m, MUZ IG 485/27; Border Dolomite
- Figs. 2, 4, 6. *Triadispora verrucata* (Schulz) Scheuring, 2 — polar view, borehole Płońsk IG 2 (central Poland), depth 2666.8 m, MUZ IG 488/66; 4 — polar view, Y mark clearly visible, borehole CW 61, Zawiercie (Silesian-Cracow Upland), depth 137.0—137.8 m, MUZ IG 487/89; 6 — lateral view, borehole Wągrowiec IG 1 (western Poland), depth 1744.8 m, MUZ IG 486/49; Lower Gypsum Beds
- Figs. 5, 7. *Minutosaccus gracilis* (Scheuring) Orłowska-Zwolińska, borehole Połczyn IG 1 (western Pomerania), 5 — depth 1532.2 m, MUZ IG 483/74; 7 — depth 1604.2 m, MUZ IG 483/96; Lower Keuper
- Fig. 8. *Minutosaccus potoniei* Mädler, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1379.6—1385.8 m, MUZ IG 489/51; Lower Keuper
- Fig. 9. *Gibeosporites lativerrucosus* (Leschik) Leschik, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 488/25; Reed Sandstone

## PLATE LXVIII

- Fig. 1. *Gibeosporites lativerrucosus* (Leschik) Leschik, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 488/21; Reed Sandstone
- Figs. 2, 3. *Praecirculina granifer* (Leschik) Klaus, borehole CW 62, Zawiercie (Silesian-Cracow Upland), depth 137.0—137.8 m, MUZ IG 487/88; Lower Gypsum Beds
- Fig. 4. *Gibeosporites hirsutus* (Leschik) Leschik, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 488/21; Reed Sandstone
- Figs. 5, 6. *Duplicisporites granulatus* Leschik emend. Klaus, 5 — borehole Wągrowiec IG 1 (western Poland), depth 1739.0 m, MUZ IG 486/46; 6 — borehole CW 62, Zawiercie (Silesian-Cracow Upland), depth 153.0—155.0 m, MUZ IG 487/93; Lower Gypsum Beds
- Figs. 7, 8. *Camerosporites secatus* Leschik emend. Clarke, 7 — sculpture of proximal surface with trilete Y mark, MUZ IG 487/89; 8 — opening (?) at distal side, borehole CW 61, Zawiercie (Silesian-Cracow Upland), depth 137.0—137.8 m, MUZ IG 487/88; Lower Gypsum Beds
- Fig. 9. *Eucommiidites microgranulatus* Scheuring, borehole Sulechów IG 1 (Fore-Sudetic Monocline), depth 630.0 m, MUZ IG 485/27; Border Dolomite
- Fig. 10. *Zebrasporites fimbriatus* Klaus, borehole Płońsk IG 2 (central Poland), depth 2635.9 m, MUZ IG 488/29; Reed Sandstone
- Fig. 11. *Eucommiidites microgranulatus* Scheuring, borehole Książ IG 2 (Fore-Sudetic Monocline), depth 1331.0 m, MUZ IG 484/28; Border Dolomite

## PLATE LXIX

- Figs. 1, 4. *Semüretisporis gothae* Reinhardt,  $\times 750$ , borehole Nidzica IG 1 (NE Poland), depth 1724.4—1730.7 m, MUZ IG 493/29; 1 — proximal surface; 4 — distal surface; Bartoszyce Beds
- Fig. 2. *Lophotriletes verrucosus* Orłowska-Zwolińska — holotype,  $\times 1000$ , borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/17; Wielichowo Beds
- Figs. 3, 6. *Polypodiisporites polymicroforatus* (Orłowska-Zwolińska) Lund — holotype,  $\times 1000$ , specimen in two optical sections, borehole Nidzica IG 1 (NE Poland), depth 1724.4—1730.7, MUZ IG 493/29; Bartoszyce Beds

Fig. 5. *Semiretisporis wielichoviensis* Orłowska-Zwolińska — holotype,  $\times 750$ , borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/14; Wielichowo Beds

## PLATE LXX

Figs. 1, 7. *Semiretisporis ornatus* Orłowska-Zwolińska — holotype, 1 — distal surface, MUZ IG 494/12; 7 — proximal surface, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/11; Wielichowo Beds

Figs. 2, 3. *Paraklukisporites foraminis* Mädlér, specimen in two optical sections, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.0 m, MUZ IG 494/7; Wielichowo Beds

Fig. 4. *Cornutisporites seebergensis* Schulz, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/17; Wielichowo Beds

Fig. 5. *Triancoraesporites ancorae* (Reinhardt) Schulz, borehole Wielichowo IG 1 (western Poland), depth 345.7 m, MUZ IG 494/9; Wielichowo Beds

Fig. 6. *Triancoraesporites reticulatus* Schulz, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m; MUZ IG 494/16; Wielichowo Beds

## PLATE LXXI

Figs. 1—3. *Cingulizonates rhaeticus* (Reinhardt) Schulz; borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 352.0 m; 1 — MUZ IG 494/25; 2 — MUZ IG 494/26; 3 — fragment of sculpture of cingulum, borehole Warnowo 3 (western Pomerania), depth 1216.0 m, MUZ IG 488/78; Wielichowo Beds

Figs. 4, 5. *Limbosporites lundbladii* Nilsson, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 352.7 m; 4 — distal surface, MUZ IG 494/31; 5 — proximal surface, MUZ IG 494/32; Wielichowo Beds

Fig. 6. *Aratrisporites paletae* (Klaus) Playford et Dettmann, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/16; Wielichowo Beds

Figs. 7, 8. *Densosporites cavernatus* Orłowska-Zwolińska, specimen in two optical sections, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.0 m, MUZ IG 494/6; Wielichowo Beds

Fig. 9. *Densosporites cavernatus* Orłowska-Zwolińska — holotype, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.7 m, MUZ IG 494/17; Wielichowo Beds

## PLATE LXXII

Fig. 1. *Cedripites microreticulatus* Orłowska-Zwolińska — holotype, borehole Trzebyczka TN 96 (Silesian-Cracow Upland), depth 10.8—11.9 m, MUZ IG 487/60; Rhaetic

Figs. 2, 4, 5. *Granuloperculatiipollis rudis* Venkatachala et Góczán; 2 — tetrad, borehole Trzebyczka TN 96 (Silesian-Cracow Upland), depth 10.8—11.9 m, MUZ IG 487/60; Rhaetic; 4 and 5 — single specimen, borehole Wągrowiec IG 1 (western Poland), depth 1502.0 m, MUZ IG 486/38; top part of Upper Gypsum Beds

Figs. 3, 6. *Corollina meyeriana* (Klaus) Venkatachala et Góczán; 3 — tetrad, borehole Ośno IG 1 (Fore-Sudetic Monocline), depth 890.5 m, MUZ IG 490/15; Rhaetic; 6 — single specimen, borehole Wągrowiec IG 1 (western Poland), depth 1291.8 m, MUZ IG 486/11a, Zbąszynek Beds

Fig. 7. *Monosulcites punctatus* Orłowska-Zwolińska — holotype, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 352.7 m, MUZ IG 494/29; Wielichowo Beds

Fig. 8. *Classopollis classoides* (Pflug) Pocock et Jansonius, borehole Ośno IG 1 (Fore-Sudetic Monocline), depth 890.5 m, MUZ IG 490/15; Rhaetic

Fig. 9. *Ricciisporites tuberculatus* Lundblad,  $\times 750$ , borehole Nidzica IG 1 (NE Poland), depth 1724.4—1730.7 m, MUZ IG 493/29; Wielichowo Beds

## Megaspores

## PLATE LXXIII

Fig. 1. *Maexisporites meditectatus* (Reinhardt) Kozur, borehole Świnoujście 1 (western Pomerania), depth 1133.0 m, MUZ IG 507/5/76M; Lower Keuper

Figs. 2, 3. *Maexisporites meditectatus* (Reinhardt) Kozur, borehole Ursynów 1 (Lublin region), depth 1429.2—1432.1 m, 2 — MUZ IG 507/3/76M; 3 — MUZ IG 507/4/76M; Lower Keuper

- Fig. 4. *Verrutrilletes marcinkiewiczae* Kozur, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 112.0 m, MUZ IG 507/6/76M; Lower Keuper
- Fig. 5. *Verrutrilletes marcinkiewiczae* Kozur, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 100.8 m, MUZ IG 507/7/76M; Lower Keuper
- Figs. 6, 7. *Henrisporites triassicus* Kozur, borehole Gacki IG 1 (Góry Świętokrzyskie Mts), depth 297.0 m, MUZ IG 507/36/76M; 6 — proximal surface; 7 — distal surface; Lower Keuper
- Fig. 8. *Henrisporites triassicus* Kozur, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 100.8 m, MUZ IG 507/35/76M; Lower Keuper
- Plates LXXIII—LXXXII —  $\times 100$ ; photos made by D. Oleksiak

## PLATE LXXIV

- Fig. 1. *Verrutrilletes marcinkiewiczae* Kozur, borehole Bobolice 3 (western Pomerania), depth 1692.5 m, MUZ IG 507/11/76 M; Lower Keuper
- Fig. 2. *Tenellisporites marcinkiewiczae* Reinhardt et Fricke, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 120.3 m, MUZ IG 507/56/76M; Lower Keuper
- Fig. 3. *Tenellisporites marcinkiewiczae* Reinhardt et Fricke, borehole Laskowice IG 2 (Fore-Sudetic Monocline), depth 291.0 m, MUZ IG 507/57/76M; Lower Keuper
- Fig. 4. *Tenellisporites marcinkiewiczae* Reinhardt et Fricke, borehole Grzybnica IG 1 (western Pomerania), depth 1524.5 m, MUZ IG 507/55/76M; Lower Keuper
- Fig. 5. *Flabellisporites crinitus* Marcinkiewicz, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 115.0 m, MUZ IG 507/52/76M; Lower Keuper
- Figs. 6, 7. *Flabellisporites crinitus* Marcinkiewicz — holotype, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 115.0 m, MUZ IG 507/51/76M; 6 — proximal surface; 7 — distal surface; Lower Keuper

## PLATE LXXV

- Fig. 1. *Flabellisporites crinitus* Marcinkiewicz, borehole Solec 60 (Góry Świętokrzyskie Mts), depth 109.0 m, MUZ IG 507/54/76M; Lower Keuper
- Fig. 2. *Dijkstraisporites beutleri* Reinhardt, borehole Gacki 1 (Góry Świętokrzyskie Mts), depth 302.73—303.0 m, MUZ IG 507/47/76M; Lower Keuper
- Figs. 3, 4. *Dijkstraisporites beutleri* Reinhardt, borehole Bobolice 3 (western Pomerania), depth 1692.5 m, MUZ IG 507/44/76M; 3 — proximal surface, 4 — distal surface; Lower Keuper
- Fig. 5. *Hughesisorites ?orlowskiae* Kozur, borehole Jamno IG 1 (western Pomerania), depth 1160.7 m, MUZ IG 507/43/76M; Lower Keuper
- Fig. 6. *Hughesisorites ?orlowskiae* Kozur, borehole Ostrów Mazowiecka IG 1 (NE Poland), depth 1118.5 m, MUZ IG 507/41/76M; Lower Keuper

## PLATE LXXVI

- Figs. 1, 3. *Echitrilletes frickei* Kannegieser et Kozur, borehole Kozieglówki 24—Za (Silesian-Cracow Upland), depth 142.1 m, 1 — MUZ IG 507/24/76M; 3 — MUZ IG 507/25/76M; Reed Sandstone
- Fig. 2. *Echitrilletes frickei* Kannegieser et Kozur, borehole Szymonków IG 1 (Fore-Sudetic Monocline), depth 474.5 m, MUZ IG 507/23/76M; Reed Sandstone
- Fig. 4. *Trileites altotectatus* Kannegieser et Kozur,  $\times 75$ , borehole Raduchów 1 (Fore-Sudetic Monocline), depth 689.0 m, MUZ IG 507/2/76M; Reed Sandstone
- Fig. 5. *Narkisporites harrisi* (Reinhardt et Fricke) Kozur, borehole Tuczna TN 94 (Silesian-Cracow Upland), depth 10.6—11.5 m, MUZ IG 507/30/76M; Reed Sandstone
- Fig. 6. *Hughesisorites gibbosus* (Reinhardt et Fricke) Kozur, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 507/37/76M; Reed Sandstone
- Fig. 7. *Trileites altotectatus* Kannegieser et Kozur, borehole Raduchów 1 (Fore-Sudetic Monocline), depth 689.0 m, MUZ IG 507/1/76M; Reed Sandstone

## PLATE LXXVII

- Fig. 1. *Echitrilletes sentus* Marcinkiewicz, borehole Płońsk IG 2 (central Poland), depth 2634.9 m, MUZ IG 507/26/76M; Reed Sandstone
- Fig. 2. *Echitrilletes sentus* Marcinkiewicz — holotype, borehole Kuźnica Strobińska 1 (Fore-Sudetic Monocline), depth 1288.7—1292.0 m, MUZ IG 507/27/76M; Reed Sandstone

- Fig. 3. *Hughesporites gibbosus* (Reinhardt et Fricke) Kozur, borehole V, vicinities of Zawiercie (Silesian-Cracow Upland), depth 54.1 m, MUZ IG 507/38/76M; Reed Sandstone
- Figs. 4, 5. *Narkisporites harrisi* (Reinhardt et Fricke) Kozur, borehole Tuczna TN 94 (Silesian-Cracow Upland), depth 10.6—11.5 m, MUZ IG 507/28/76M; 4 — proximal surface, 5 — distal surface; Reed Sandstone
- Fig. 6. *Hughesporites gibbosus* (Reinhardt et Fricke) Kozur, borehole Aleksandrów 1 (central Poland), depth 880.0 m, MUZ IG 507/39/76M; Reed Sandstone

## PLATE LXXVIII

- Figs. 1, 2. *Verru-triletes ornatus* Reinhardt et Fricke, borehole Raduchów 1 (Fore-Sudetic Monocline), depth 689.0 m, MUZ IG 507/13/76M, 1 — proximal surface, 2 — distal surface; Reed Sandstone
- Fig. 3. *Verru-triletes ornatus* Reinhardt et Fricke, borehole Płońsk IG 2 (central Poland), depth 2632.9 m, MUZ IG 507/14/76M; Reed Sandstone
- Fig. 4. *Radosporites planus* (Reinhardt et Fricke) Kozur, borehole 3—501, vicinities of Zawiercie (Silesian-Cracow Upland), depth 54.1 m, MUZ IG 507/18/76M; Reed Sandstone
- Fig. 5. *Radosporites planus* (Reinhardt et Fricke) Kozur, borehole Płońsk IG 2 (central Poland), depth 2637.2 m, MUZ IG 507/19/76M; Reed Sandstone
- Fig. 6. *Narkisporites harrisi* (Reinhardt et Fricke) Kozur, borehole Tuczna TN 94 (Silesian-Cracow Upland), depth 10.6—11.5 m, MUZ IG 507/31/76M; Reed Sandstone

## PLATE LXXIX

- Fig. 1. *Trileites rectus* Marcinkiewicz — holotype, borehole Jamno IG 2 (western Pomerania), depth 809.0 m, MUZ IG 506/1/76M; Wielichowo Beds
- Fig. 2. *Trileites stenozysmatodes* (Harris) Potonié, borehole Jamno IG 2 (western Pomerania), depth 809.0 m, MUZ IG 506/111/76M; Wielichowo Beds
- Fig. 3. *Trileites rectus* Marcinkiewicz, borehole Jamno IG 2 (western Pomerania), depth 809.0 m, MUZ IG 506/2/76M; Wielichowo Beds
- Figs. 4, 5. *Trileites pinguis* (Harris) Potonié, borehole Tarnówko 1 (Fore-Sudetic Monocline), depth 344.0 m, 4 — MUZ IG 506/4/76M; 5 — MUZ IG 506/5/76M; Wielichowo Beds
- Figs. 6, 7. *Maexisporites misellus* Marcinkiewicz, borehole Bartoszyce IG 1 (NE Poland), depth 825.8—833.8 m, 6 — MUZ IG 506/21/76M; 7 — MUZ IG 506/22/76M; Wielichowo Beds
- Fig. 8. *Maexisporites misellus* Marcinkiewicz — holotype, borehole Mechowo IG 1 (western Pomerania), depth 1151.7 m, MUZ IG 506/20/76M; Wielichowo Beds

## PLATE LXXX

- Figs. 1, 2. *Tasmanitriletes pedinacron* (Harris) Jux et Kempf, borehole Jamno IG 3 (western Pomerania), depth 1103.0 m, 1 — MUZ IG 506/6/76M; 2 — MUZ IG 506/7/76M; Wielichowo Beds
- Fig. 3. *Tasmanitriletes pedinacron* (Harris) Jux et Kempf, borehole Warszawa IG 1 (central Poland), depth 1787.0 m, MUZ IG 506/11/76M; Wielichowo Beds
- Fig. 4. *Trileites candoris* Marcinkiewicz, borehole Jamno IG 3 (western Pomerania), depth 1103.0 m, MUZ IG 506/16/76M; Wielichowo Beds
- Fig. 5. *Trileites candoris* Marcinkiewicz, borehole Jamno IG 2 (western Pomerania), depth 809.0 m, MUZ IG 506/15/76M; Wielichowo Beds
- Fig. 6. *Verru-triletes utilis* (Marcinkiewicz) Marcinkiewicz — holotype, borehole Koszalin IG 1 (western Pomerania), depth 1348.4 m, MUZ IG 506/24/76M; Wielichowo Beds

## PLATE LXXXI

- Figs. 1, 2. *Verru-triletes utilis* (Marcinkiewicz) Marcinkiewicz, borehole Warszawa IG 1 (central Poland), depth 1785.0 m; 1 — MUZ IG 506/26/76M; 2 — MUZ IG 506/25/76M; Wielichowo Beds
- Fig. 3. *Verru-triletes utilis* (Marcinkiewicz) Marcinkiewicz, borehole Tarnówko 1 (Fore-Sudetic Monocline), depth 344.0 m, MUZ IG 506/28/76M; Wielichowo Beds
- Fig. 4. *Verru-triletes litchi* (Harris) Potonié, borehole Bartoszyce IG 1 (NE Poland), depth 826.8—833.8 m, MUZ IG 506/29/76M; Wielichowo Beds

- Fig. 5. *Verrutrilletes guttatus* Marcinkiewicz — holotype, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 345.0 m, MUZ IG 506/32/76M; Wielichowo Beds
- Figs. 6, 7. *Verrutrilletes guttatus* Marcinkiewicz, borehole Warszawa IG 1 (central Poland), depth 1787.0 m, MUZ IG 506/34/76M; 1 — proximal surface, 2 — distal surface; Wielichowo Beds

## PLATE LXXXII

- Fig. 1. *Bacutrilletes tylotus* (Harris) Potonié, borehole Radzymin 1 (central Poland), depth 1565.6 m, MUZ IG 506/37/76M; Wielichowo Beds
- Fig. 2. *Bacutrilletes tylotus* (Harris) Potonié, borehole Bartoszyce IG 1 (NE Poland), depth 826.8—833.8 m, MUZ IG 506/38/76M; Wielichowo Beds
- Figs. 3, 4. *Minerisporites ales* (Harris) Potonié, borehole Biesiekierz 1 (western Pomerania), depth 1240.3 m; 3 — MUZ IG 506/87/76M; 4 — MUZ IG 506/88/76M; Wielichowo Beds
- Fig. 5. *Minerisporites ales* (Harris) Potonié, borehole Bartoszyce IG 1 (NE Poland), depth 826.8—833.8 m, MUZ IG 506/86/76M; Wielichowo Beds
- Fig. 6. *Horstisporites rexargentus* (Harris) Potonié, borehole Jamno IG 3 (western Pomerania), depth 1103.0 m, MUZ IG 506/110/76M; Wielichowo Beds
- Figs. 7, 9. *Horstisporites cavernatus* Marcinkiewicz, borehole Wielichowo IG 1 (Fore-Sudetic Monocline), depth 349.5 m, MUZ IG 506/55/76M; 7 — proximal surface, 9 — distal surface; Wielichowo Beds
- Fig. 8. *Horstisporites cavernatus* Marcinkiewicz — holotype, borehole Mechowo IG 1 (NW Poland), depth 1151.7 m, MUZ IG 506/54/76M; Wielichowo Beds

## PLATE LXXXIII

- Fig. 1. *Trileites crassitectatus* Fuglewicz,  $\times 100$ , reflected light, borehole Tuszcz IG 1 (Podlasie), depth 1377.5 m; Rhöt
- Fig. 2. *Trileites crassitectatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Tuszcz IG 1 (Podlasie), depth 1377.5 m, IGP UW 46; Rhöt
- Fig. 3. *Trileites levis* Fuglewicz,  $\times 100$ , reflected light, borehole Sochaczew 2 (central Poland), depth 3348.2 m; Rhöt
- Fig. 4. *Trileites levis* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1943.0 m, IGP UW 4; Upper Buntsandstein
- Fig. 5. *Trileites flexuosus* Fuglewicz — holotype,  $\times 250$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1371.0 m, IGP UW 45; Rhöt
- Fig. 6. *Trileites flexuosus* Fuglewicz,  $\times 100$ , reflected light, borehole Tuszcz IG 1 (Podlasie), depth 1387.5 m; Rhöt
- Fig. 7. *Trileites grandis* Fuglewicz,  $\times 120$ , SEM micrograph, borehole Kliczków 1 (Fore-Sudetic Monocline), depth 1669.5 m; Rhöt
- Fig. 8. *Trileites granáis* Fuglewicz,  $\times 100$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 478.5 m; Rhöt

## PLATE LXXXIV

- Fig. 1. *Trileites polonicus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m, IGP UW 6; Middle Buntsandstein
- Fig. 2. *Trileites polonicus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Olszyny IG 1 (NE Poland), depth 1410.0 m; Middle Buntsandstein
- Fig. 3. *Trileites polonicus* Fuglewicz,  $\times 140$ , SEM micrograph, borehole Środa IG 2 (Fore-Sudetic Monocline), depth 2409.0 m; Middle Buntsandstein
- Fig. 4. *Trileites vulgaris* Fuglewicz,  $\times 100$ , SEM micrograph, borehole Środa IG 2 (Fore-Sudetic Monocline), depth 2382.7 m; Middle Buntsandstein
- Fig. 5. *Trileites vulgaris* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 2002.0 m, IGP UW 10; Middle Buntsandstein
- Fig. 6. *Trileites validus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1842.5 m, IGP UW 9; Rhöt
- Fig. 7. *Trileites validus* Fuglewicz,  $\times 100$ , reflected light, borehole Kliczków 1 (Fore-Sudetic Monocline), depth 1669.5 m; Rhöt

## PLATE LXXXV

- Fig. 1. *Maexisporites parvus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 11; a — proximal side, b — distal side; Upper Buntsandstein

- Fig. 2. *Maexisporites pyramidalis* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 12; Upper Buntsandstein
- Fig. 3. *Maexisporites pyramidalis* Fuglewicz,  $\times 300$ , SEM micrograph, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m; Upper Buntsandstein
- Fig. 4. *Maexisporites magnuszewensis* Fuglewicz,  $\times 100$ , reflected light, borehole Pasłęk IG 1 (NE Poland), depth 1047.0 m; Lower Keuper
- Fig. 5. *Maexisporites magnuszewensis* Fuglewicz — holotype,  $\times 300$ , SEM micrograph, borehole Magnuszew IG 1 (central Poland), depth 1772.0—1773.0 m, IGP UW 47; Upper Muschelkalk
- Fig. 6. *Maexisporites magnuszewensis* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Pasłęk IG 1 (NE Poland), depth 1047.0 m; Lower Keuper
- Fig. 7. *Trileites tenellus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1841.0 m, IGP UW 7; Rhöt
- Fig. 8. *Trileites tenellus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Konary IG 1 (central Poland), depth 2153.0 m; Rhöt
- Fig. 9. *Trileites sinuosus* (Dertmann) Fuglewicz,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m; Middle Buntsandstein

## PLATE LXXXVI

- Fig. 1. *Maexisporites rotundus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Tłuszcz IG 1 (Podlasie), depth 1387.5 m; Rhöt
- Fig. 2. *Maexisporites rotundus* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 13; a —  $\times 100$ , reflected light, b —  $\times 200$ , SEM micrograph; Upper Buntsandstein
- Fig. 3. *Maexisporites spongiosus* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Sochaczew 2 (central Poland), depth 3348.2 m; Rhöt
- Fig. 4. *Maexisporites spongiosus* Fuglewicz — holotype,  $\times 200$ , SEM micrograph, borehole Sochaczew 2 (central Poland), depth 3348.2 m, IGP UW 48; Rhöt
- Fig. 5. *Maexisporites ooliticus* Fuglewicz — holotype,  $\times 300$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 821.0 m, IGP UW 49; Lower Buntsandstein
- Fig. 6. *Maexisporites ooliticus* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 792.5—793.0 m; Lower Buntsandstein

## PLATE LXXXVII

- Fig. 1. *Verrutrilites fragilis* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 15; a —  $\times 250$ , SEM micrograph, b, c —  $\times 100$ , reflected light, b — distal side, c — proximal side; Upper Buntsandstein
- Fig. 2. *Verrutrilites preutilis* Fuglewicz,  $\times 100$ , reflected light, borehole Magnuszew IG 1 (central Poland), depth 1772.0—1773.0 m; a — proximal side, b — distal side; Upper Muschelkalk
- Fig. 3. *Verrutrilites preutilis* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Magnuszew IG 1 (central Poland), depth 1772.0—1773.0 m, IGP UW 50; a — distal side, b — proximal side; Upper Muschelkalk
- Fig. 4. *Maexisporites spongiosus* Fuglewicz,  $\times 100$ , reflected light, borehole Sochaczew 2 (central Poland), depth 3348.2 m; Rhöt
- Fig. 5. *Maexisporites spongiosus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Sochaczew 2 (central Poland), depth 3348.2 m, IGP UW 48; Rhöt
- Fig. 6. *Verrutrilites preutilis* Fuglewicz,  $\times 120$ , SEM micrograph, borehole Tłuszcz IG 1 (Podlasie), depth 1307.0 m; Lower Keuper

## PLATE LXXXVIII

- Fig. 1. *Pusulosporites inflatus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Września IG 1 (Fore-Sudetic Monocline), depth 2574.5 m; Middle Buntsandstein
- Fig. 2. *Pusulosporites inflatus* Fuglewicz,  $\times 150$ , transmitted light, borehole Nidzica IG 1 (NE Poland), depth 2038.0 m; Middle Buntsandstein
- Fig. 3. *Pusulosporites inflatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2038.0 m; IGP UW 21; Middle Buntsandstein

- Fig. 4. *Pusulosporites inflatus* Fuglewicz,  $\times 120$ , transmitted light, borehole Nidzica IG 1 (NE Poland), depth 2038.0 m; Middle Buntsandstein
- Fig. 5. *Pusulosporites inflatus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 492.5 m; Middle Buntsandstein
- Fig. 6. *Pusulosporites crassus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m, IGP UW 17; a — proximal side, b — distal side; Middle Buntsandstein

## PLATE LXXXIX

- Fig. 1. *Pusulosporites marginatus* Fuglewicz,  $\times 75$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 495.0 m; Middle Buntsandstein
- Fig. 2. *Pusulosporites marginatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m, IGP UW 1; Middle Buntsandstein
- Fig. 3. *Pusulosporites marginatus* Fuglewicz,  $\times 60$ , SEM micrograph, borehole Września IG 1 (Fore-Sudetic Monocline), depth 2574.5 m; Middle Buntsandstein
- Fig. 4. *Pusulosporites permotriassicus* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 863.5 m; Lower Buntsandstein
- Fig. 5. *Pusulosporites permotriassicus* Fuglewicz — holotype,  $\times 250$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 992.0 m; IGP UW 51; Zechstein
- Fig. 6. *Pusulosporites populosus* Fuglewicz,  $\times 60$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 506.5 m; Middle Buntsandstein
- Fig. 7. *Pusulosporites inflatus* Fuglewicz,  $\times 100$ , reflected light, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2105.0 m; Middle Buntsandstein
- Fig. 8. *Pusulosporites populosus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 2002.0 m, IGP UW 19; Middle Buntsandstein
- Fig. 9. *Pusulosporites populosus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Września IG 1 (Fore-Sudetic Monocline), depth 2574.5 m; Middle Buntsandstein

## PLATE XC

- Fig. 1. *Otymisporites tuberculatus* Fuglewicz — holotype,  $\times 200$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 819.0 m; IGP UW 53; Lower Buntsandstein
- Fig. 2. *Otymisporites tuberculatus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 819.0 m; Lower Buntsandstein
- Fig. 3. *Bacuriletes asaphus* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m; IGP UW 22; a —  $\times 250$ , SEM micrograph, b —  $\times 100$ , reflected light; Upper Buntsandstein
- Fig. 4. *Otymisporites eotriassicus* Fuglewicz — holotype, borehole Stęszów IG 1 (Fore-Sudetic Monocline), depth 1074.0 m, IGP UW 52; a —  $\times 100$ , reflected light, b —  $\times 230$ , SEM micrograph; Lower Buntsandstein
- Fig. 5. *Otymisporites eotriassicus* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 854.5 m; Lower Buntsandstein

## PLATE XCI

- Fig. 1. *Bacuriletes asaphus* Fuglewicz,  $\times 100$ , reflected light, borehole Czerńczyce IG 1 (Fore-Sudetic Monocline), depth 334.0—335.0 m; Rhöt
- Fig. 2. *Bacuriletes costatispinosus* Fuglewicz,  $\times 300$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1376.0 m; Rhöt
- Fig. 3. *Bacuriletes costatispinosus* Fuglewicz — holotype,  $\times 250$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 1012.0 m, IGP UW 54; Lower Keuper
- Fig. 4. *Bacuriletes globosus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m, IGP UW 23; Middle Buntsandstein
- Fig. 5. *Bacuriletes insolitus* Fuglewicz,  $\times 300$ , SEM micrograph, borehole Czerńczyce IG 1 (Fore-Sudetic Monocline), depth 346.0 m; Rhöt
- Fig. 6. *Bacuriletes insolitus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 24; Upper Buntsandstein

## PLATE XCII

- Fig. 1. *Bacuriletes costatispinosus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Nidzica IG 1 (NE Poland), depth 1830.0 m; Lower Keuper

- Fig. 2. *Bacurilletes pseudoreticulatus* Fuglewicz,  $\times 250$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1379.0 m; Rhöt
- Fig. 3. *Bacurilletes pseudoreticulatus* Fuglewicz — holotype,  $\times 250$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1379.0 m, IGP UW 55; Rhöt
- Fig. 4. *Bacurilletes corynactiformis* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1814.0—1815.0 m, IGP UW 56; a —  $\times 100$ , reflected light, b —  $\times 150$ , SEM micrograph; Reed Sandstone
- Fig. 5. *Bacurilletes pseudoreticulatus* Fuglewicz,  $\times 120$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1384.0 m; Rhöt

## PLATE XCIII

- Fig. 1. *Bacurilletes micros* Fuglewicz — holotype,  $\times 250$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1321.0 m, IGP UW 57; Lower Keuper
- Fig. 2. *Echiriletes prerussus* Fuglewicz — holotype,  $\times 100$ , Lipie Śląskie brickyard (Silesian-Cracow Upland), IGP UW 58; Lower Rhaetic
- Fig. 3. *Bacurilletes micros* Fuglewicz,  $\times 100$ , reflected light, borehole Magnuszew IG 1 (central Poland), depth 1762.0 m; Lower Keuper
- Fig. 4. *Echiriletes prerussus* Fuglewicz,  $\times 200$ , Lipie Śląskie brickyard (Silesian-Cracow Upland); Lower Rhaetic
- Fig. 5. *Echiriletes prerussus* Fuglewicz,  $\times 100$ , Lipie Śląskie brickyard (Silesian-Cracow Upland); Lower Rhaetic
- Fig. 6. *Echiriletes pectinatus* Fuglewicz — holotype, borehole Kliczków 1 (Fore-Sudetic Monocline), depth 1669.5 m, IGP UW 59; a —  $\times 300$ , SEM micrograph, b —  $\times 100$ , reflected light; Rhöt

## PLATE XCIV

- Fig. 1. *Echiriletes latispinosus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Sochaczew 2 (central Poland), depth 3184.0 m; Lower Keuper
- Fig. 2. *Echiriletes latispinosus* Fuglewicz — holotype,  $\times 120$ , SEM micrograph, borehole Sochaczew 2 (central Poland), depth 3185.0 m, IGP UW 60; Lower Keuper
- Fig. 3. *Echiriletes latispinosus* Fuglewicz,  $\times 100$ , reflected light, borehole Sochaczew 2 (central Poland), depth 3185.0 m; Lower Keuper
- Fig. 4. *Echiriletes latispinosus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Sochaczew 2 (central Poland), depth 3184.0 m; Lower Keuper
- Fig. 5. *Narkisporites insignis* Fuglewicz,  $\times 100$ , reflected light, borehole Pasłek IG 1 (NE Poland), depth 1138.0 m; Upper Buntsandstein

## PLATE XCV

- Fig. 1. *Echiriletes gracilis* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 991.2—991.5 m; Lower Keuper
- Fig. 2. *Echiriletes gracilis* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1935.2 m, IGP UW 29; a —  $\times 100$ , reflected light, b —  $\times 200$ , SEM micrograph; Upper Buntsandstein
- Fig. 3. *Echiriletes fragilispinus* Fuglewicz — holotype, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 793.0 m; IGP UW 76; a — proximal side,  $\times 150$ , b — fragment of exine,  $\times 600$ ; Lower Buntsandstein
- Fig. 4. *Echiriletes echinatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 2031.5 m, IGP UW 25; Middle Buntsandstein

## PLATE XCVI

- Fig. 1. *Echiriletes multispinosus* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1935.2 m, IGP UW 30; a —  $\times 90$ , SEM micrograph, b —  $\times 100$ , reflected light; Upper Buntsandstein
- Fig. 2. *Narkisporites insignis* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Pasłek IG 1 (NE Poland), depth 1138.0 m, IGP UW 37; Upper Buntsandstein
- Fig. 3. *Narkisporites insignis* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1379.0 m; Rhöt
- Fig. 4. *Narkisporites brevispinosus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1935.2 m, IGP UW 27; Upper Buntsandstein

Fig. 5. *Narkisporites brevispinosus* Fuglewicz,  $\times 100$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 478.5 m; Rhöt

## PLATE XCVII

- Fig. 1. *Horstisporites sulcatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m, IGP UW 36; Middle Buntsandstein  
 Fig. 2. *Horstisporites sulcatus* Fuglewicz,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 2018.0 m; Middle Buntsandstein  
 Fig. 3. *Horstisporites bertelseni* Fuglewicz — holotype,  $\times 130$ , Lipie Śląskie brickyard (Silesian-Cracow Upland), IGP UW 63; Lower Rhaetic  
 Fig. 4. *Horstisporites bertelseni* Fuglewicz,  $\times 150$ , SEM micrograph, Lipie Śląskie brickyard (Silesian-Cracow Upland); Lower Rhaetic  
 Fig. 5. *Horstisporites irregularis* Fuglewicz — holotype, borehole Magnuszew IG 1 (central Poland), depth 1762.0 m, IGP UW 62; a —  $\times 120$ , SEM micrograph, b —  $\times 100$ , reflected light; Lower Keuper

## PLATE XCVIII

- Fig. 1. *Bothriotriletes grandis* Fuglewicz — holotype, borehole Rokita IG 1 (western Pomerania), depth 1245.0 m, IGP UW 66; a —  $\times 45$ , SEM micrograph, b —  $\times 100$ , reflected light; Lower Keuper  
 Fig. 2. *Horstisporites midzicensis* Fuglewicz — holotype, borehole Nidzica IG 1 (NE Poland), depth 1823.0 m, IGP UW 64; a —  $\times 250$ , SEM micrograph, b —  $\times 100$ , reflected light; Reed Sandstone  
 Fig. 3. *Aneuletes pomeranus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Pasłek IG 1 (NE Poland), depth 1058.0 m; Lower Keuper  
 Fig. 4. *Erlansonisporites licheniformis* Fuglewicz,  $\times 100$ , reflected light, borehole Stęszów IG 1 (Fore-Sudetic Monocline), depth 593.0—594.0 m; Rhöt  
 Fig. 5. *Erlansonisporites licheniformis* Fuglewicz — holotype,  $\times 150$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 478.7 m, IGP UW 65; Rhöt

## PLATE XCIX

- Fig. 1. *Aneuletes acrochordonodes* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Magnuszew IG 1 (central Poland), depth 1772.0—1773.0 m, IGP UW 73; Upper Muschelkalk  
 Fig. 2. *Aneuletes acrochordonodes* Fuglewicz,  $\times 100$ , reflected light, borehole Magnuszew IG 1 (central Poland), depth 1772.0—1773.0 m; Upper Muschelkalk  
 Fig. 3. *Hughesisporites inflatus* Fuglewicz — holotype, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 2002.0 m, IGP UW 40; a —  $\times 100$ , reflected light, b —  $\times 250$ , SEM micrograph; Middle Buntsandstein  
 Fig. 4. *Hughesisporites simplex* Fuglewicz — holotype, borehole Stęszów IG 1 (Fore-Sudetic Monocline), depth 1064.0 m, IGP UW 71; a —  $\times 230$ , SEM micrograph, b —  $\times 100$ , reflected light; Lower Buntsandstein  
 Fig. 5. *Aneuletes clavatus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Kamień Pomorski IG 1 (western Pomerania), depth 992.0 m; IGP UW 74; Lower Keuper

## PLATE C

- Fig. 1. *Triangulatisporites makowskii* (Fuglewicz) Karczewska,  $\times 100$ , reflected light, borehole Tuszcz IG 1 (Podlasie), depth 1379.0 m; Rhöt  
 Fig. 2. *Nathorstisporites invenustus* Fuglewicz,  $\times 200$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1320.5 m; Lower Keuper  
 Fig. 3. *Aneuletes rotundus* Fuglewicz — holotype,  $\times 100$ , reflected light, borehole Nidzica IG 1 (NE Poland), depth 1948.0 m, IGP UW 42; Upper Buntsandstein  
 Fig. 4. *Dijkstraisporites capillatus* Fuglewicz,  $\times 100$ , reflected light, borehole Krauzów 1 (Góry Świętokrzyskie Mts), depth 286.1 m; Lower Keuper  
 Fig. 5. *Aneuletes rotundus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Pasłek IG 1 (NE Poland), depth 1058.0 m; Lower Keuper  
 Fig. 6. *Nathorstisporites invenustus* Fuglewicz — holotype,  $\times 150$ , SEM micrograph, borehole Tuszcz IG 1 (Podlasie), depth 1322.0 m, IGP UW 70; Lower Keuper

Fig. 7. *Dijkstraisporites capillatus* Fuglewicz — holotype,  $\times 150$ , SEM micrograph, borehole Pasłek IG 1 (NE Poland), depth 1047.0 m, IGP UW 69; Lower Keuper

## PLATE CI

- Fig. 1. *Triangulatisporites tuberculatus* Fuglewicz — holotype, borehole Tluszcz IG 1 (Podlasie), depth 1482.0 m, IGP UW 67, a — distal side,  $\times 200$ , SEM micrograph, b — proximal side,  $\times 150$ , SEM micrograph; Rhöt
- Fig. 2. *Triangulatisporites makowskii* (Fuglewicz) Karczewska — holotype,  $\times 100$ , reflected light, borehole Boża Wola IG 1 (Góry Świętokrzyskie Mts), depth 1842.5 m, IGP UW 38; Rhöt
- Fig. 3. *Triangulatisporites reticulatus* Fuglewicz — holotype, borehole Gorzów Wielkopolski IG 1 (Fore-Sudetic Monocline), depth 2575.5–2576.0 m, IGP UW 68, a —  $\times 200$ , SEM micrograph, b —  $\times 100$ , reflected light; Lower Buntsandstein

## PLATE CII

- Fig. 1. *Triangulatisporites makowskii* (Fuglewicz) Karczewska,  $\times 150$ , SEM micrograph, borehole Tluszcz IG 1 (Podlasie), depth 1384.0 m; Rhöt
- Fig. 2. *Hughesisporites inflatus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Otyń IG 1 (Fore-Sudetic Monocline), depth 492.5 m; Middle Buntsandstein
- Fig. 3. *Aneuletes clavatus* Fuglewicz,  $\times 120$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 998.0 m; Lower Keuper
- Fig. 4. *Aneuletes pomeranus* Fuglewicz,  $\times 150$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 992.0 m; Lower Keuper
- Fig. 5. *Aneuletes clavatus* Fuglewicz — holotype,  $\times 180$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 992.0 m, IGP UW 74; Lower Keuper
- Fig. 6. *Aneuletes pomeranus* Fuglewicz — holotype,  $\times 200$ , SEM micrograph, borehole Kamień Pomorski IG 1 (western Pomerania), depth 992.0 m, IGP UW 75; Lower Keuper

## Macroflora

## PLATE CIII

- Dasycladaceae of the Upper Anisian (Illyrian) in the high-tatric series of the Tatra Mts (Figs. 1–15) and the Upper Silesia (Fig. 16)
- Fig. 1. *Physoporella praealpina* Pia, a — longitudinal section, b — oblique-longitudinal section, c — *Diplopora annulatissima* Pia, oblique-longitudinal section
- Fig. 2. *Physoporella praealpina* Pia, a — oblique-longitudinal section, b — oblique-transversal section, c — *Physoporella dissita* (Gümbel) Pia, longitudinal section, d, e — *Diplopora annulatissima* Pia, oblique-longitudinal sections, f — *Physoporella praealpina* Pia, longitudinal section
- Fig. 3. *Physoporella praealpina* Pia, oblique-longitudinal section
- Fig. 4. *Physoporella* sp., transversal section
- Figs. 5, 6. *Physoporella dissita* (Gümbel) Pia, 5 — longitudinal section, 6 — oblique-longitudinal section
- Figs. 7–9. *Diplopora annulatissima* Pia, 7a — longitudinal section, 7b — transversal section, 8 — tangential longitudinal section, 9 — longitudinal section
- Fig. 10. *Physoporella praealpina* Pia, a — transversal section, b — longitudinal section, c — oblique section
- Figs. 11, 12. *Physoporella minutula* (Gümbel) Pia, longitudinal sections
- Figs. 13–15. *Diplopora hexaster* (Pia) Pia, 13 — transversal section, 14, 15 — longitudinal sections
- Fig. 16. *Physoporella praealpina* (Gümbel) Pia, side view of mould (*in*: C. Pastwa-Leszczynska, S. Śliwiński, 1960); the specimen was identified as *Diplopora annulata* Schafhäütl f. *physoporelloidea*
- Figs. 1–15 — c.  $\times 6$ ; Fig. 16 — c.  $\times 10$

## PLATE CIV

- Dasycladaceae of the Lower Ladinian in the upper sub-tatric (Stražov) series (Figs. 1–5) and lower sub-tatric (Križna) series (Figs. 6–14) in the Tatra Mts
- Fig. 1. *Teutoporella herculea* (Stoppani) Pia, oblique-longitudinal section,  $\times 6$

- Fig. 2. *Diploporella annulata dolomitica* Pia, a-c — oblique-transversal sections, d — longitudinal section, e — *Teutloporella herculea* (Stoppani) Pia, transversal section;  $\times 4.5$   
 Fig. 3. *Teutloporella aequalis* (Gümbel) Pia, transversal section,  $\times 6$   
 Figs. 4, 5. *Teutloporella herculea* (Stoppani) Pia, 4 — transversal and oblique-transversal sections,  $\times 5$ , 5 — oblique-transversal section,  $\times 6$   
 Figs. 6—9. *Diploporella uniseriatis* Pia, 6 — oblique-transversal and oblique-longitudinal sections,  $\times c. 8$ , 7 — tangential longitudinal section,  $\times c. 8$ ; 8 — several oblique-longitudinal sections,  $\times c. 8$ , 9 — tangential longitudinal and axial longitudinal sections,  $\times c. 8$   
 Figs. 10—12. *Diploporella annulata dolomitica* Pia, 10 — longitudinal section,  $\times c. 8$ , 11a — longitudinal section, 11b — transversal section,  $\times c. 8$ , 12 — transversal section,  $\times c. 8$   
 Fig. 13. *Diploporella annulata annulata* Bystrický, tangential longitudinal section,  $\times c. 8$   
 Fig. 14. *Diploporella annulata dolomitica* (Pia), tangential, somewhat oblique longitudinal section,  $\times c. 8$

## PLATE CV

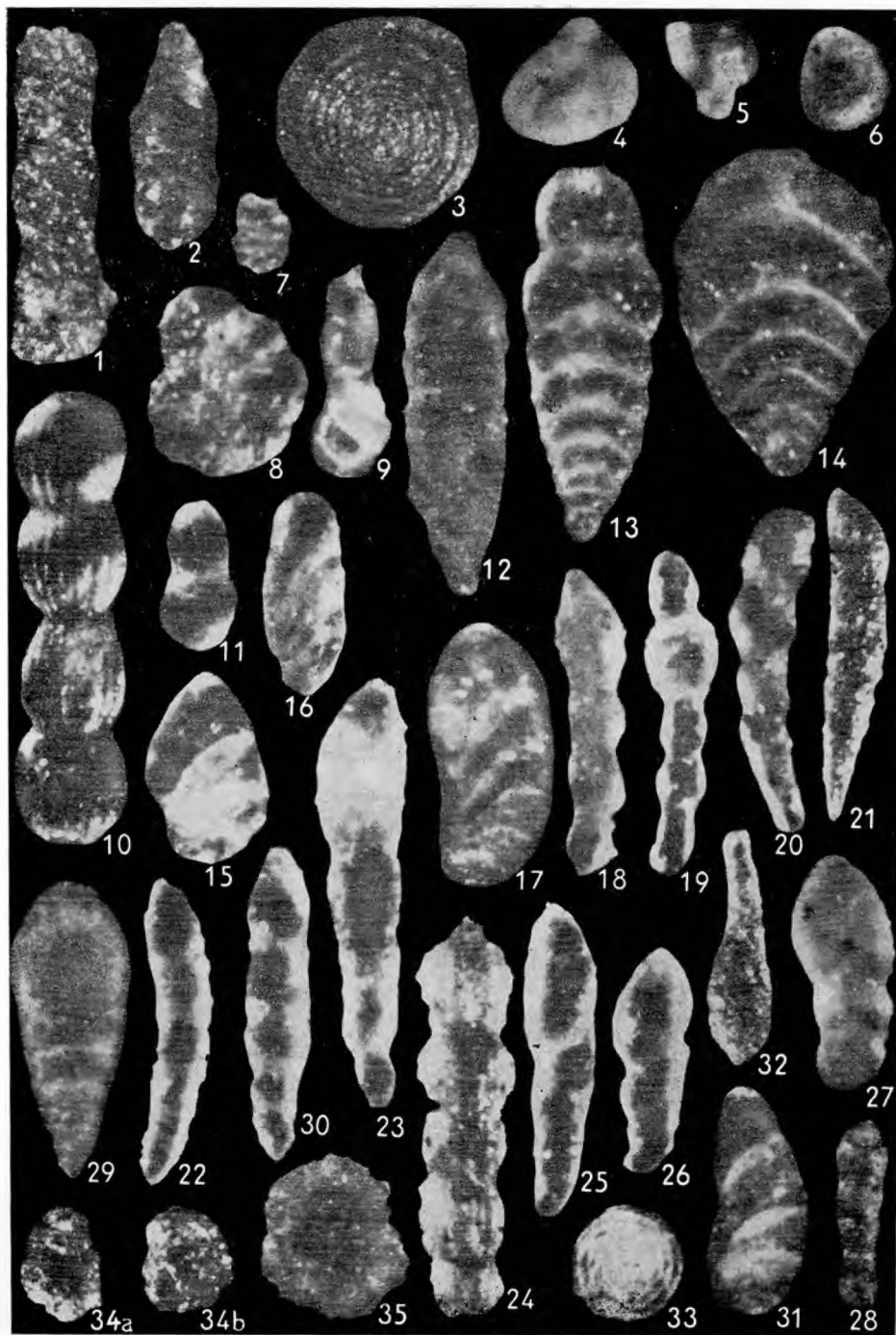
- Dasycladaceae of the Anisian in the Silesian-Cracow Upland (Figs. 1—25) and the Góry Świętokrzyskie Mts (Figs. 26—27)
- Fig. 1. *Diploporella annulata annulata* Bystrický,  $\times 8$ , oblique-longitudinal section (*in*: J. Pia, 1920), Upper Silesia; *Diploporella Dolomites* (Illyrian—Fassanian)  
 Fig. 2. *Diploporella annulata annulata* Bystrický,  $\times 10$ , oblique section (*in*: J. Pia, 1920), vicinities of Libiąż; *Diploporella Dolomites* (Illyrian—Fassanian)  
 Figs. 3—7. *Diploporella annulata* (Schafhäütl),  $\times 12.6$ , 3 — oblique-longitudinal section, 4, 6 — oblique sections, 5, 7 — transversal sections, borehole Żarki Letnisko 11-Ż, depth 128.4—129.2 m; upper part of *Diploporella Dolomites* (Illyrian)  
 Fig. 8. *Diploporella annulatissima* Pia,  $\times 12$ , oblique longitudinal section (*in*: J. Pia, 1931), Nowe Koszyce NW of Strzelce Opolskie; upper part of *Diploporella Dolomites* (Illyrian)  
 Fig. 9. *Diploporella annulatissima* Pia,  $\times 16$ , tangential longitudinal section (*in*: J. Pia, 1931), area SW of Tarnowskie Góry; upper part of *Diploporella Dolomites* (Illyrian)  
 Figs. 10—13. *Diploporella annulatissima* Pia,  $\times 12.6$ , tangential sections through typical narrow rings, borehole Żarki Letnisko 11-Ż, depth 128.4—129.2 m; upper part of *Diploporella Dolomites* (Illyrian)  
 Figs. 14, 15. *Physoporella praealpina* Pia,  $\times 12.6$ , oblique-transversal sections, borehole Żarki Letnisko 11-Ż, depth 128.4—129.2 m; upper part of *Diploporella Dolomites* (Illyrian)  
 Fig. 16. *Physoporella praealpina* Pia,  $\times 16$ , tangential longitudinal section, borehole Winowno 25 WW, depth 90.56 m; lower part of *Diploporella Dolomites* (Pelsonian)  
 Fig. 17. *Physoporella dissita* (Gümbel) Pia,  $\times 16$ , tangential longitudinal section, borehole Winowno 25 WW, depth 90.56 m; lower part of *Diploporella Dolomites* (Pelsonian)  
 Figs. 18, 19. *Physoporella dissita* (Gümbel) Pia,  $\times 16$ , oblique sections, borehole Winowno 25 WW, depth 90.56 m; lower part of *Diploporella Dolomites* (Pelsonian)  
 Figs. 20, 21. *Physoporella minutula* (Gümbel) Pia, oblique-longitudinal sections, borehole Winowno 25 WW, depth 90.56 m; 20 —  $\times 16$ , 21 —  $\times 9.6$ ; lower part of the *Diploporella Dolomites* (Pelsonian)  
 Figs. 22—25. *Oligoporella elegans* (Assmann) Pia (*in*: J. Pia, 1931), 22 — tangential longitudinal section,  $\times 16$ , 23 — somewhat oblique, longitudinal section,  $\times 15$ , 24, 25 — oblique sections,  $\times 16$ , Nowe Koszyce NW of Strzelce Opolskie; upper part of *Diploporella Dolomites* (Illyrian)  
 Figs. 26, 27. *Aciculella baccillum* Pia,  $\times 50$  (*in*: A. Gaździcki, W. R. Kowalski, 1974), sections by fertile parts of alga: 26 — transversal, 27 — longitudinal; Łukowa Beds (the lowermost Pelsonian)

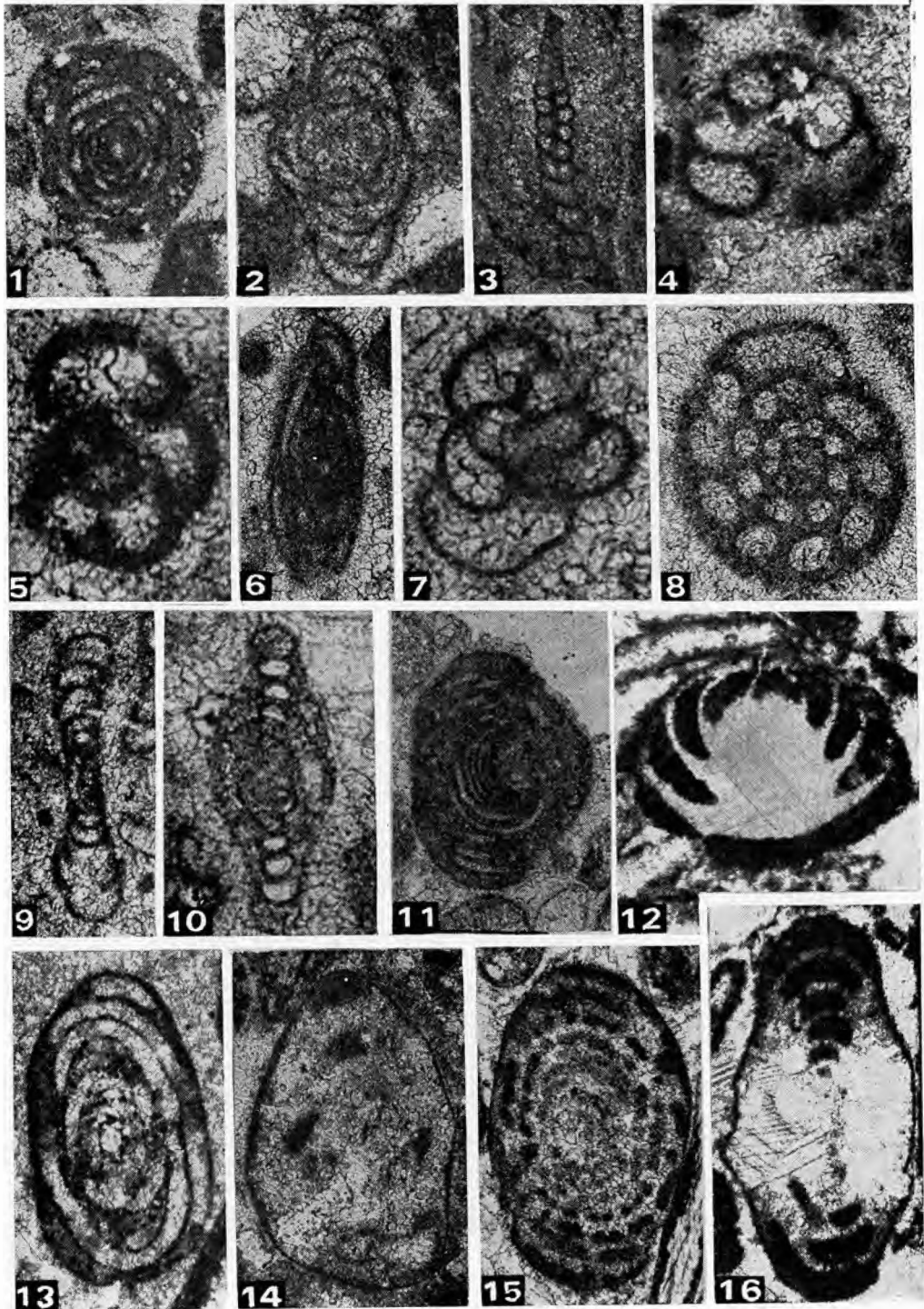
## PLATE CVI

*Physoporella* of the Anisian in core material from the vicinities of Zawiercie (Silesian-Cracow Upland)

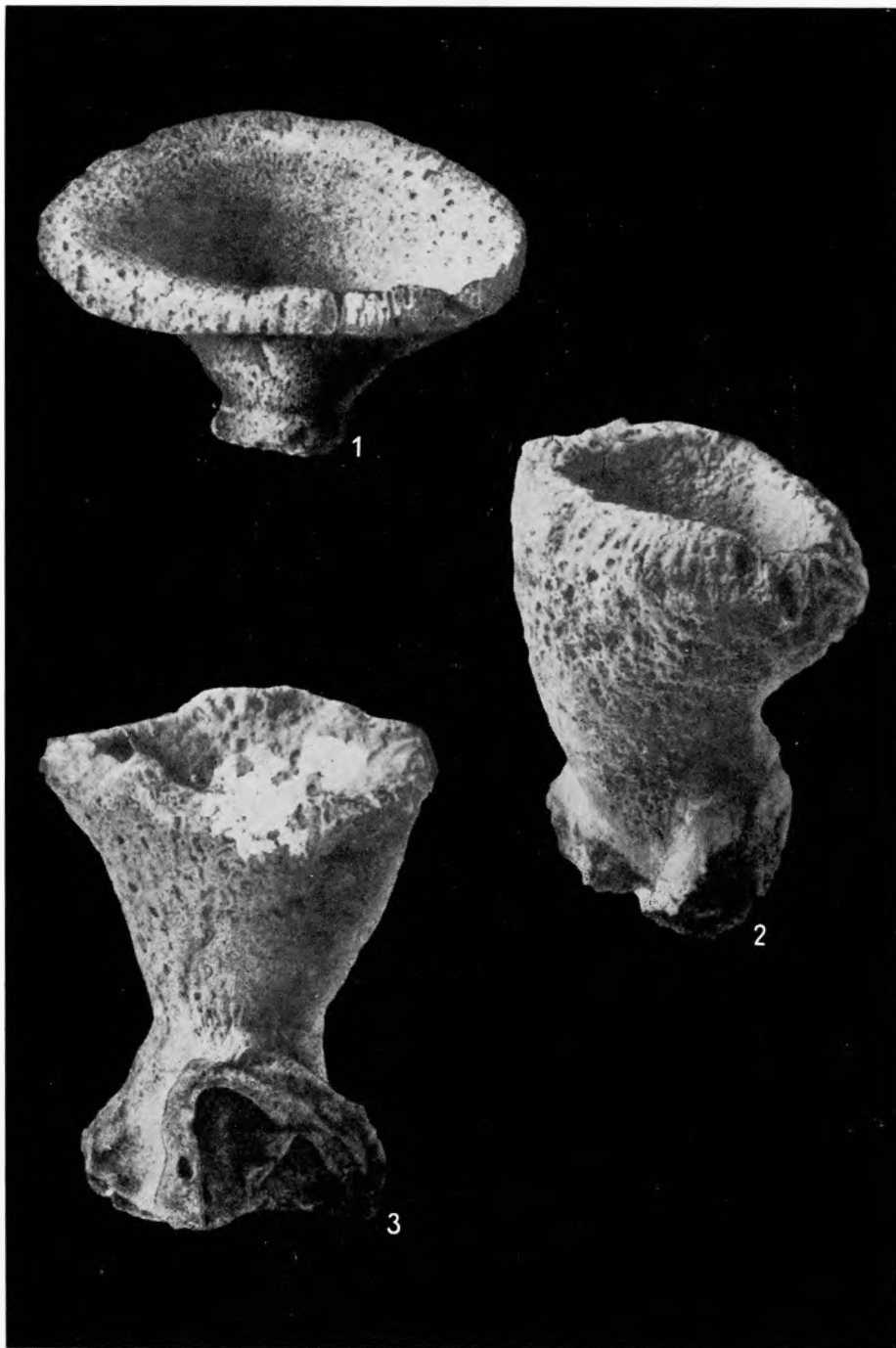
- Fig. 1. *Physoporella praealpina* Pia,  $\times 2$ , accumulation of specimens at rock surface, borehole Winowno 25 WW, depth 90.56 m; lower part of *Diploporella Dolomites* (Pelsonian)  
 Fig. 2. *Physoporella praealpina* Pia,  $\times 3$ , double rows of tubercles at upper surface of inner tube, borehole Winowno 25 WW, depth 90.56 m; lower part of *Diploporella Dolomites* (Pelsonian)  
 Fig. 3. *Physoporella praealpina* Pia,  $\times 5$ , two thin tubes (inner and outer), connected by tubercles, borehole Żarki Letnisko 11-Ż, depth 128.4—129.2 m; upper part of *Diploporella Dolomites* (Illyrian)

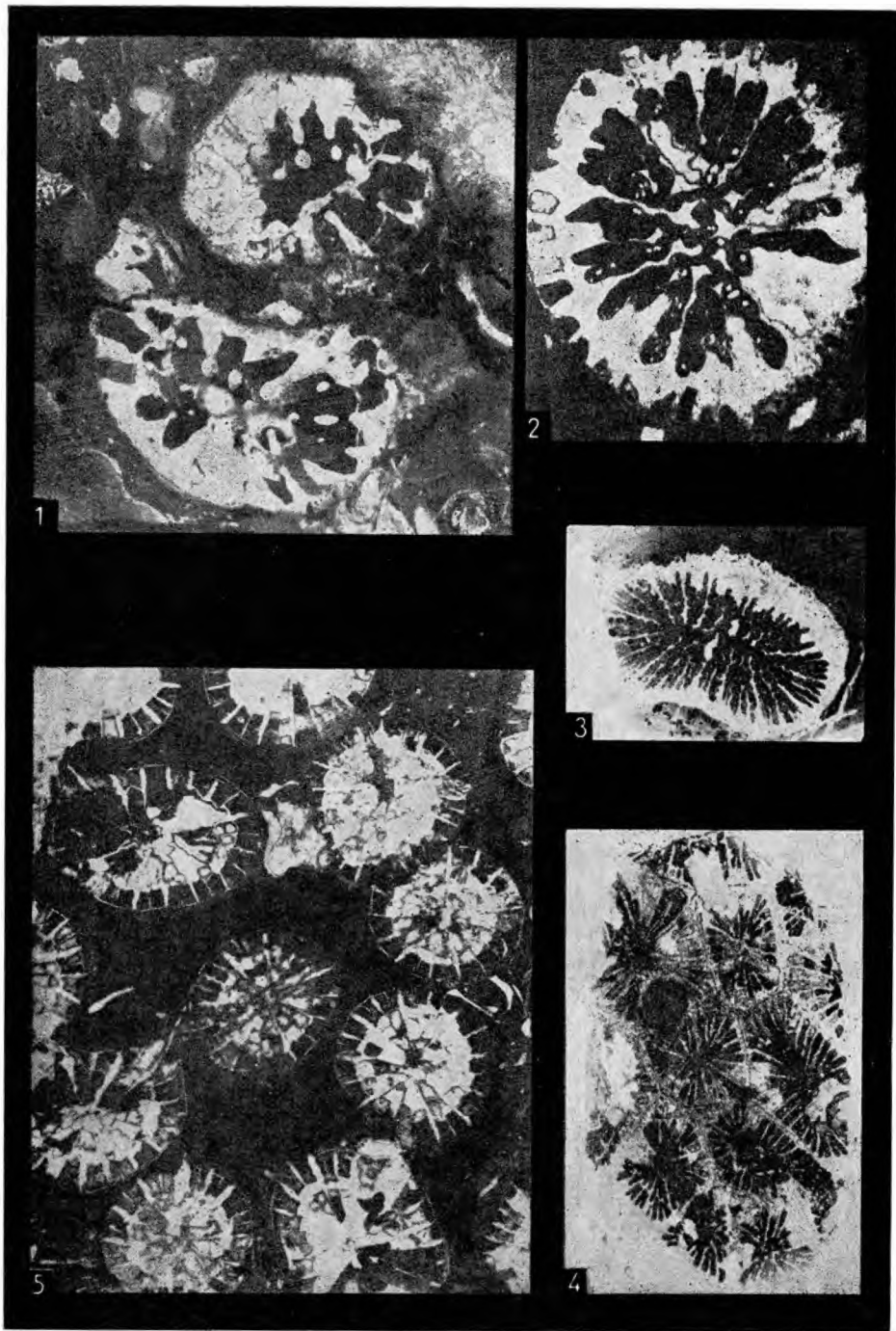
- Fig. 4. *Physoporella praealpina* Pia,  $\times 3$ , outer tube connected with fragments of the inner by tubercles, borehole Krusin 23 WW, depth 143.4 m, lower part of *Diplopora* Dolomites (Pelsonian)
- Figs. 5, 7. *Physoporella praealpina* Pia, double rows of pores on inner surface of single tube, borehole Winowno 25 WW, depth 90.35—90.40 m, 5 —  $\times 3$ , 7 —  $\times 9$ ; lower part of *Diplopora* Dolomites (Pelsonian)
- Fig. 6. *Physoporella* sp.,  $\times 3$ , transversal sections through double tube, both parts connected by tubercles, borehole Krusin 23 WW, depth 143.4 m; lower part of *Diplopora* Dolomites (Pelsonian)
- Fig. 8. *Physoporella praealpina* Pia,  $\times 2$ , a — single, partly splitted tube, with pores on inner surface, b — inner surface of single tube, with two rows of pores, borehole Winowno 25 WW, depth 90.30—90.35 m; lower part of *Diplopora* Dolomites (Pelsonian)
- Fig. 9. a — *Physoporella praealpina* Pia, b — *Physoporella pauciforata* (Gümbel) Steinmann,  $\times 9$ ; borehole Krusin 23 WW, depth 143.4 m; lower part of *Diplopora* Dolomites (Pelsonian)

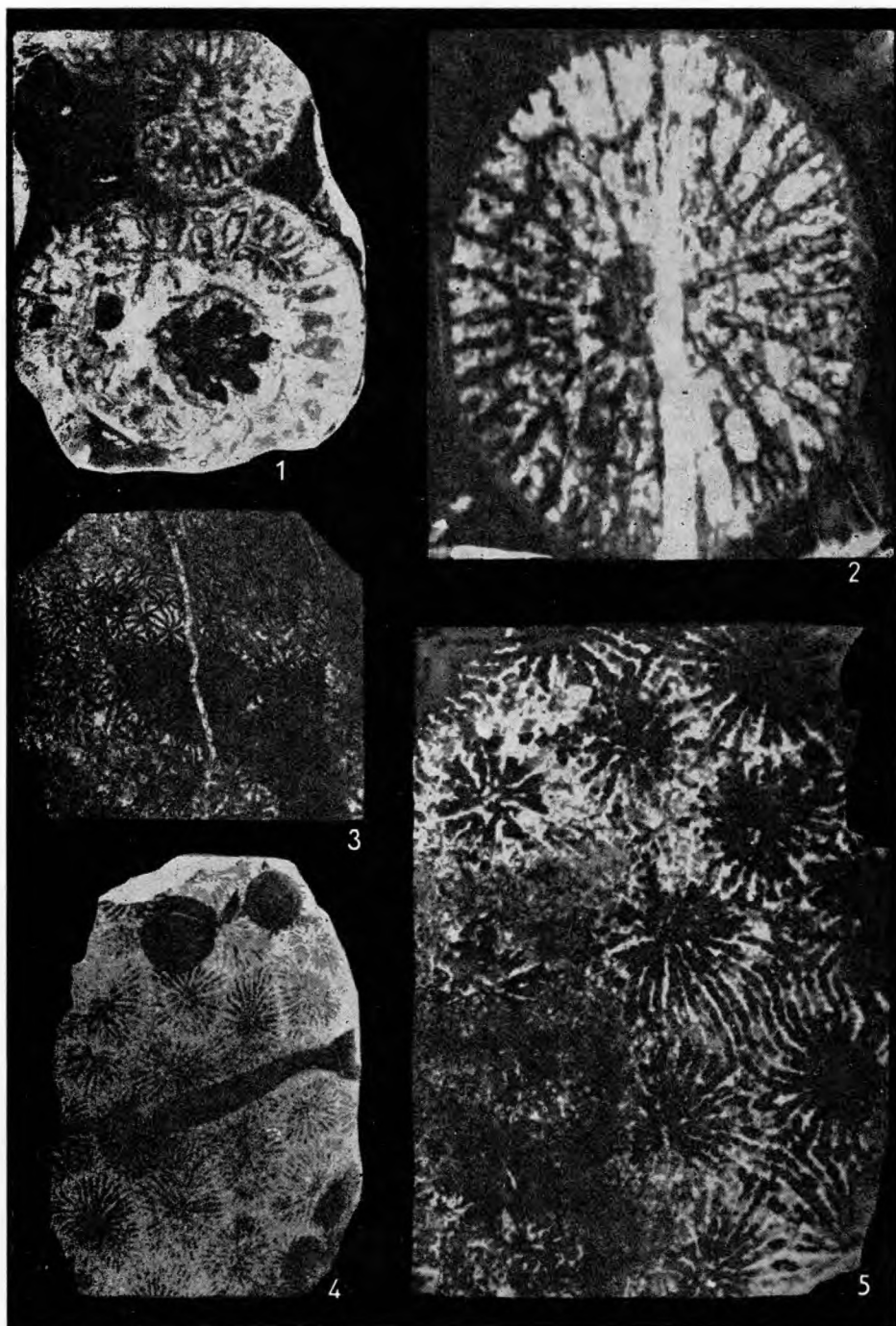


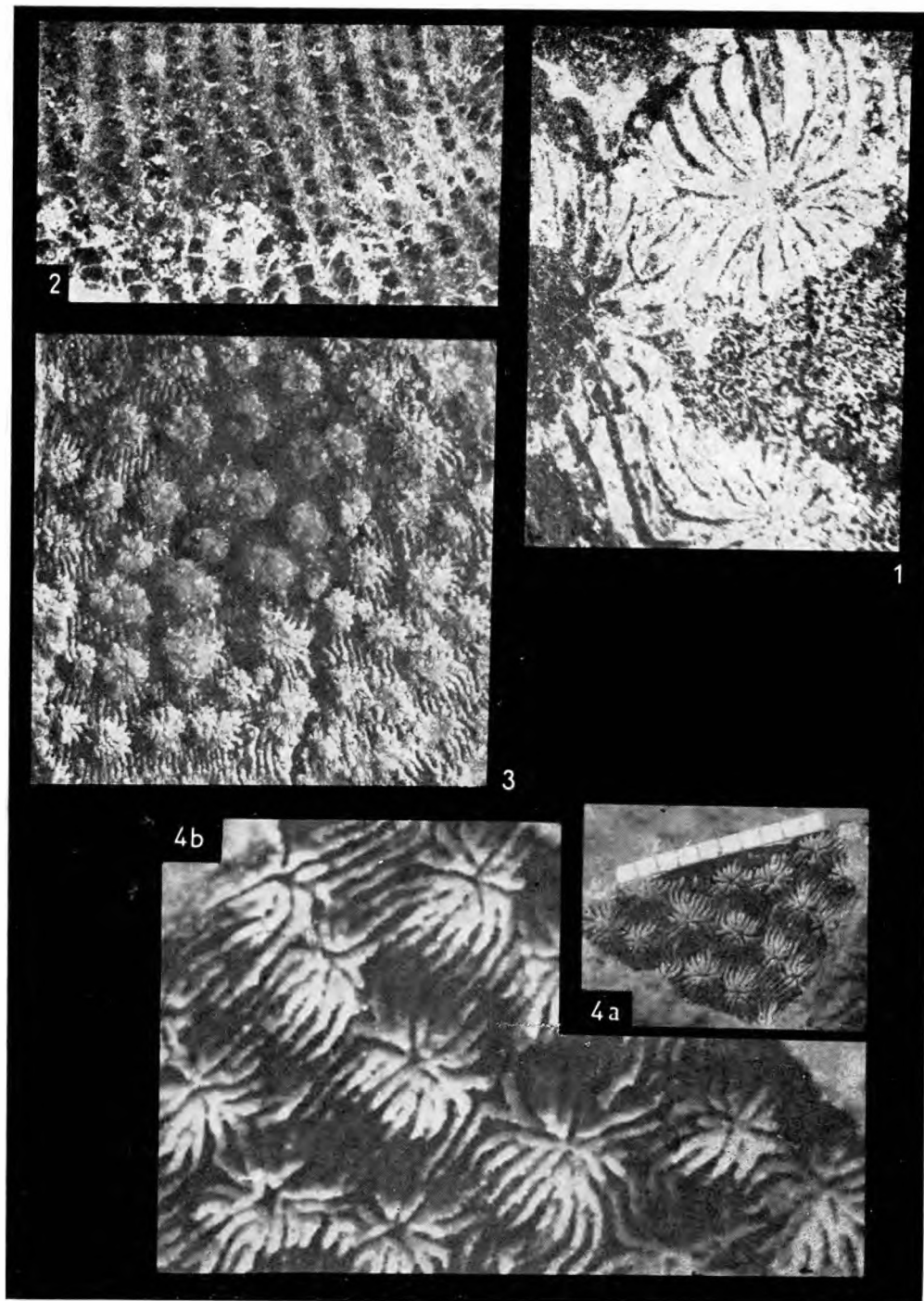


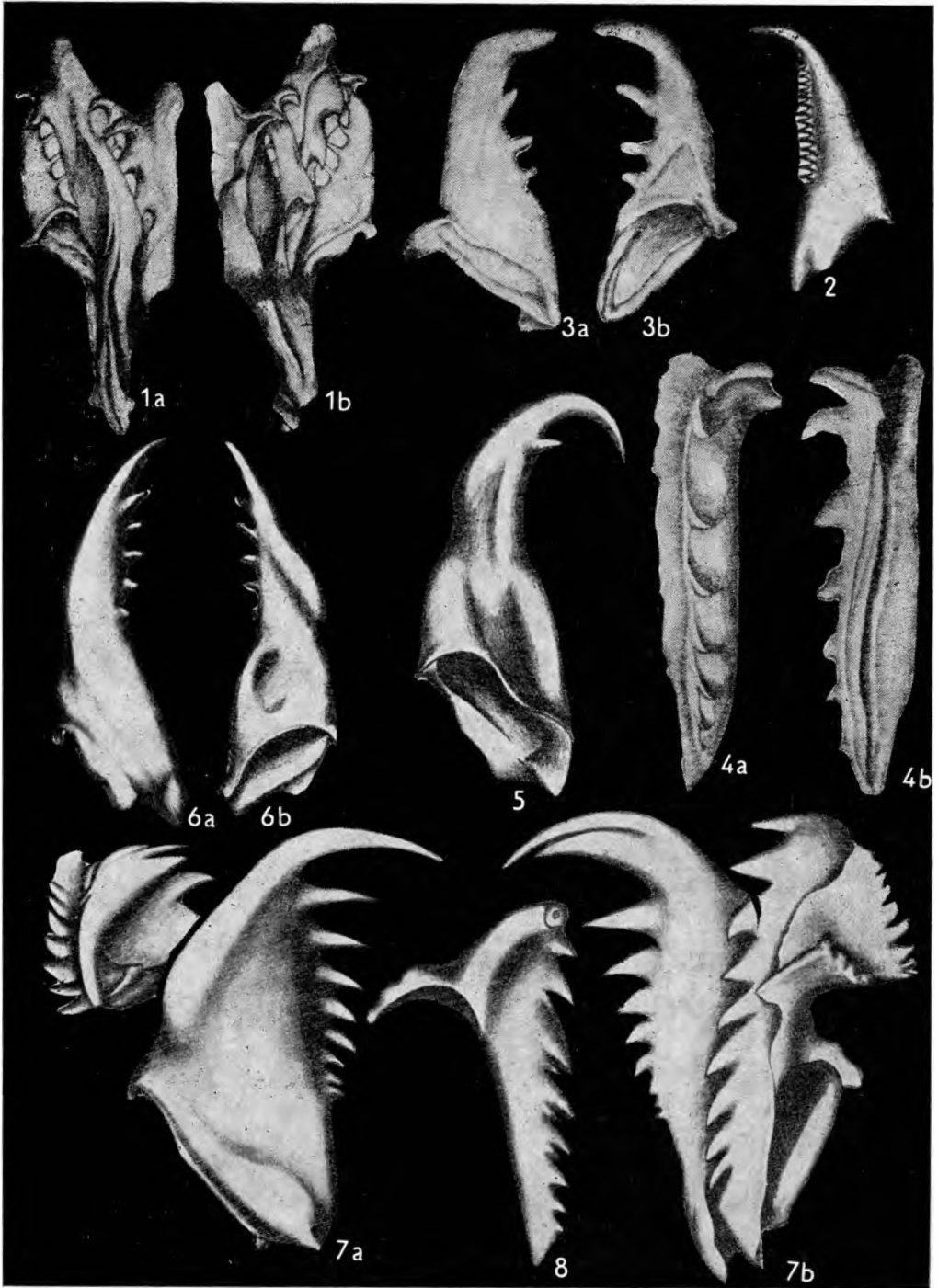
Geology of Poland. V. III, part 2a — Triassic

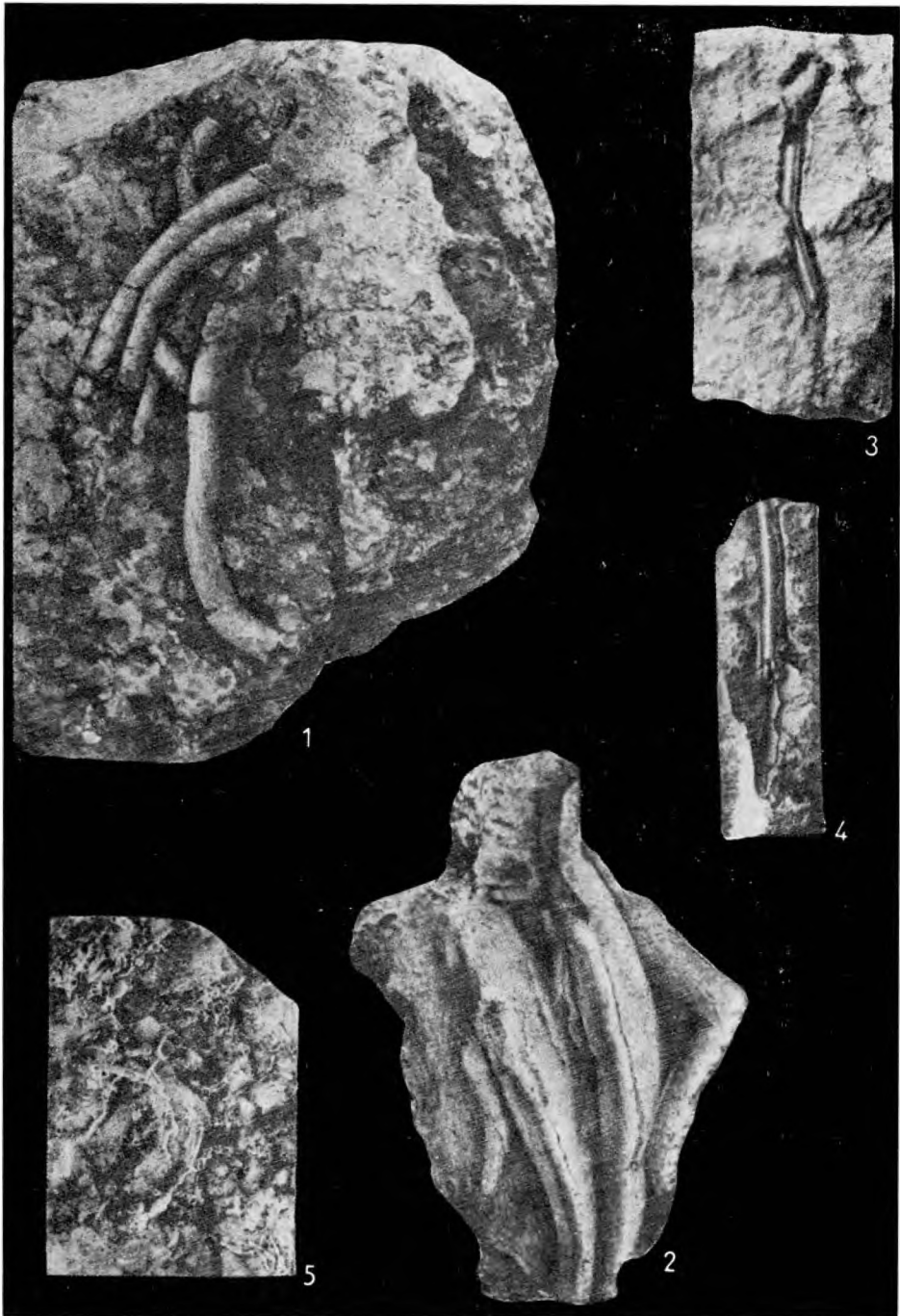


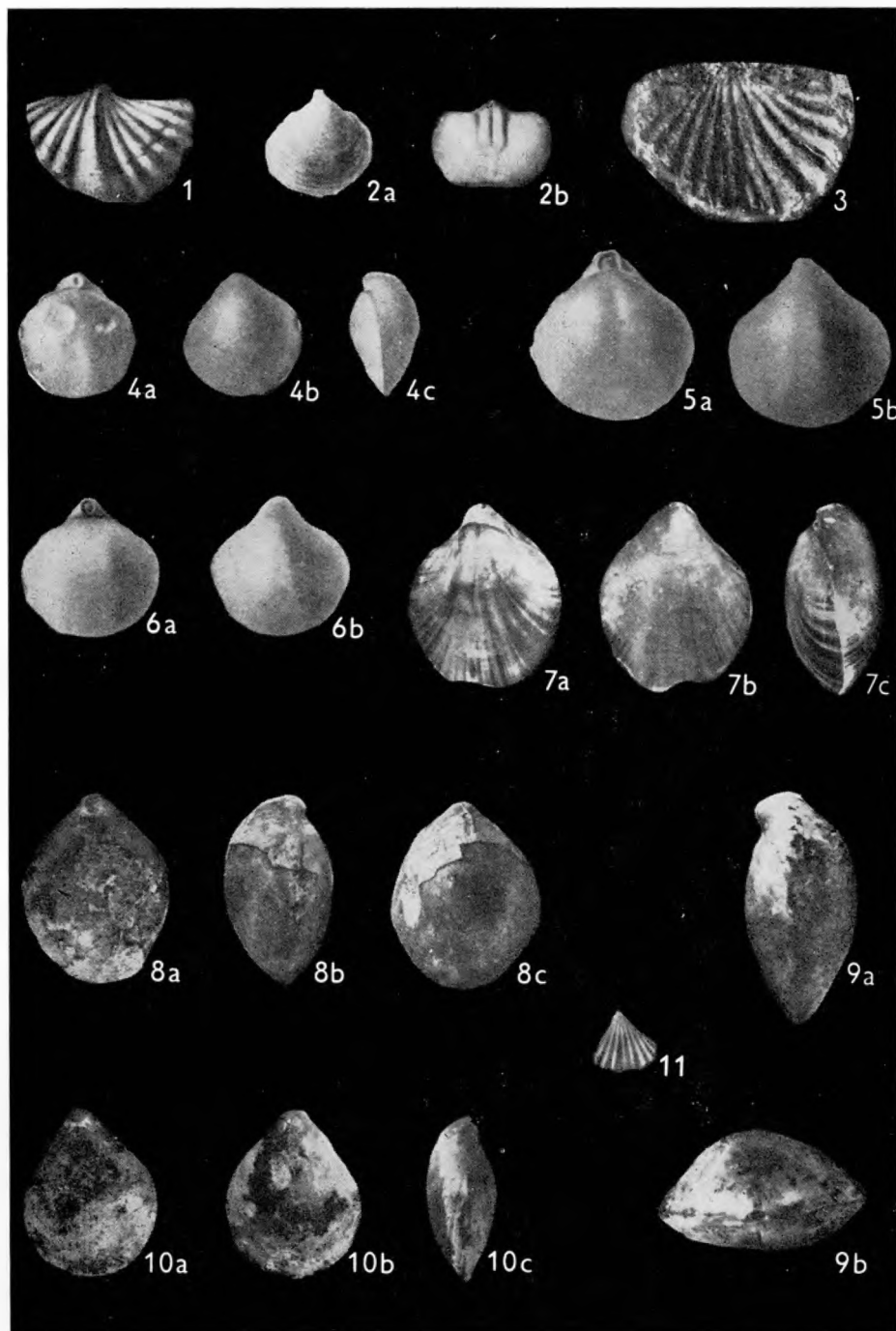


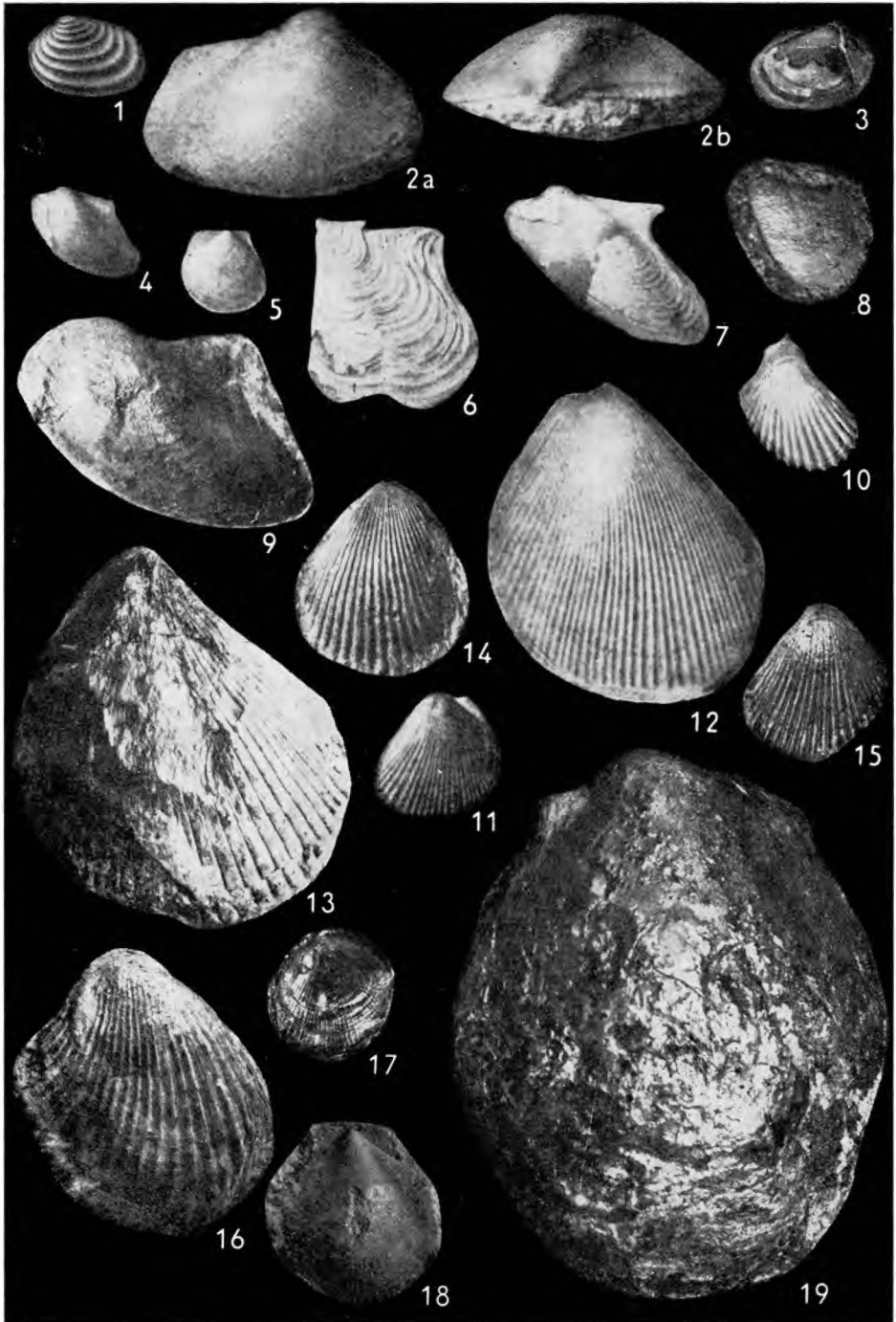




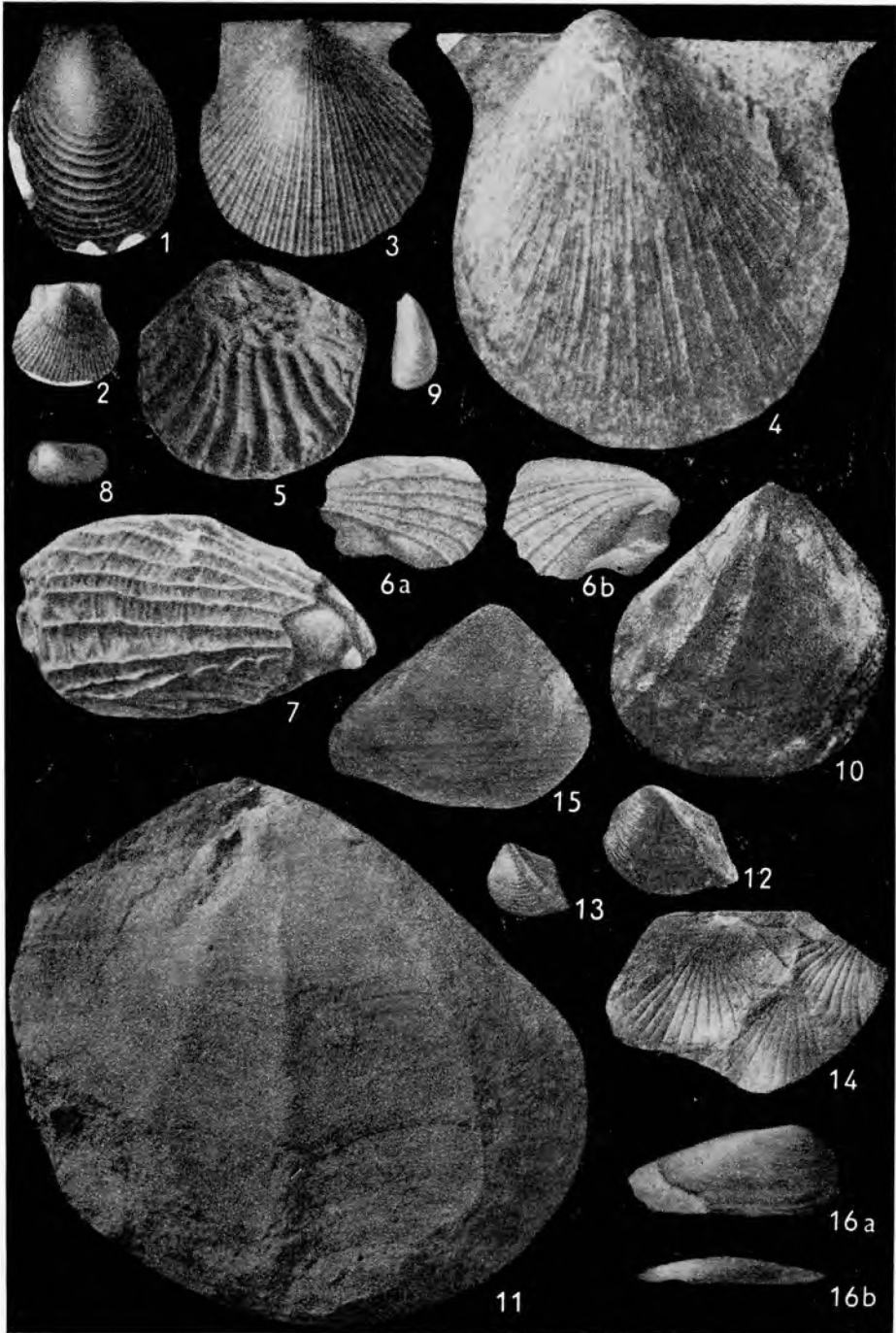




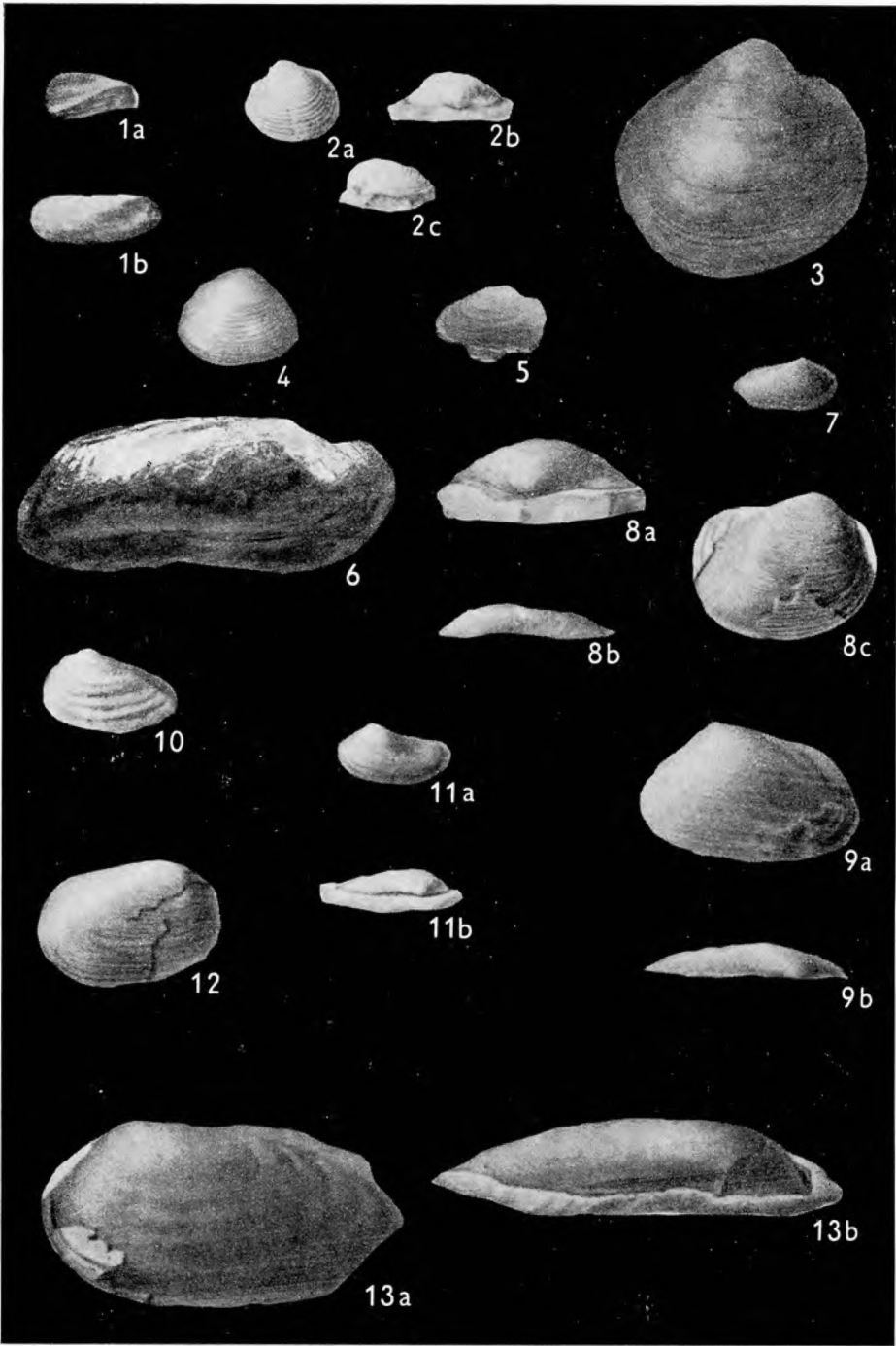


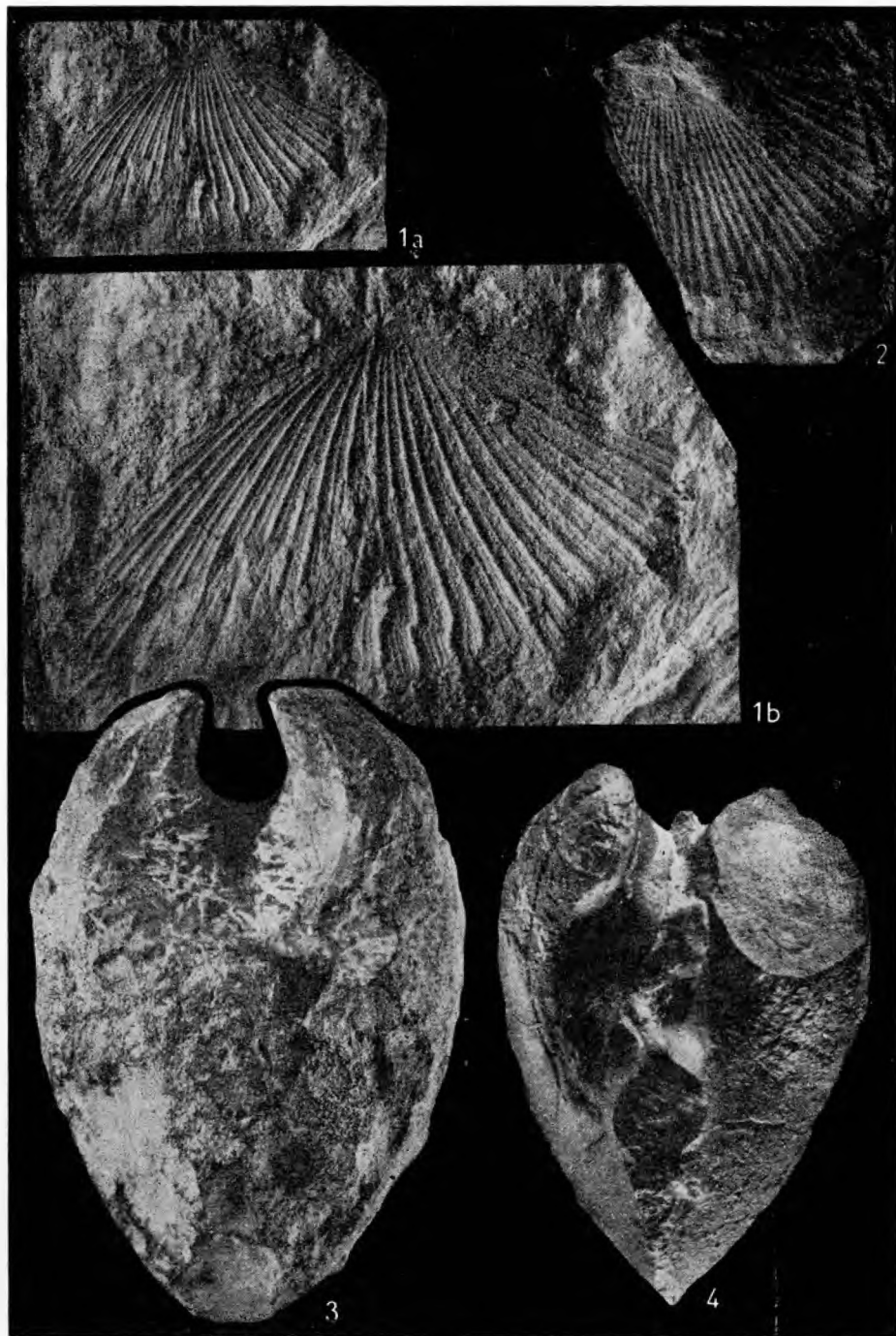


Geology of Poland. V. III, part 2a — Triassic

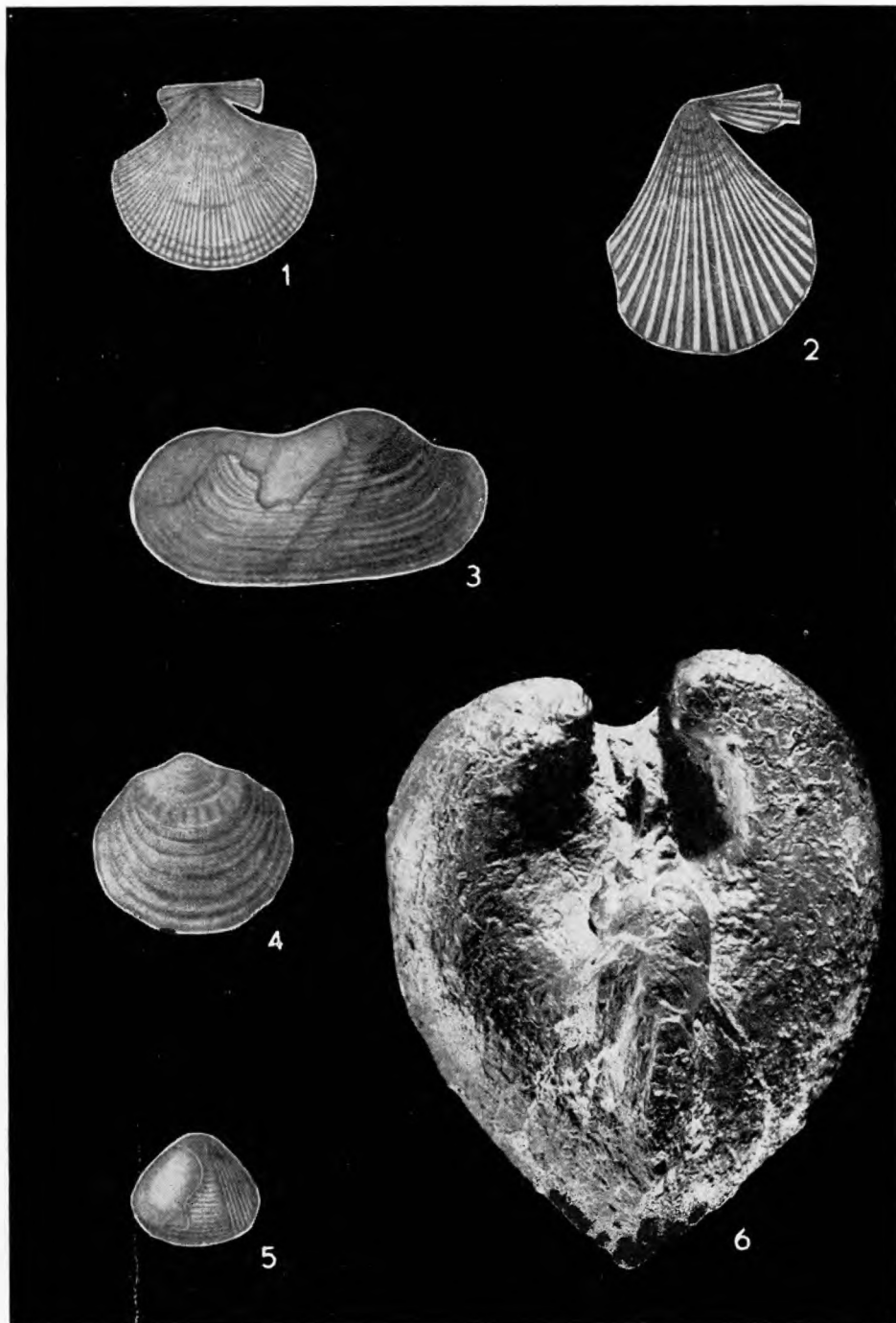


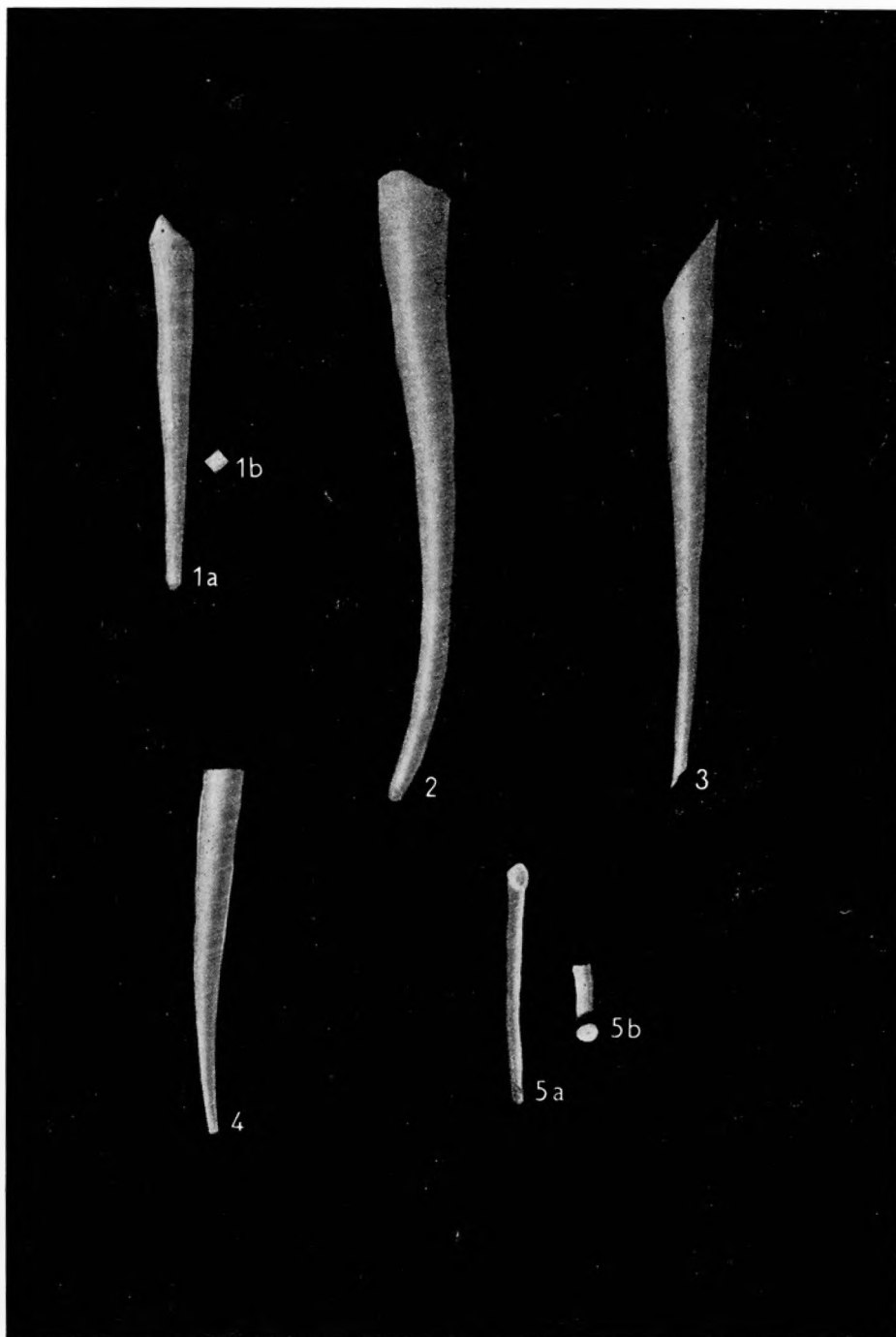
Geology of Poland. V. III, part 2a — Triassic

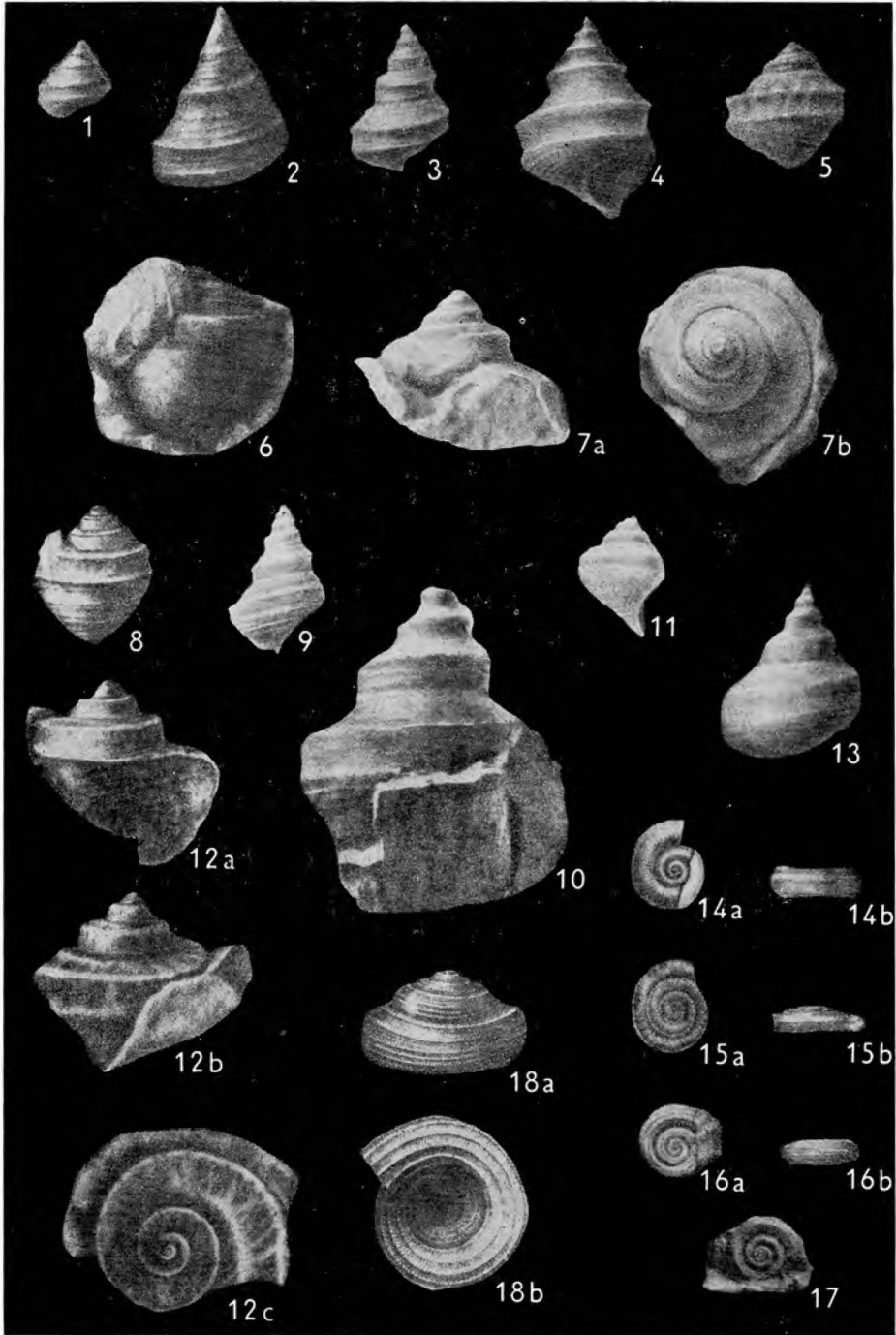


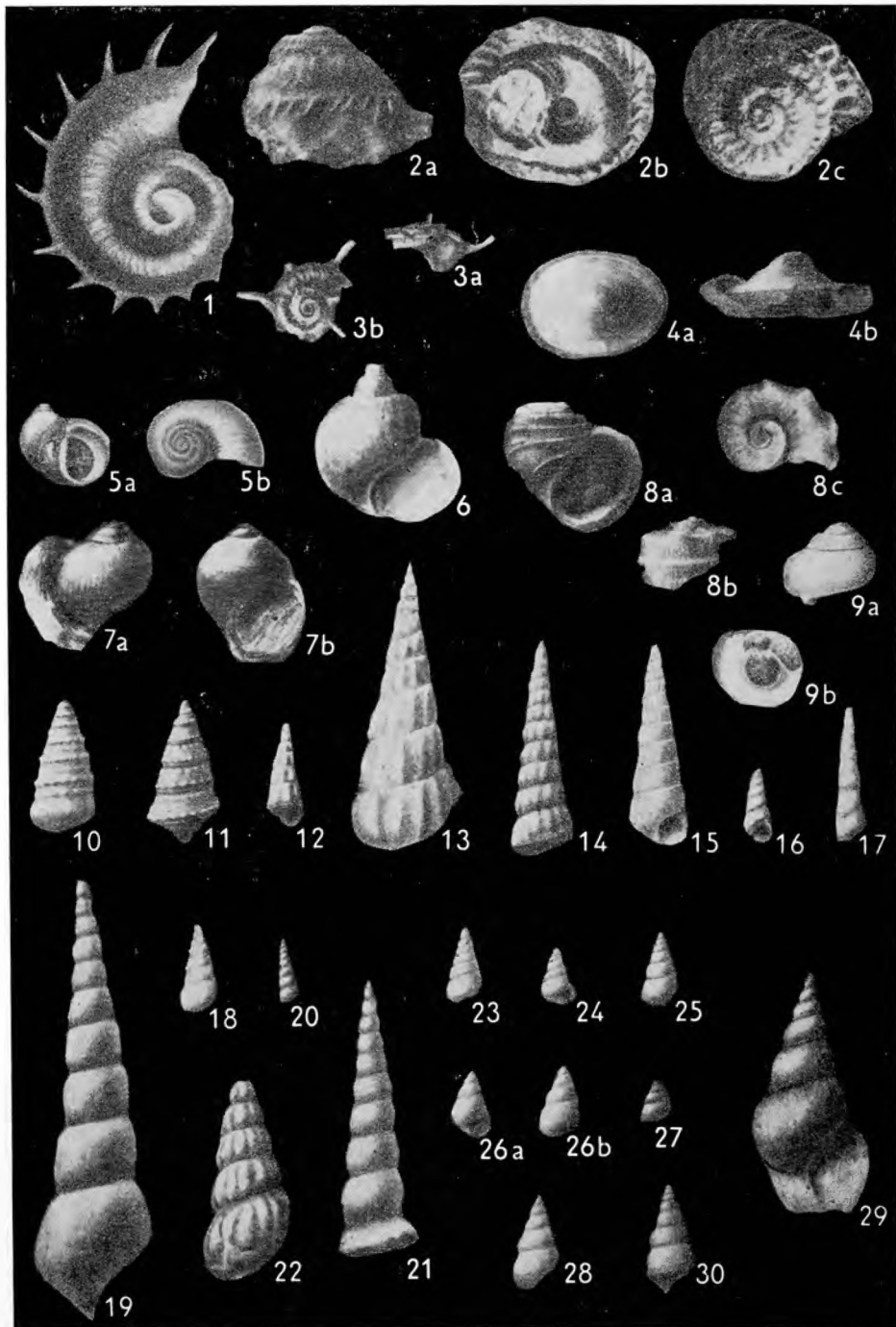


Geology of Poland. V. III, part 2a — Triassic

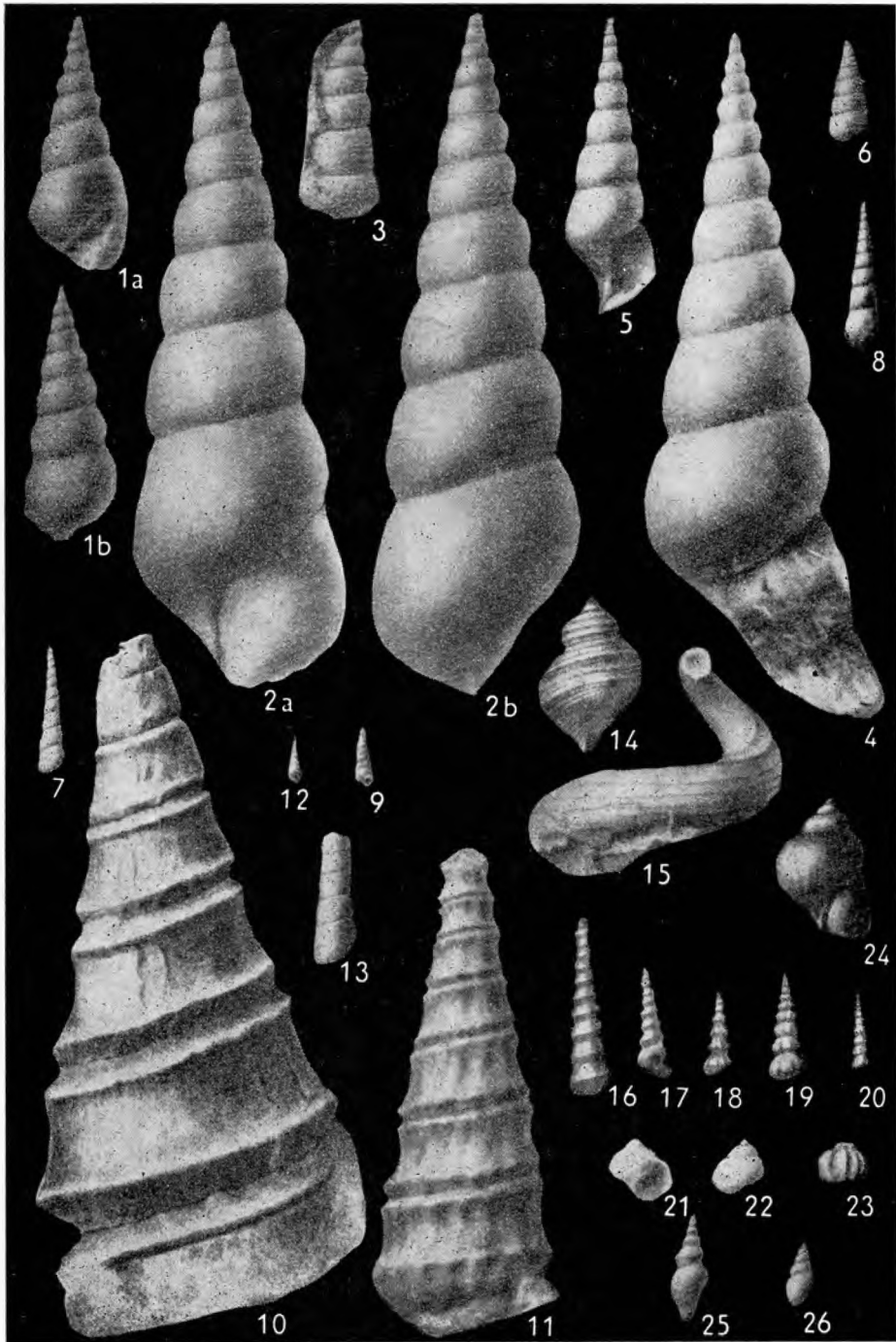




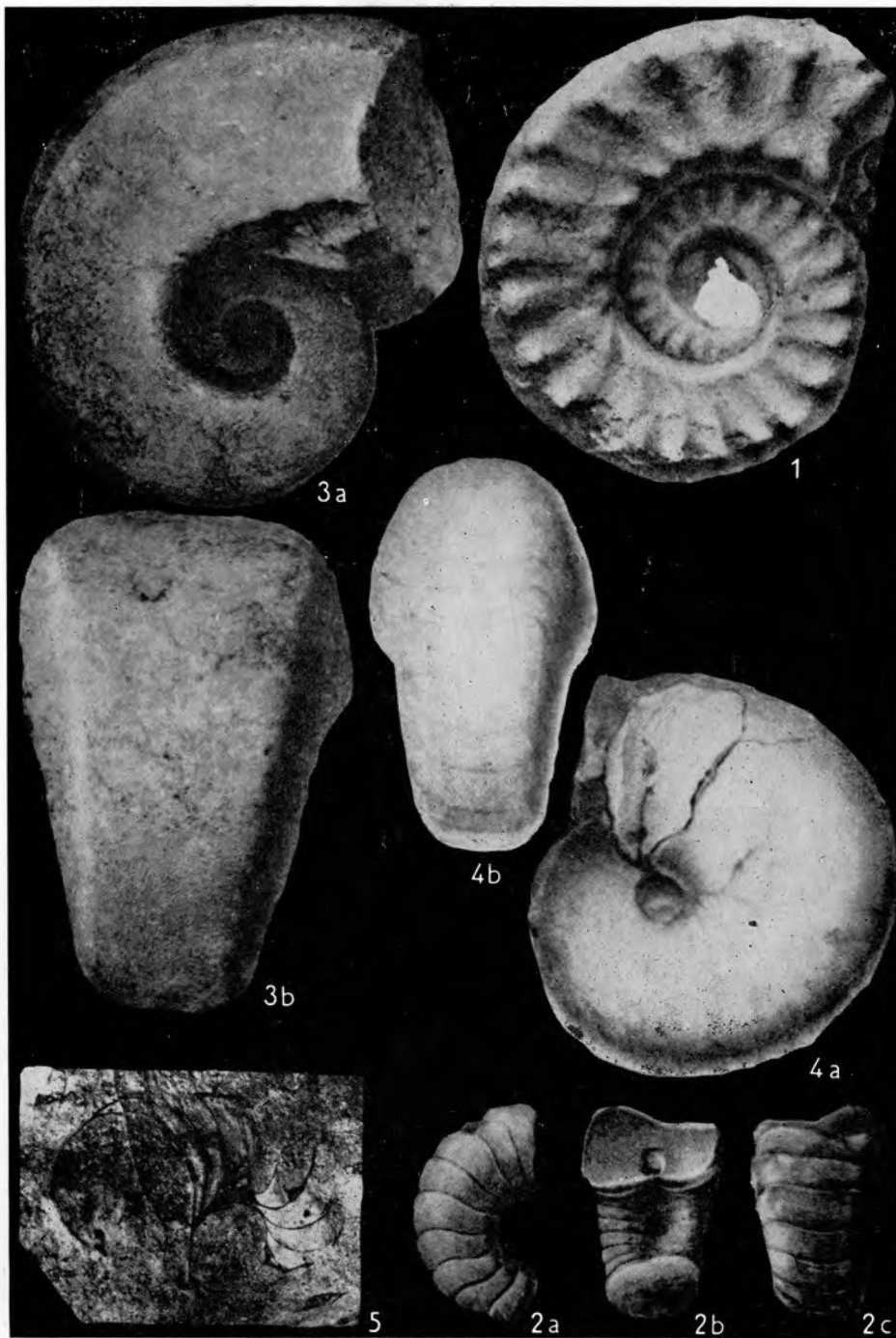


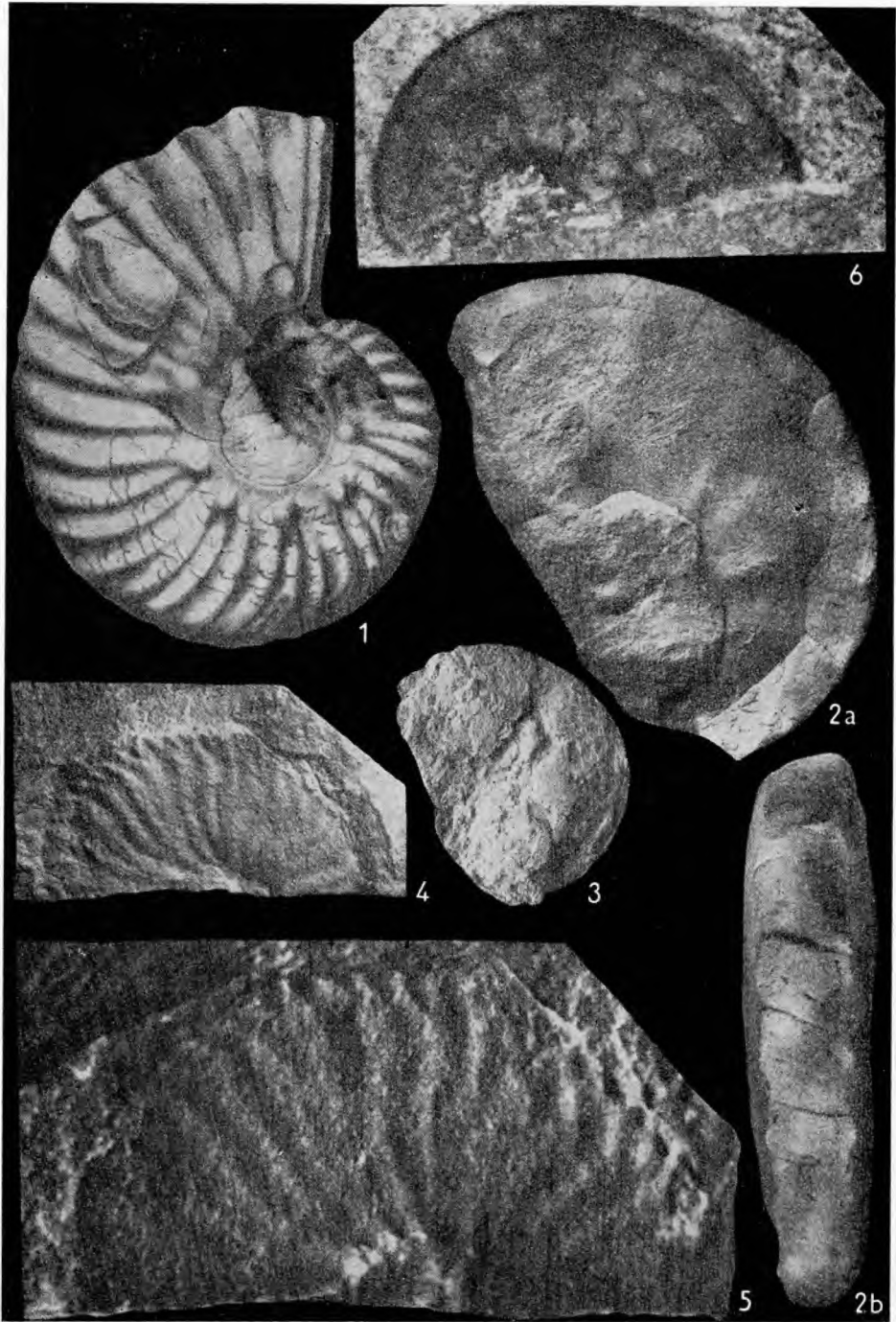


Geology of Poland. V. III, part 2a — Triassic

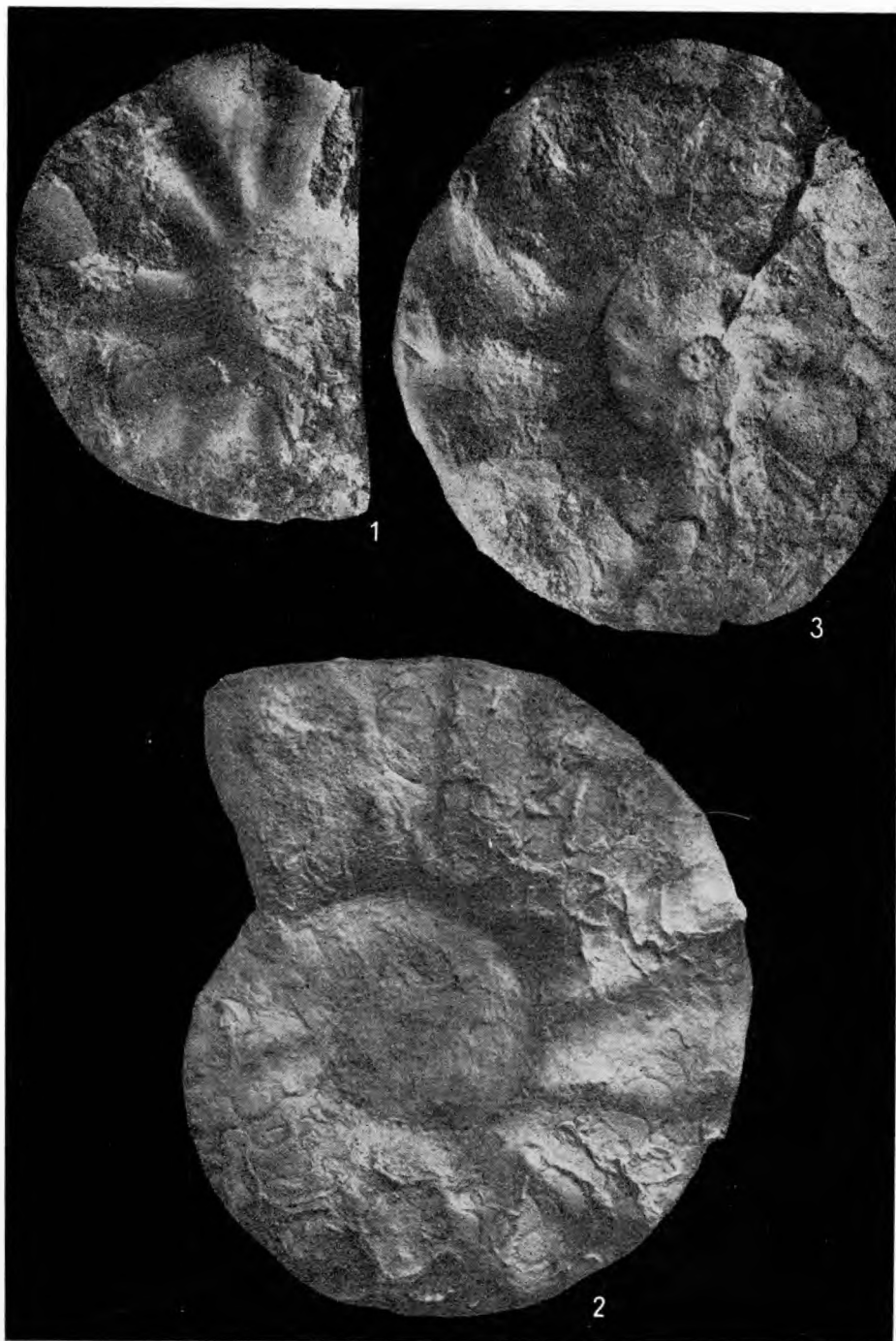


Geology of Poland. V. III, part 2a — Triassic

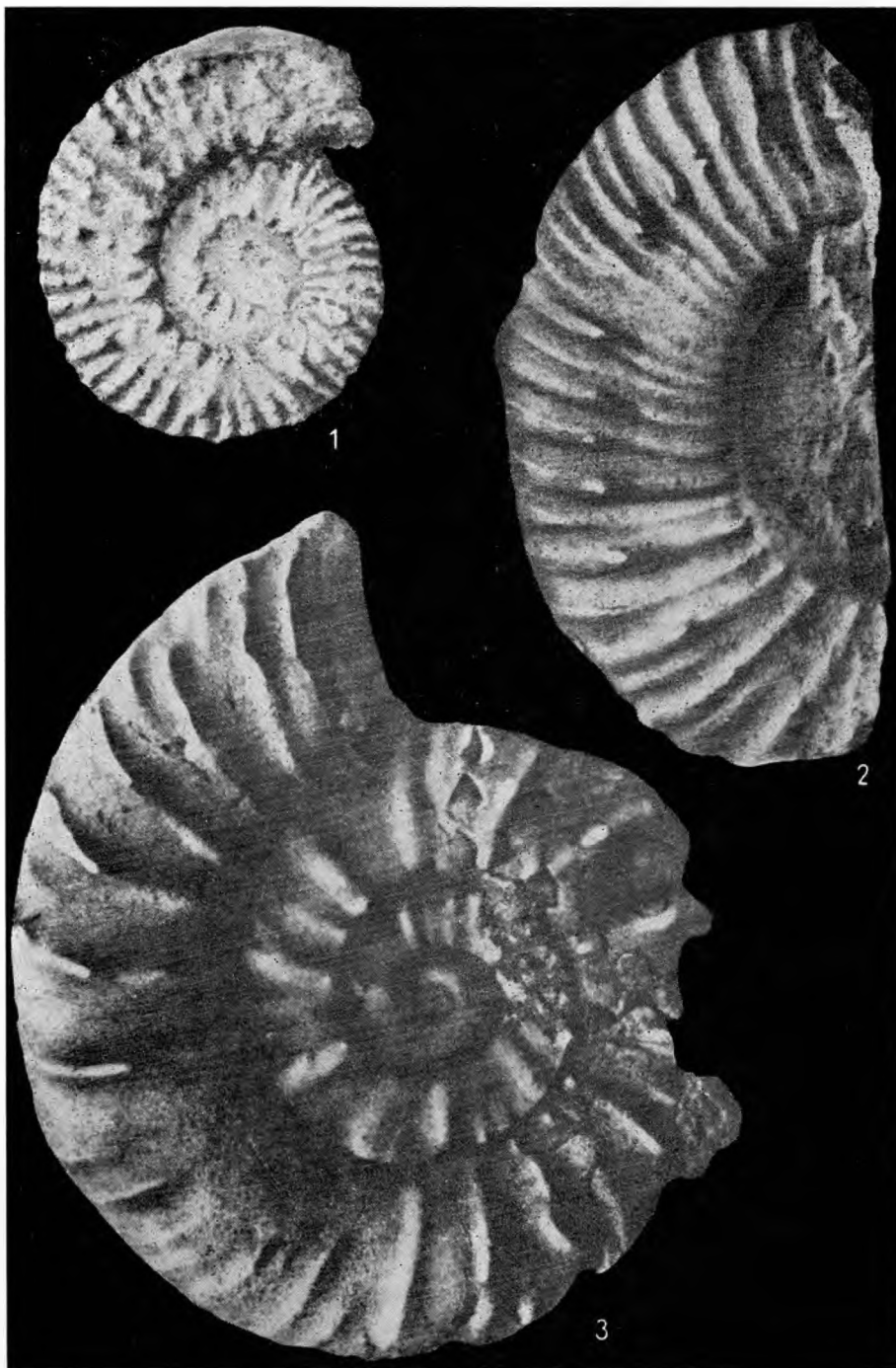




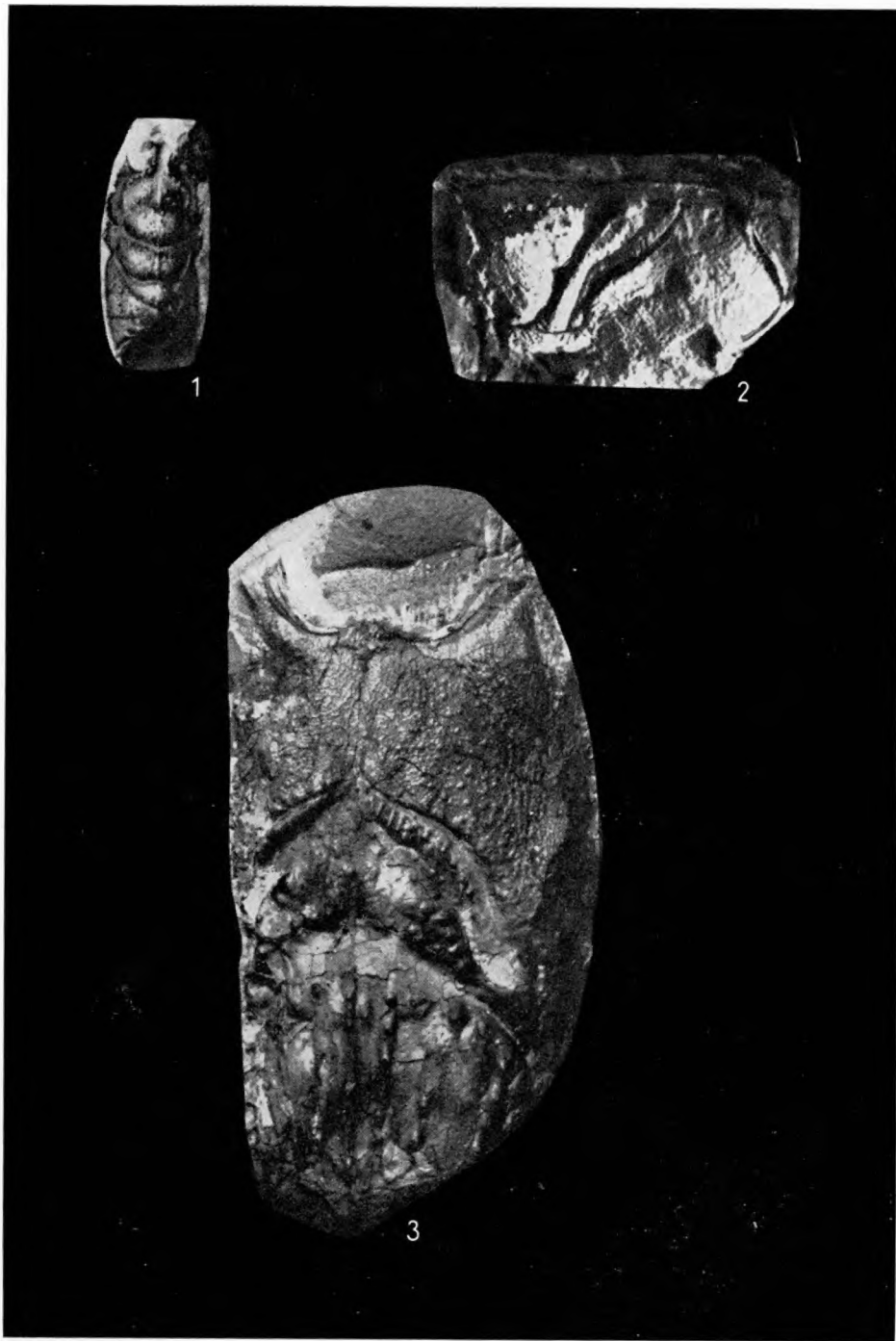
Geology of Poland. V. III, part 2a — Triassic

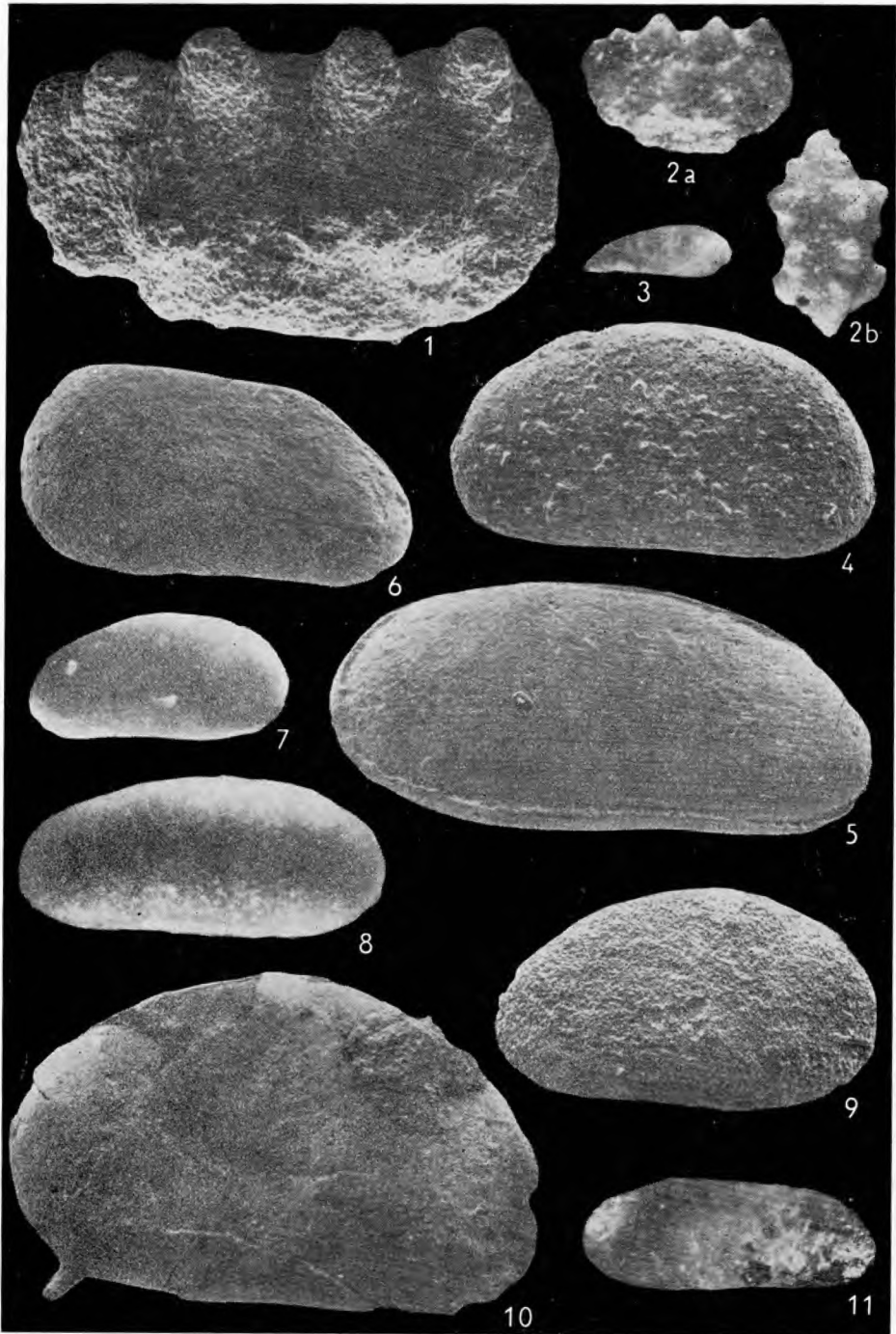


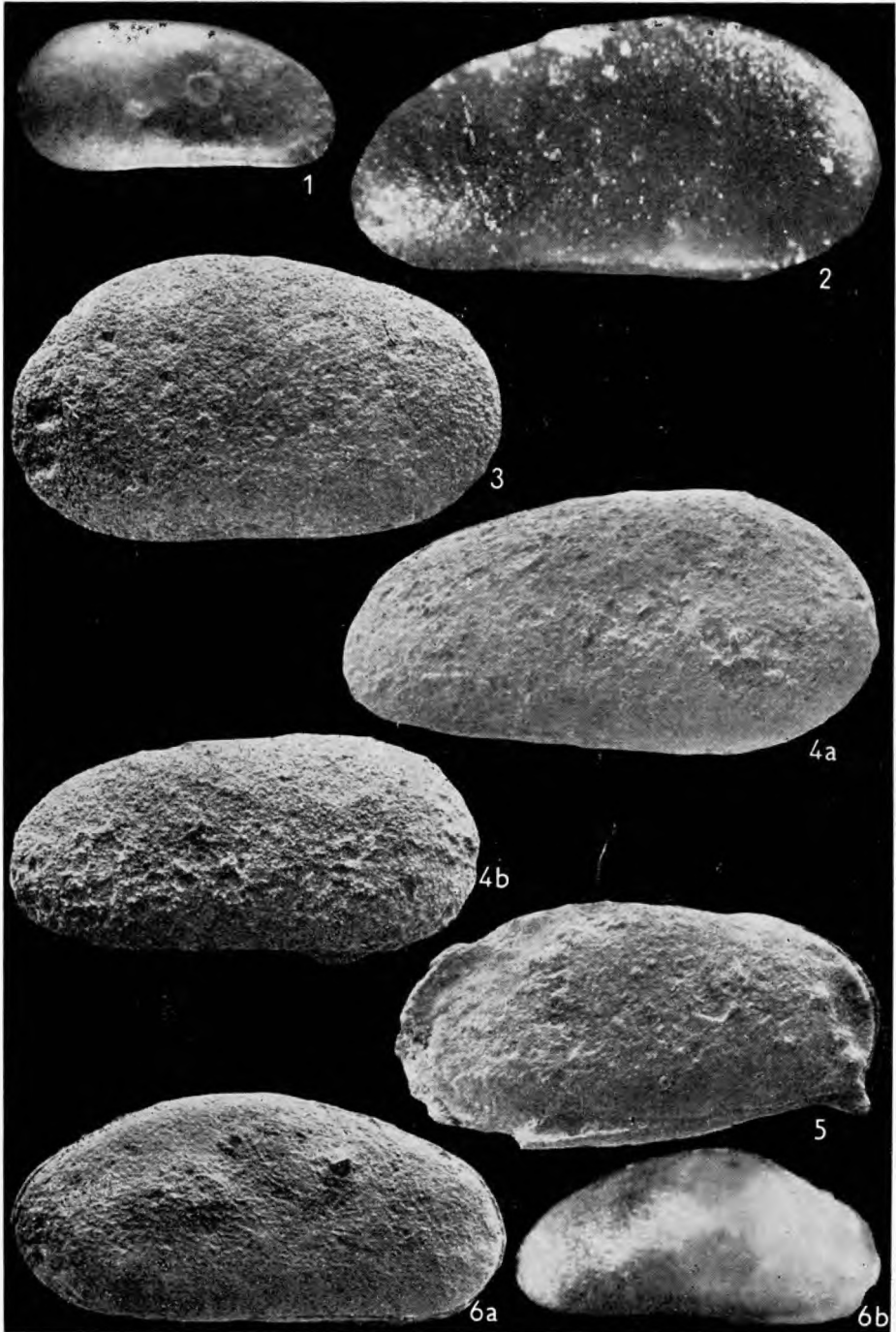


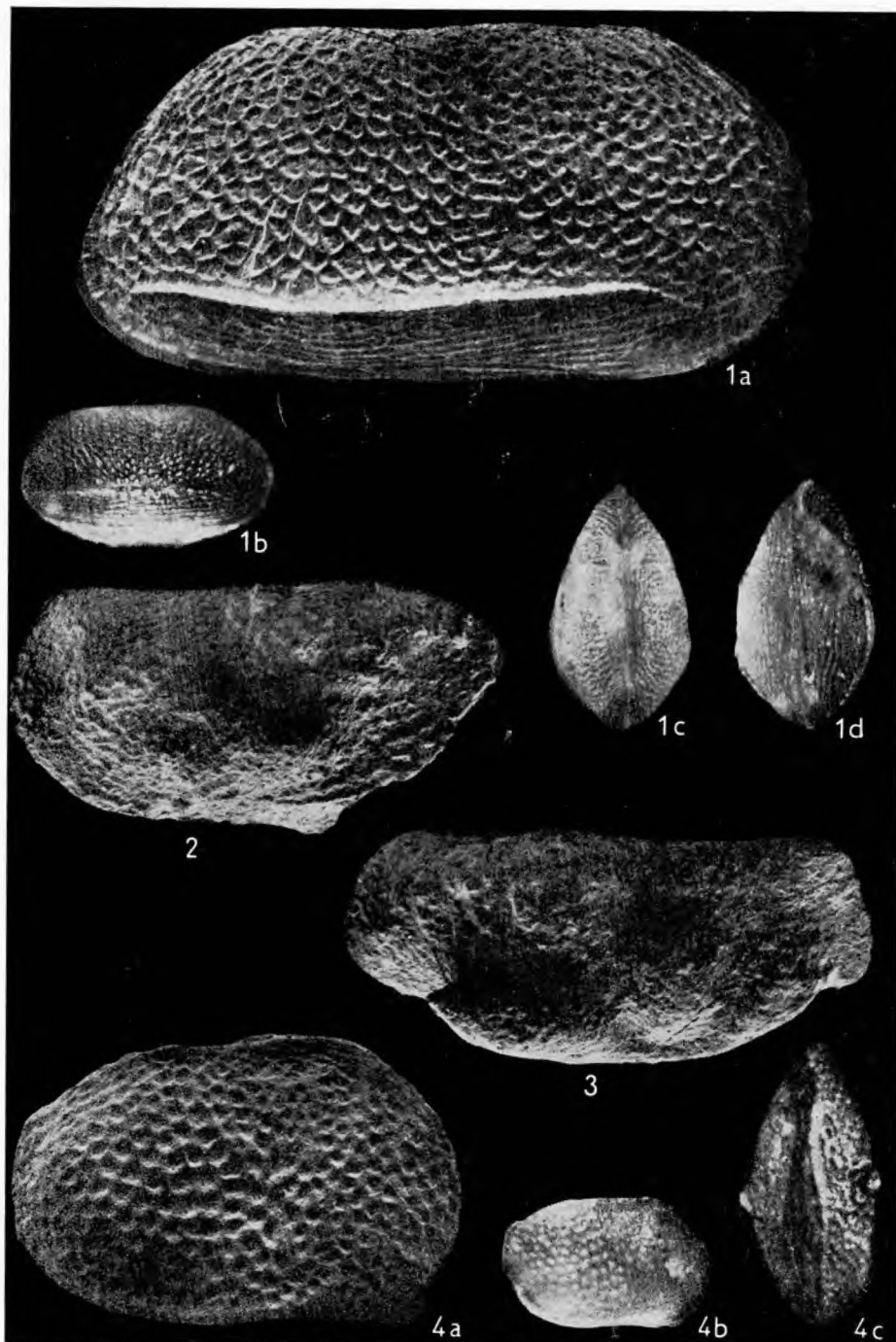




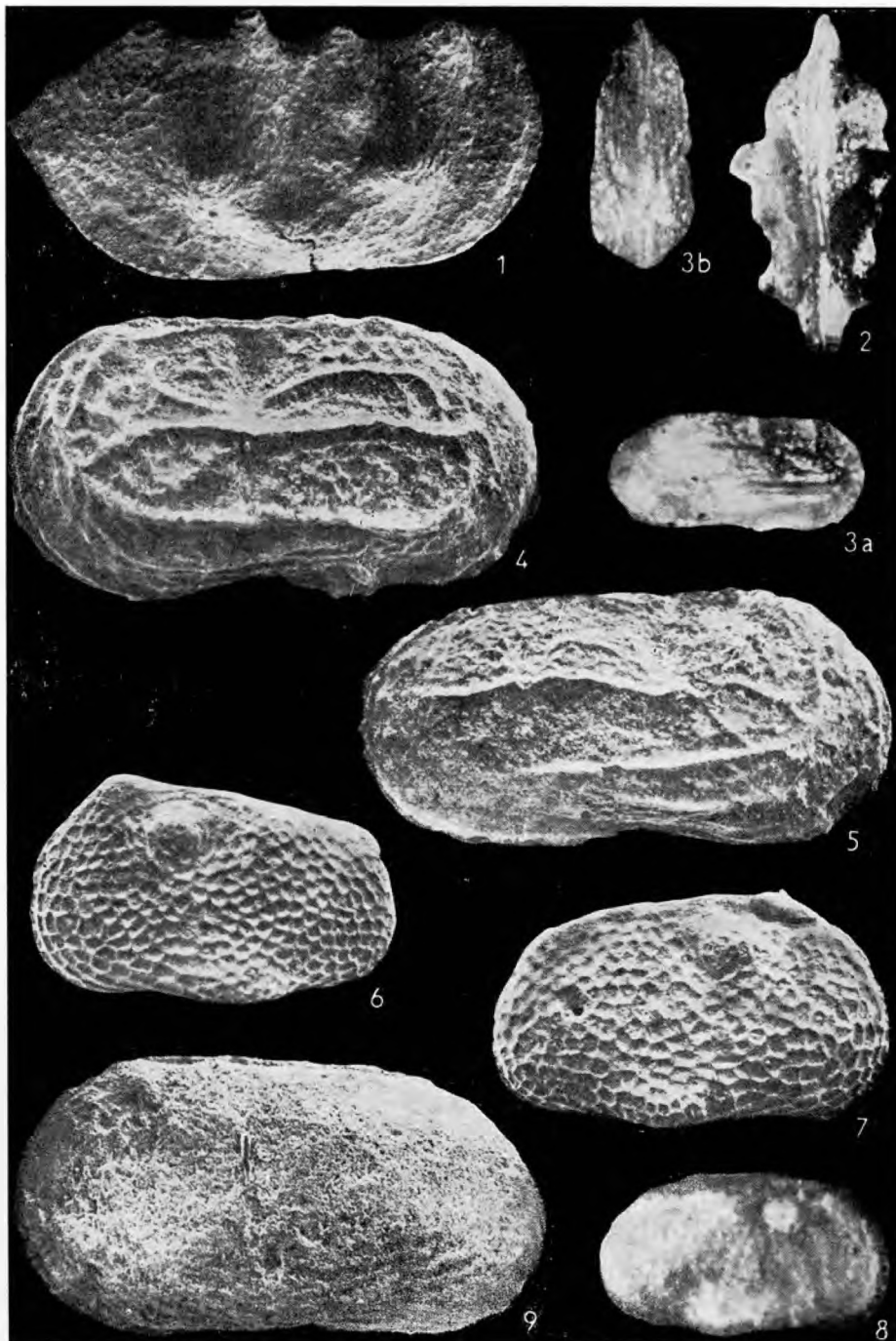


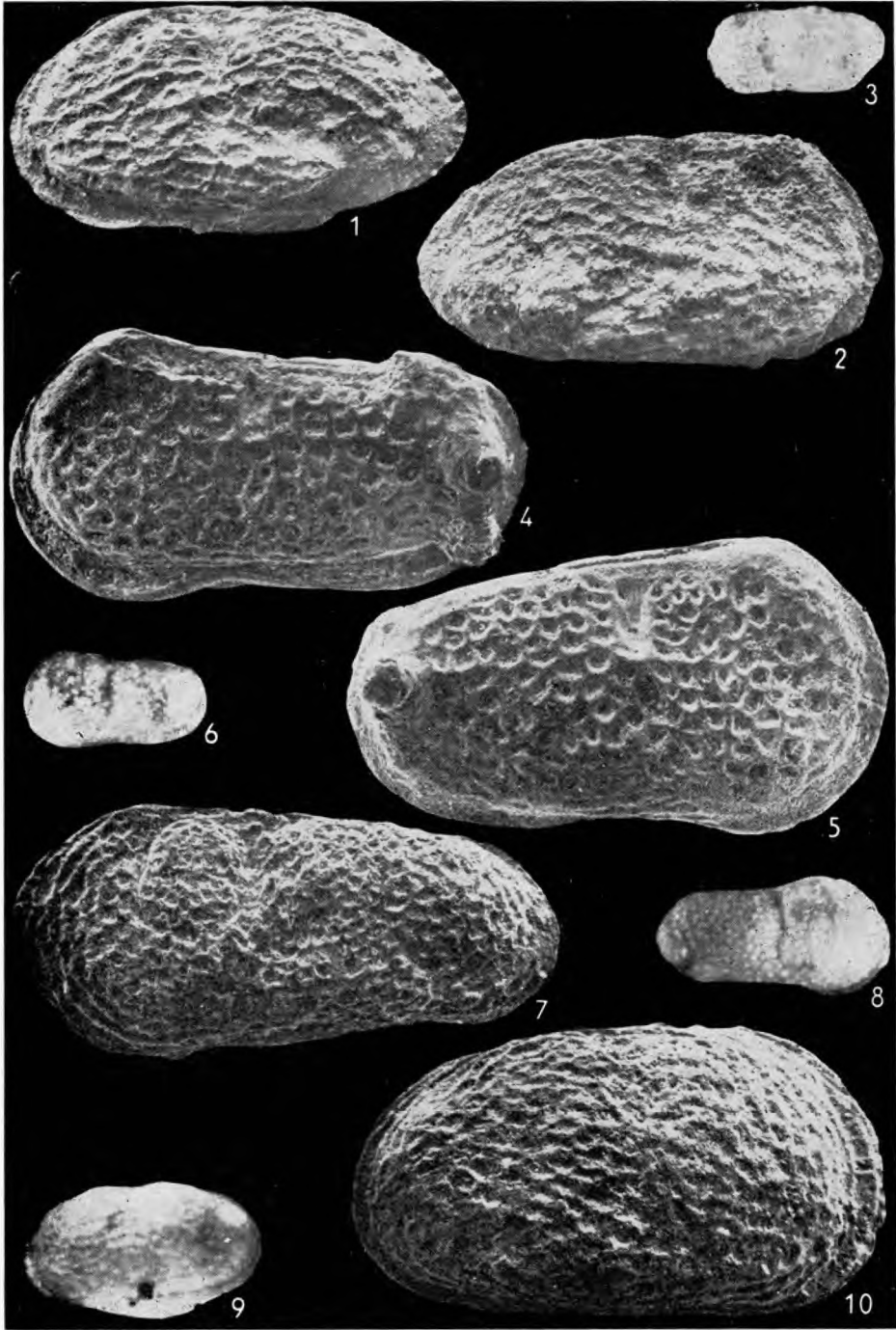




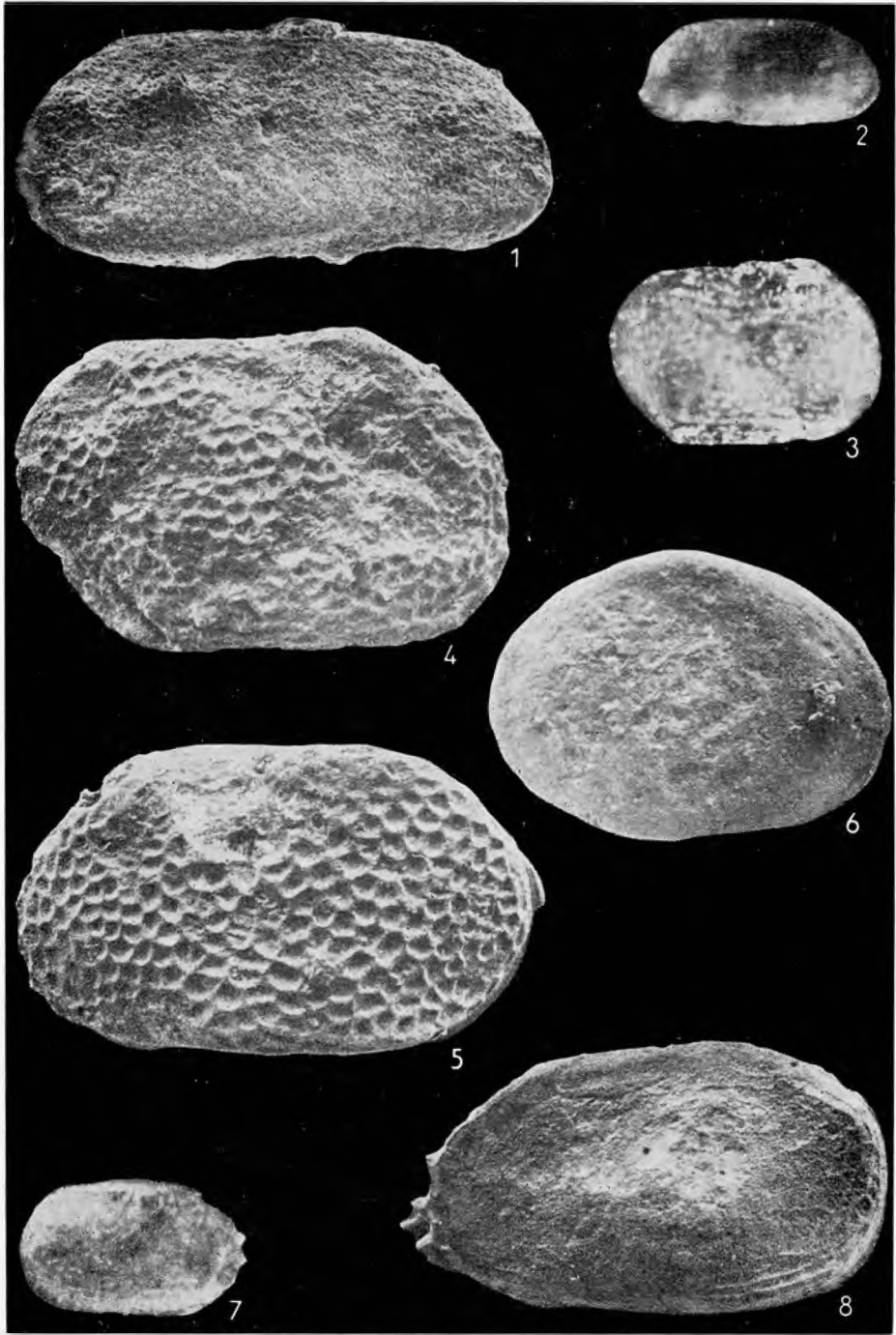


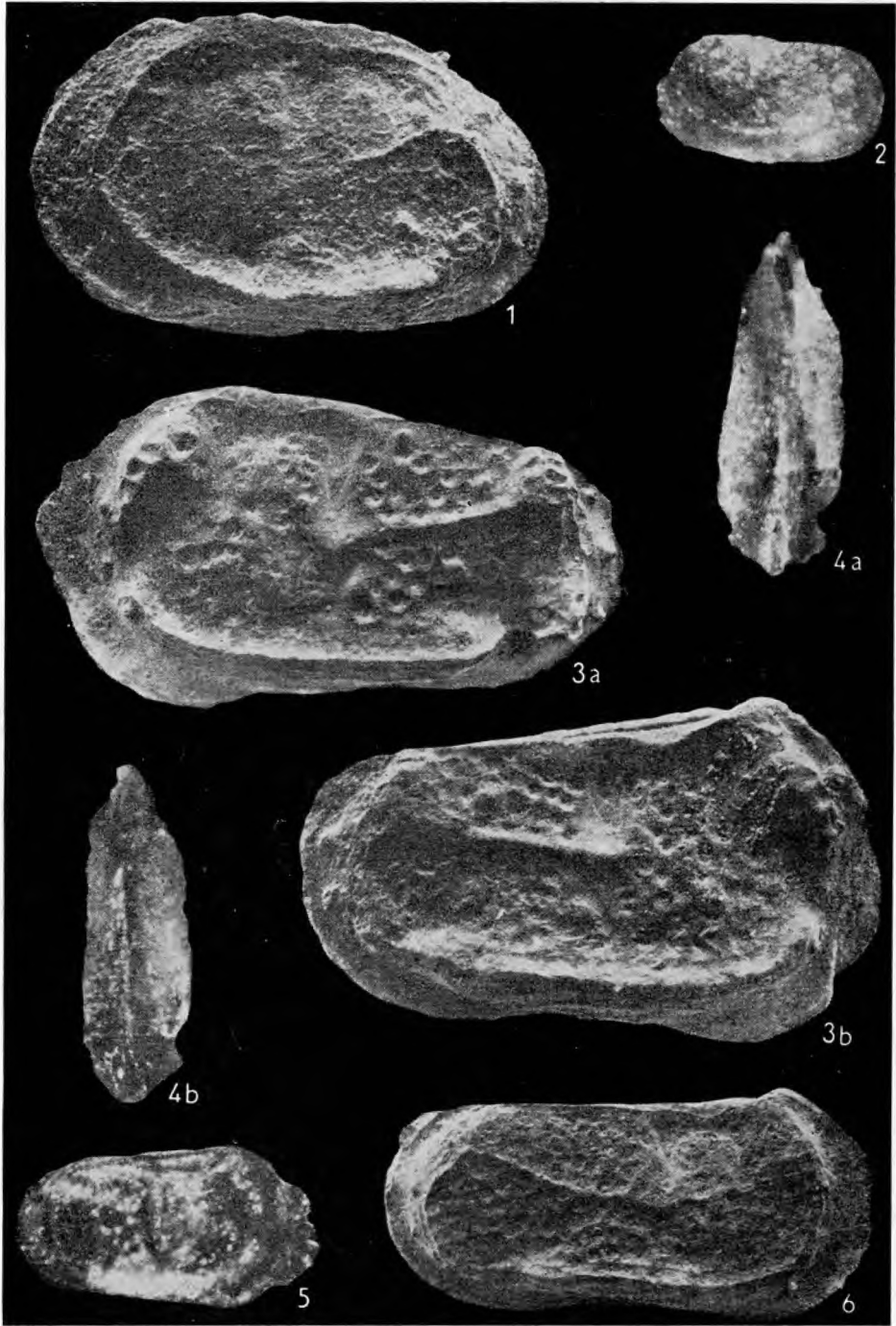
Geology of Poland. V. III, part 2a — Triassic

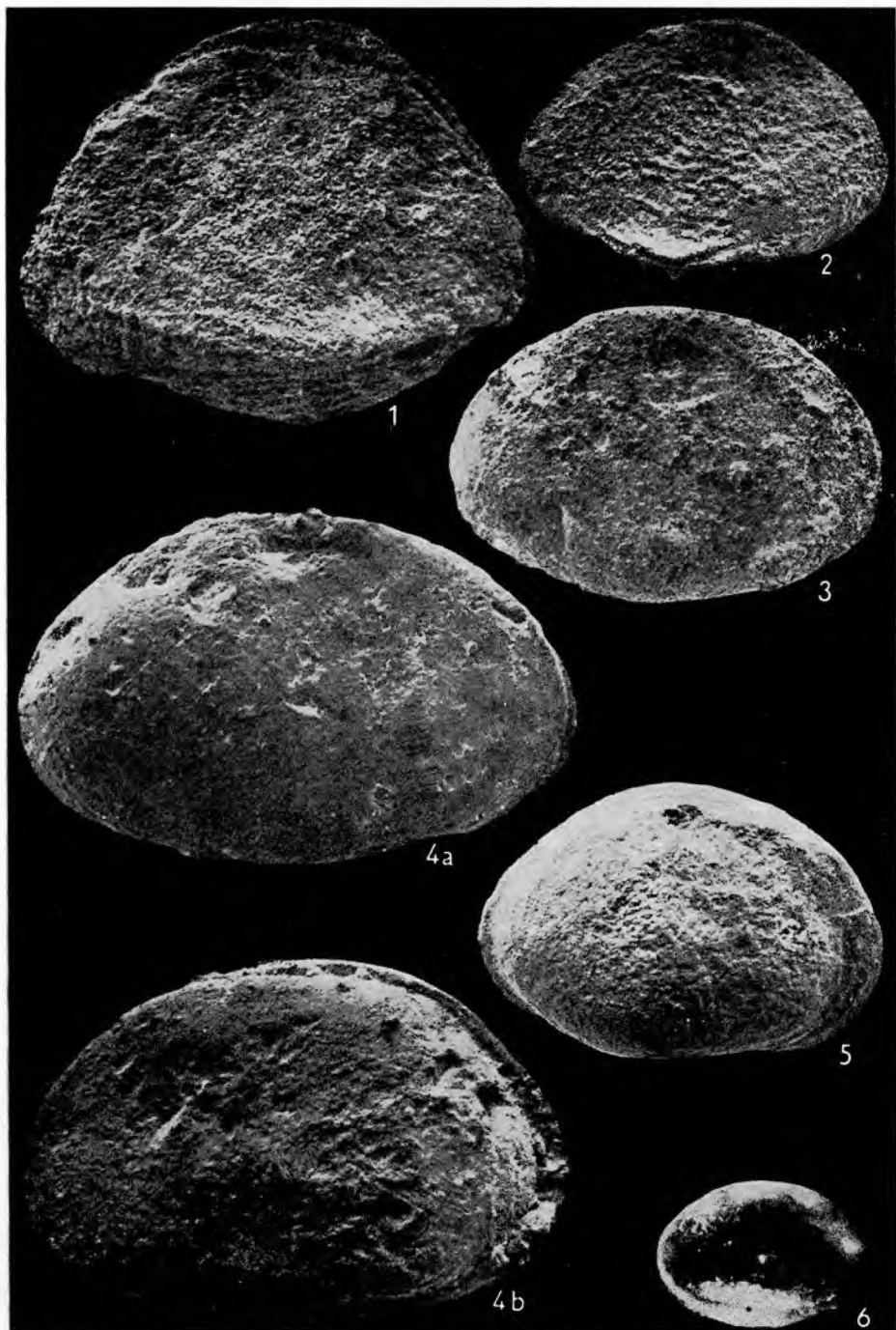


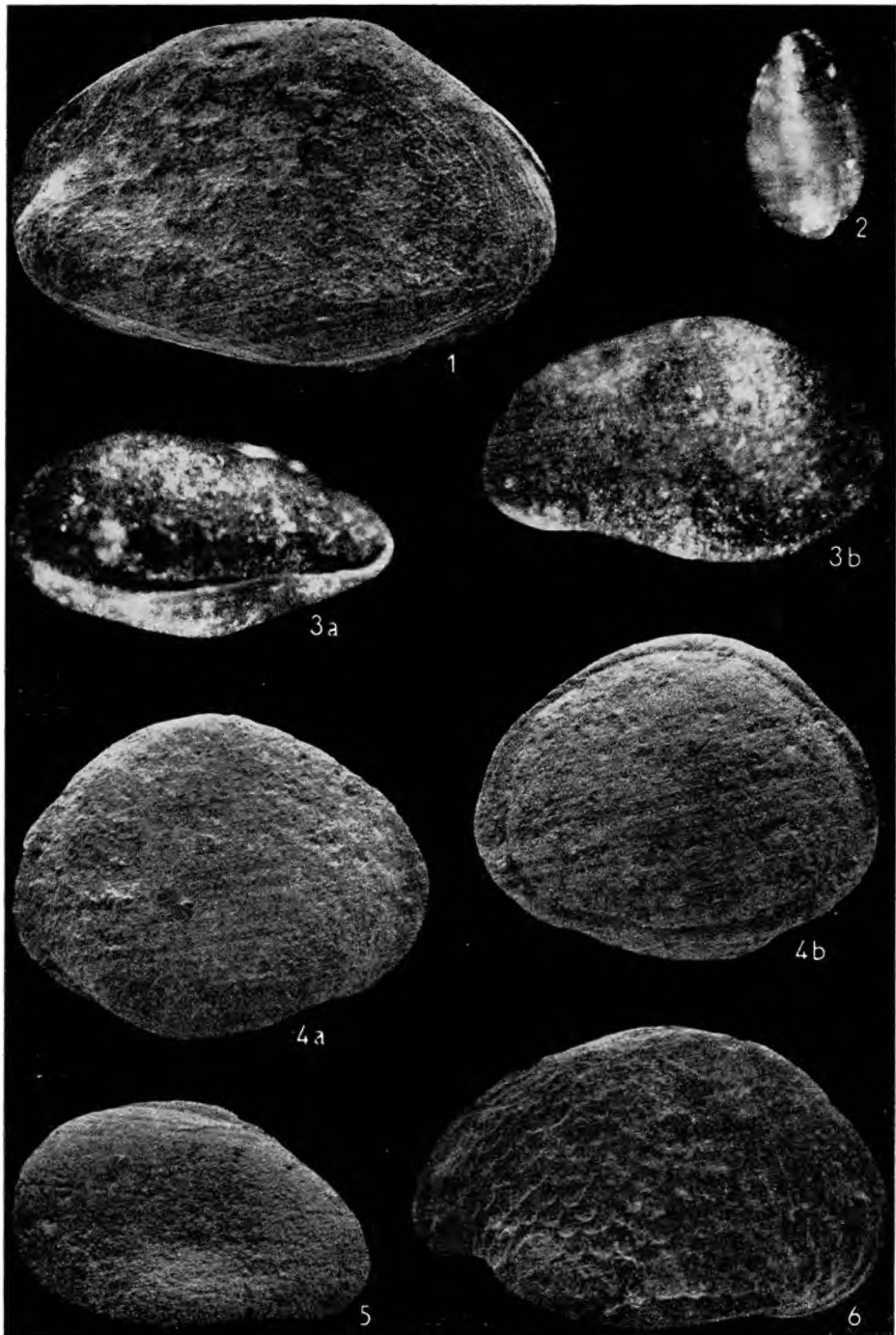


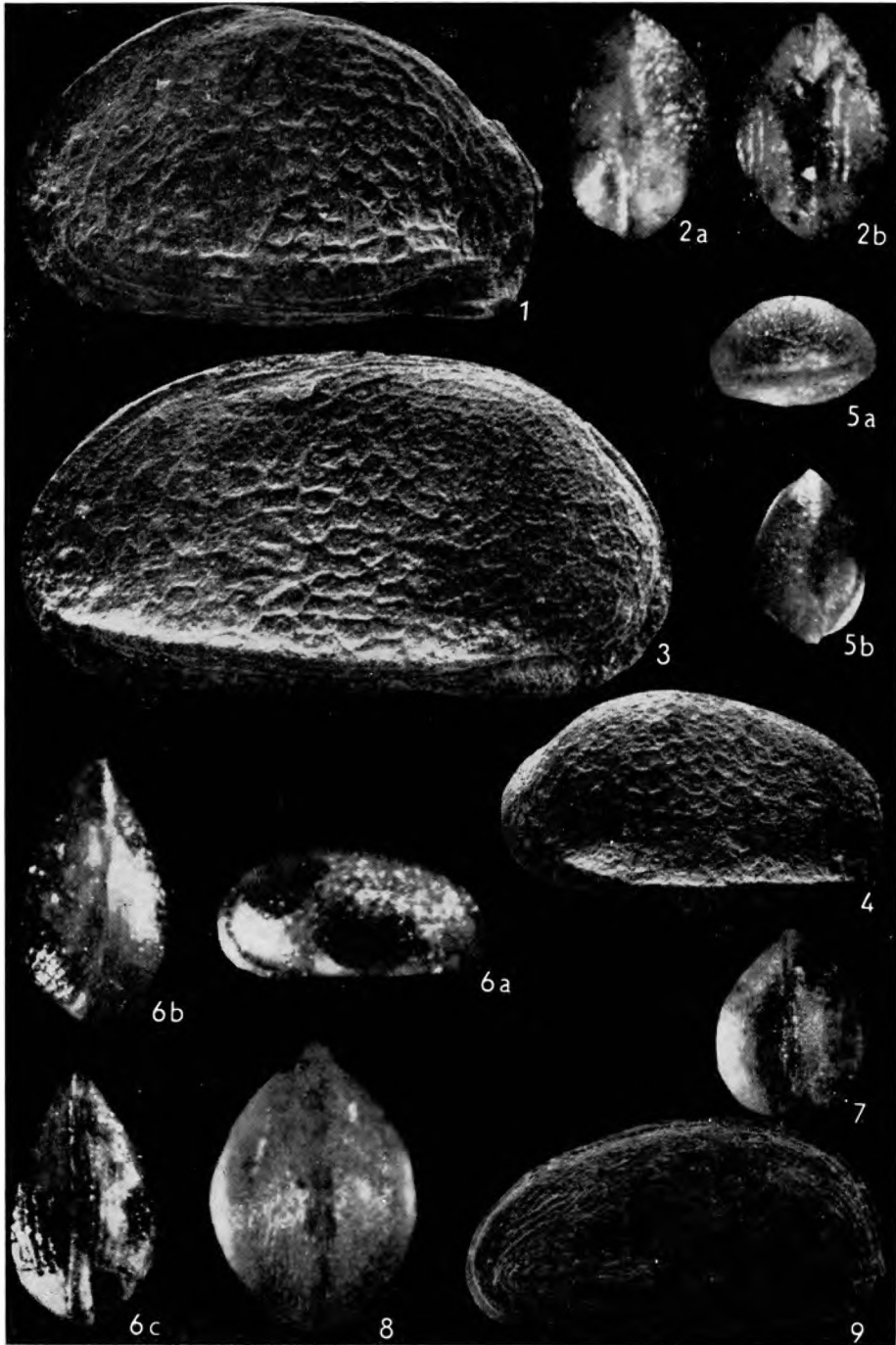
Geology of Poland. V. III, part 2a — Triassic

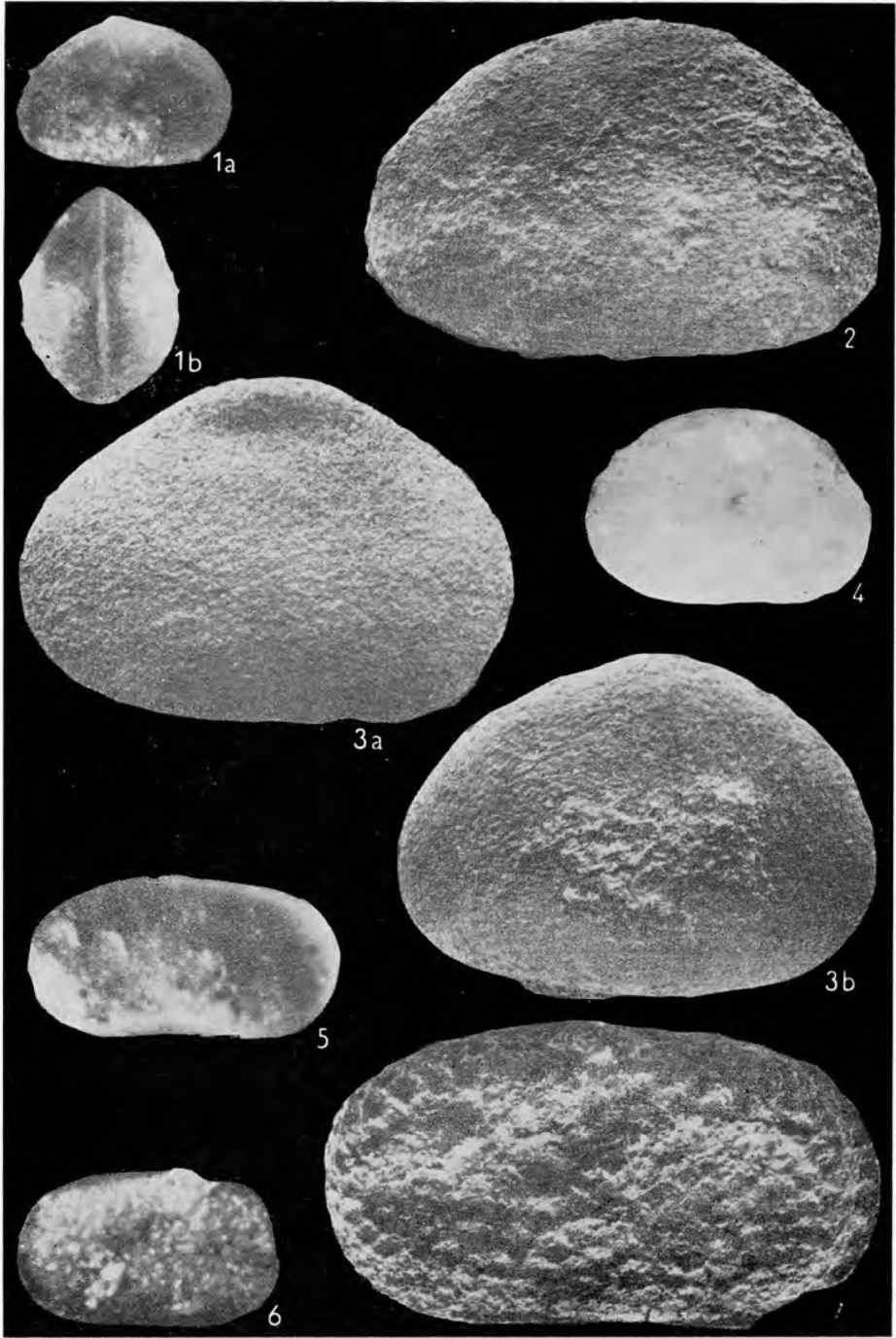




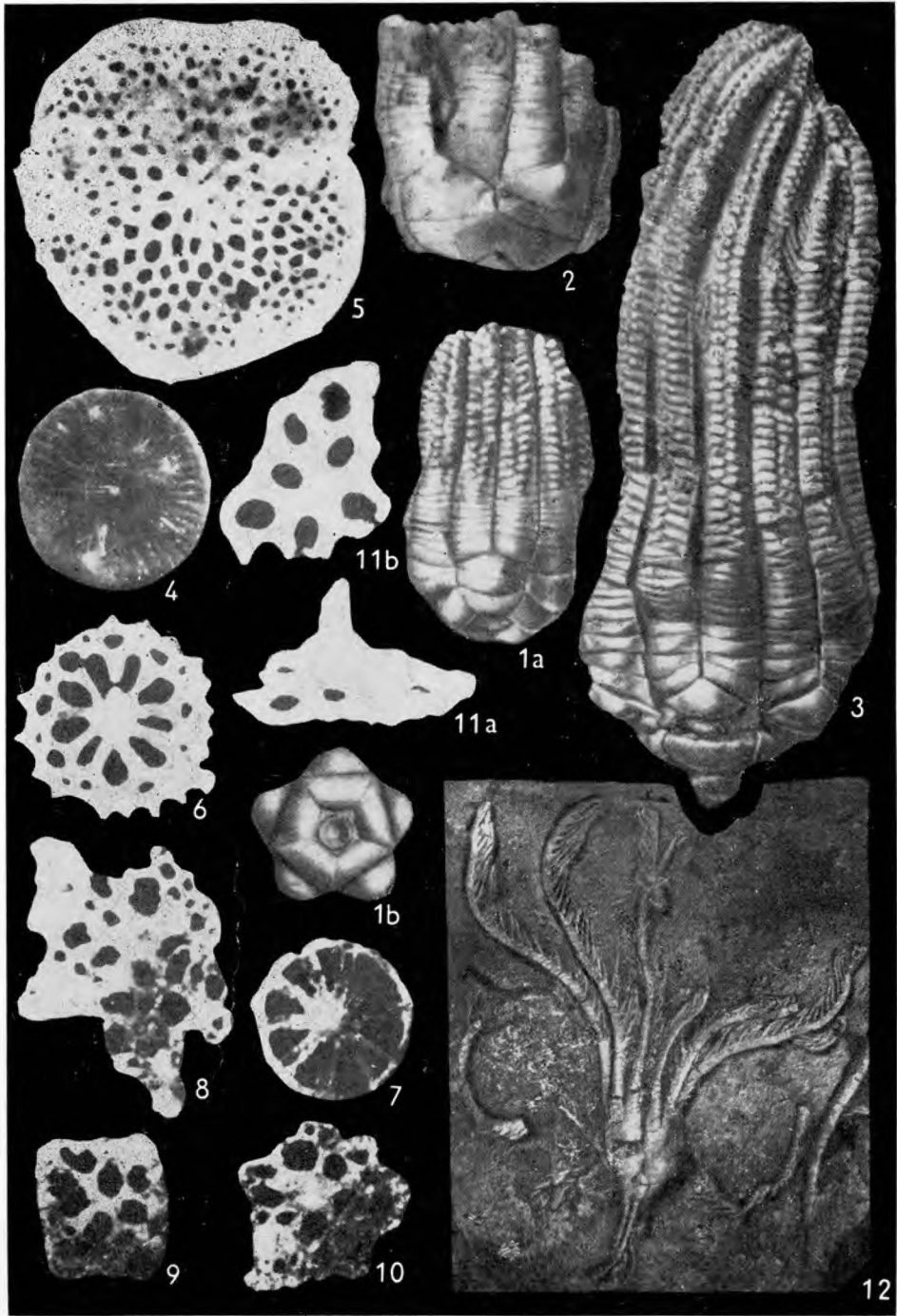


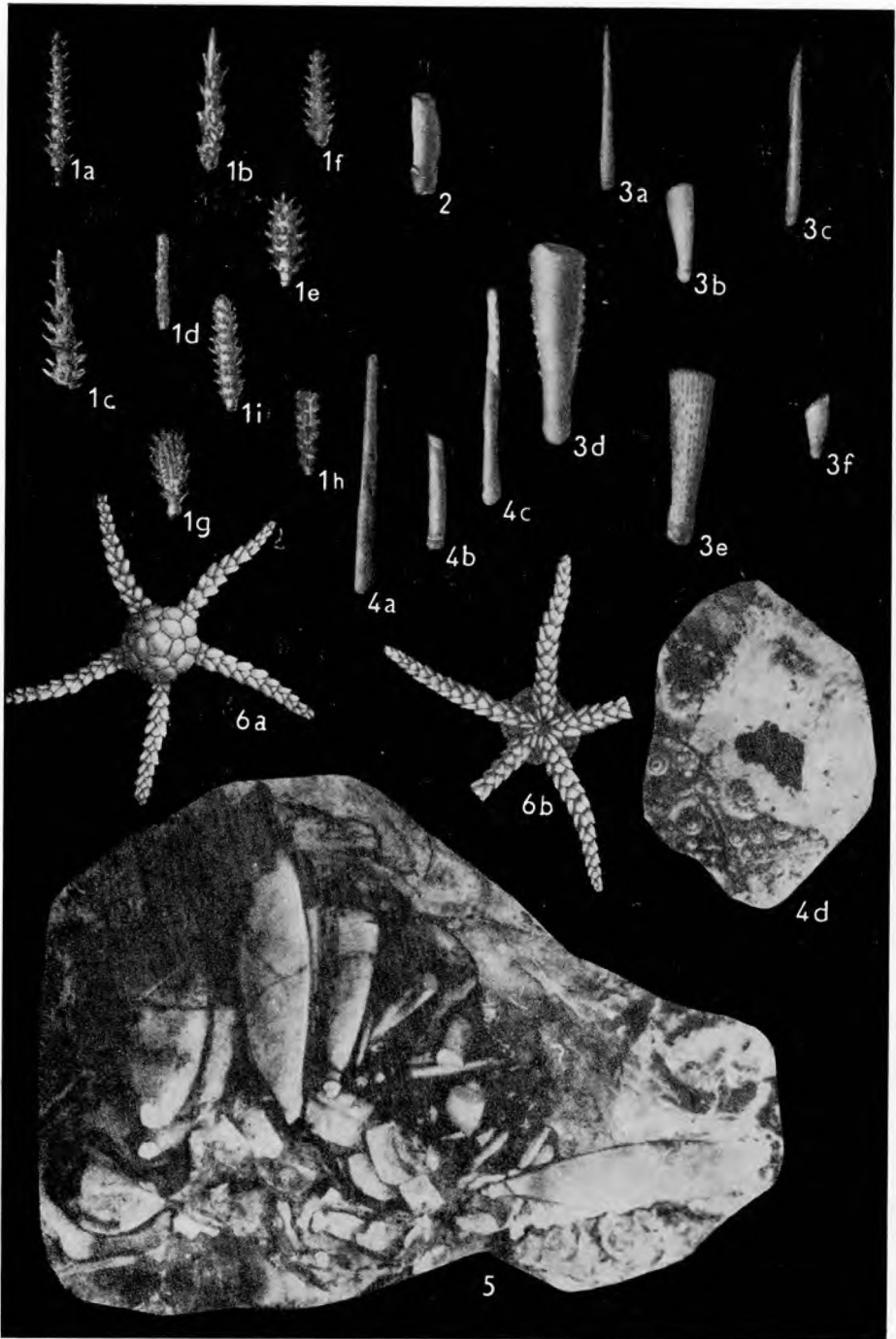


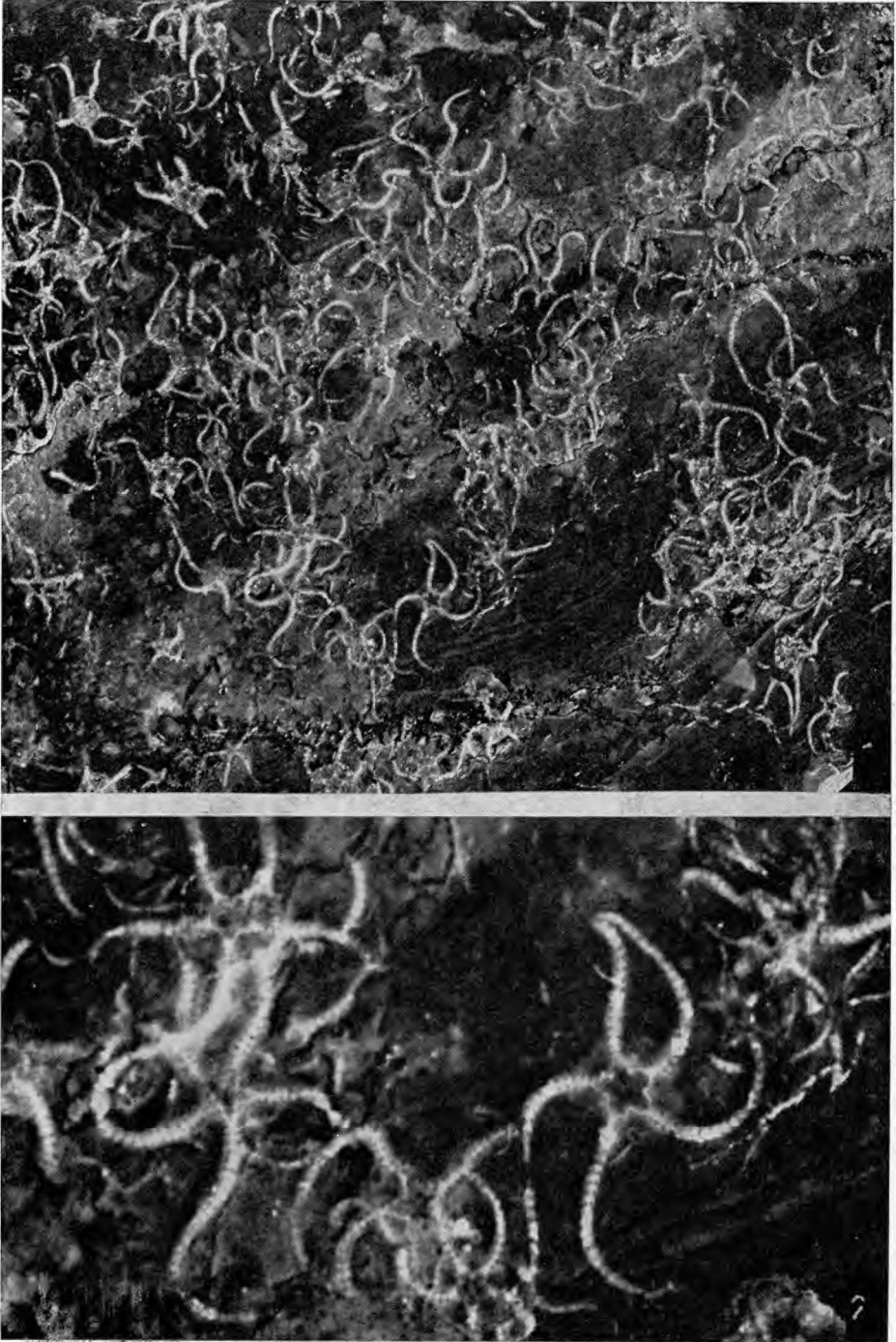


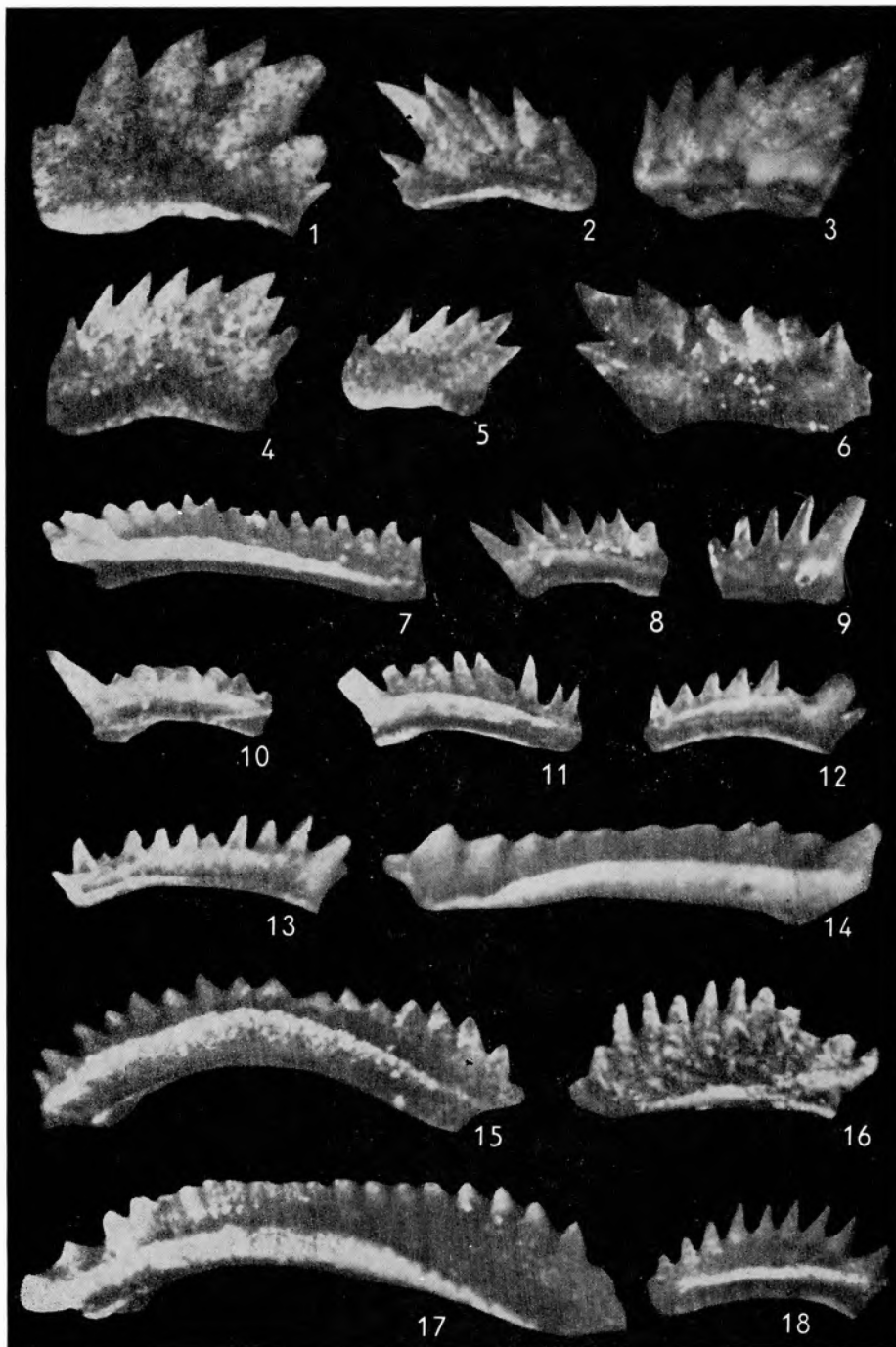


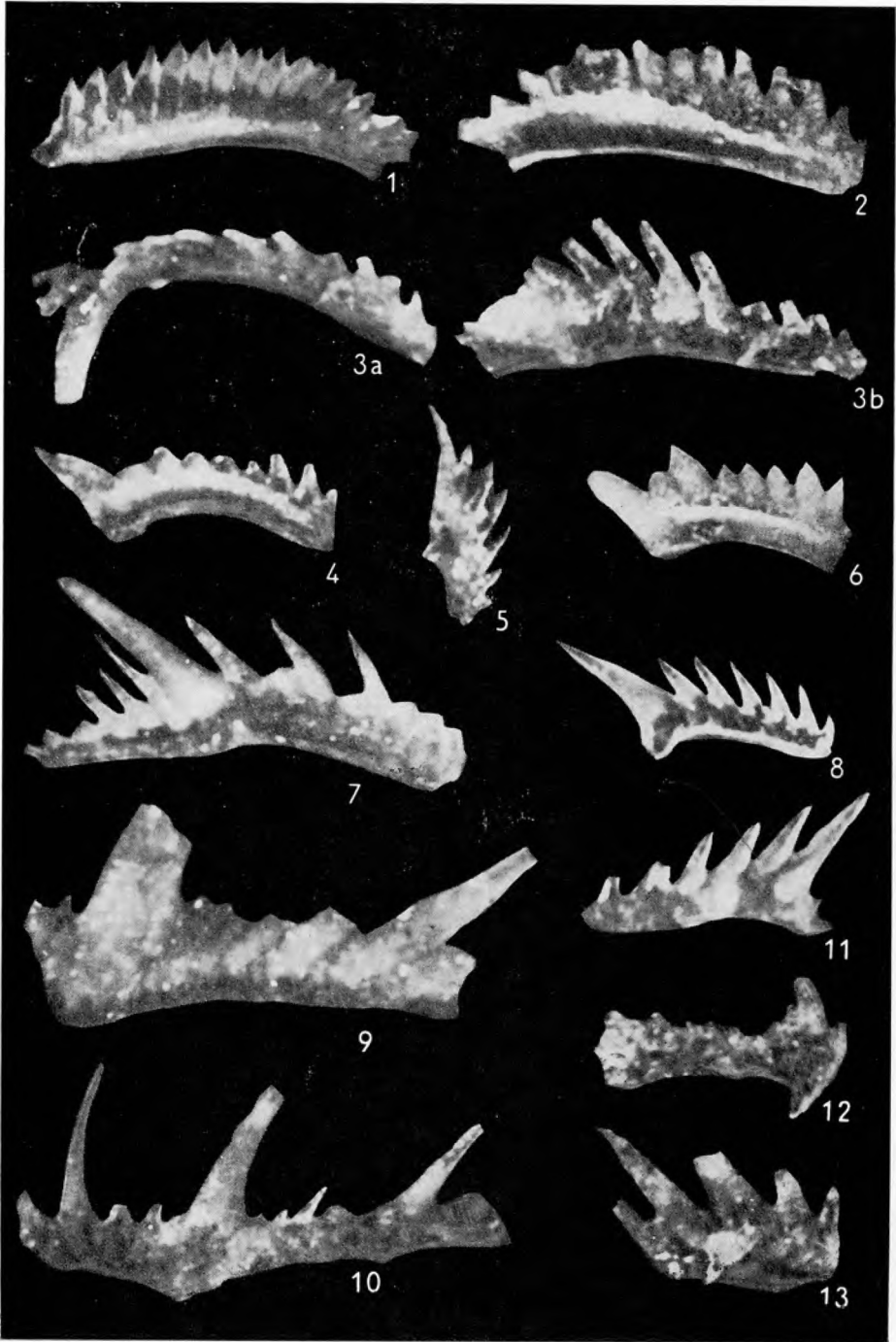
Geology of Poland. V. III, part 2a — Triassic



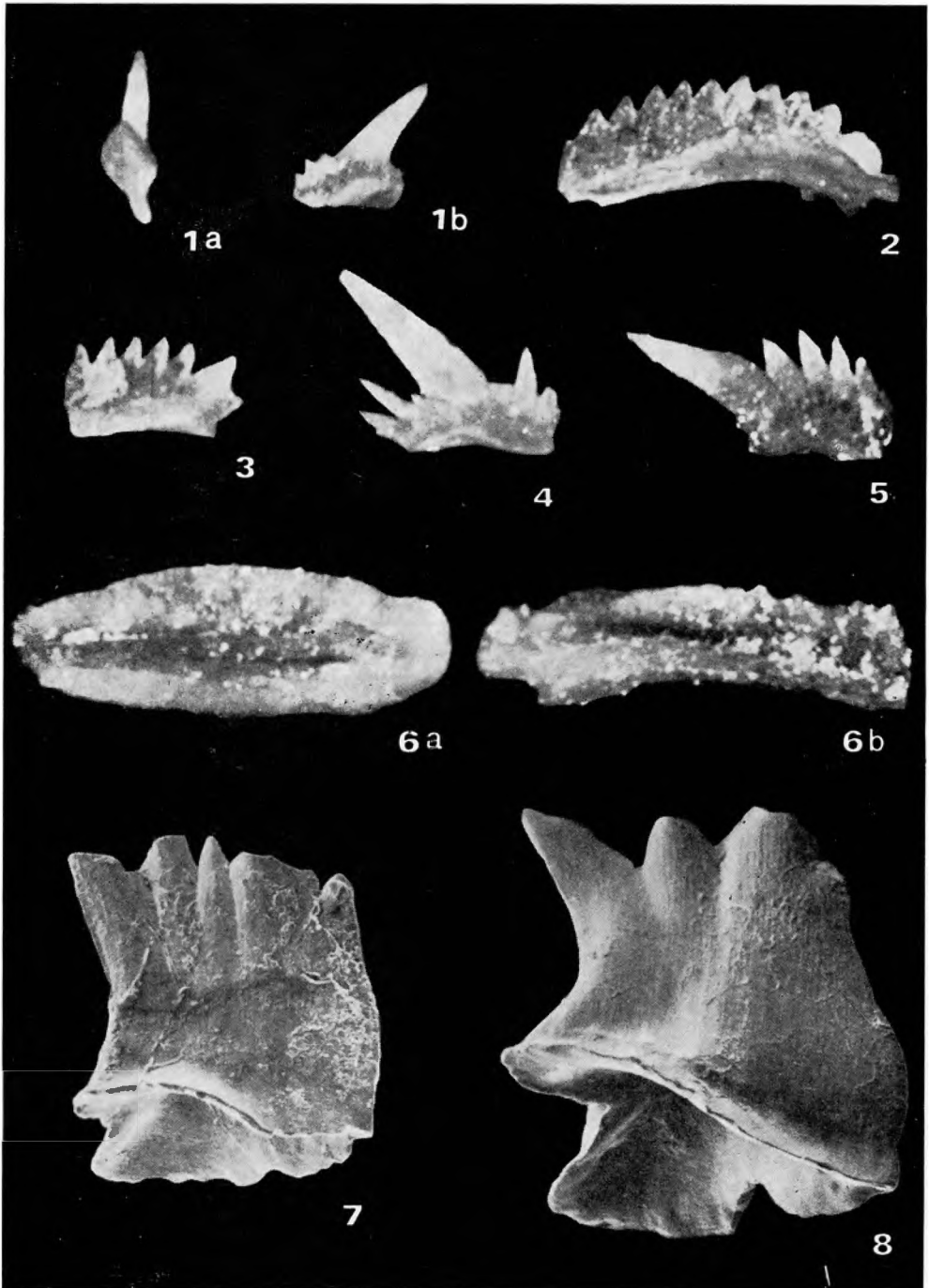


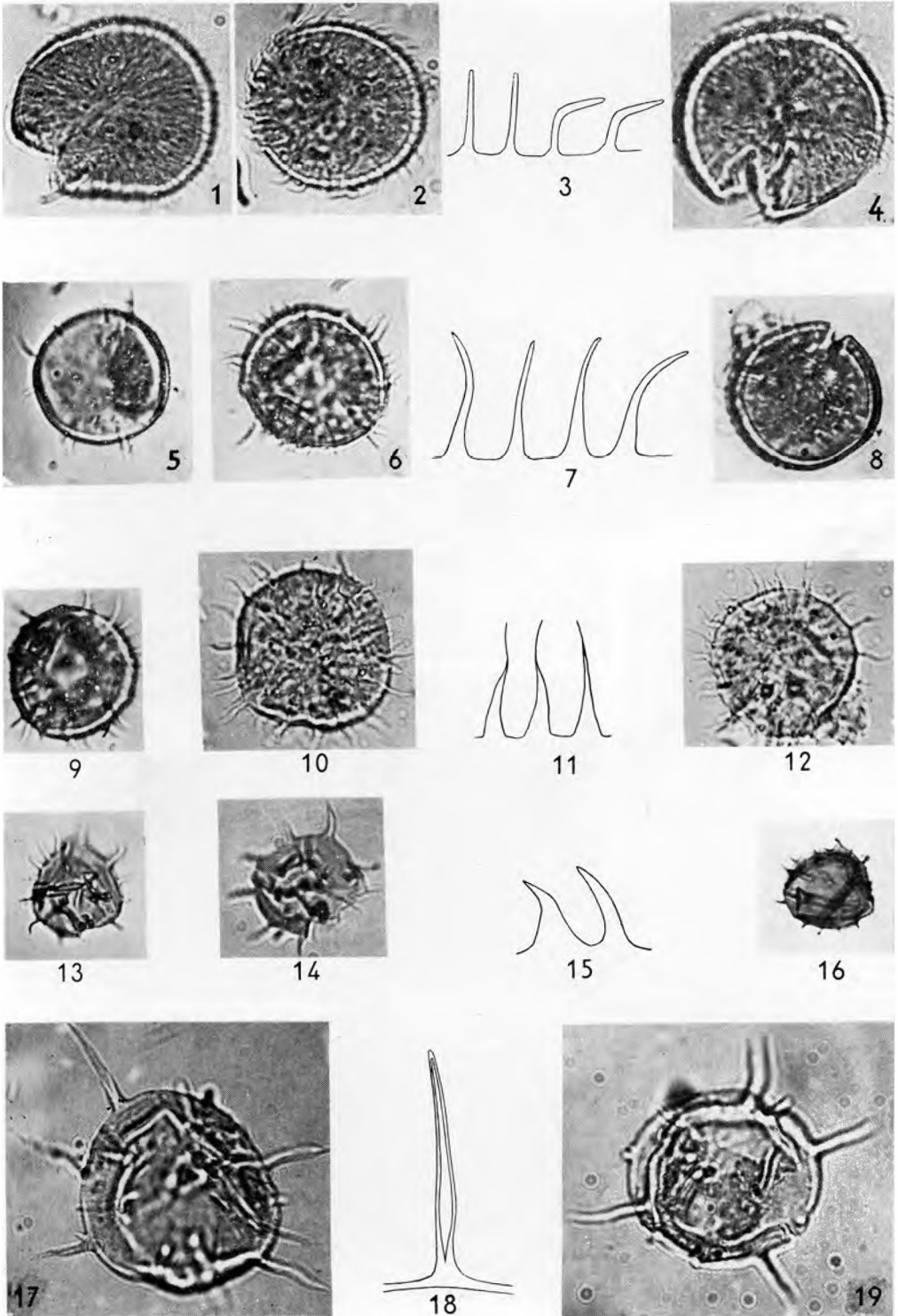


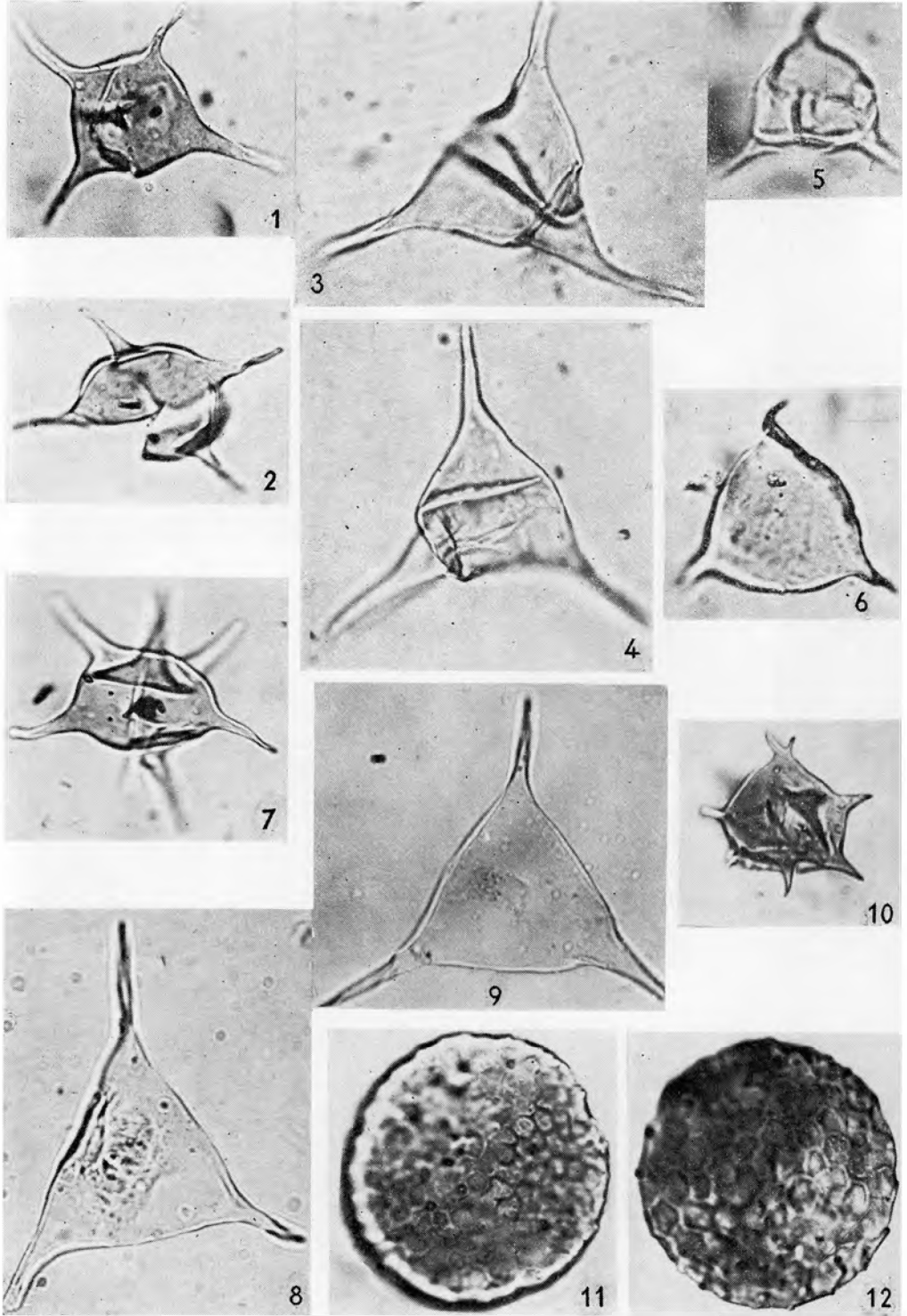


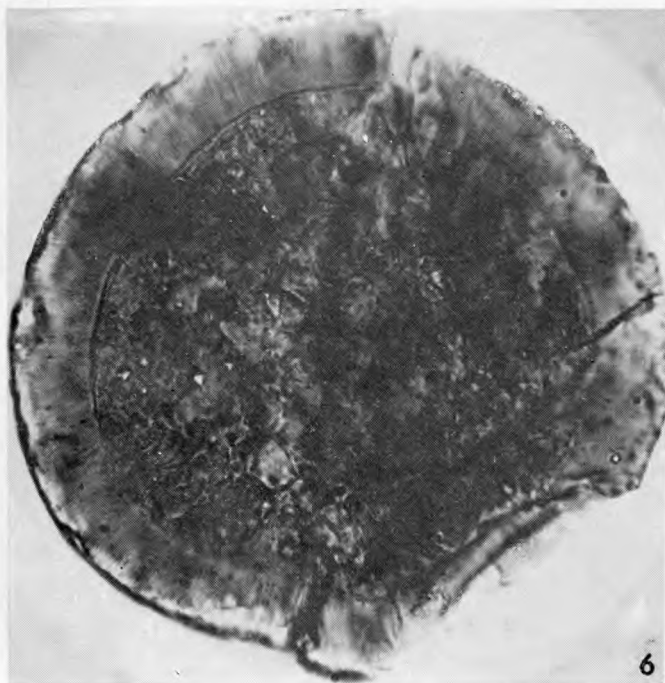
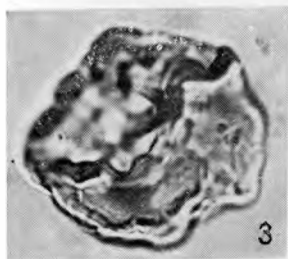
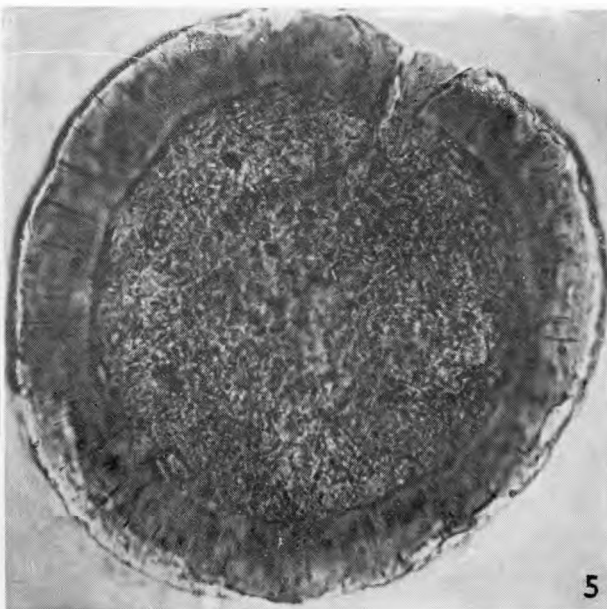


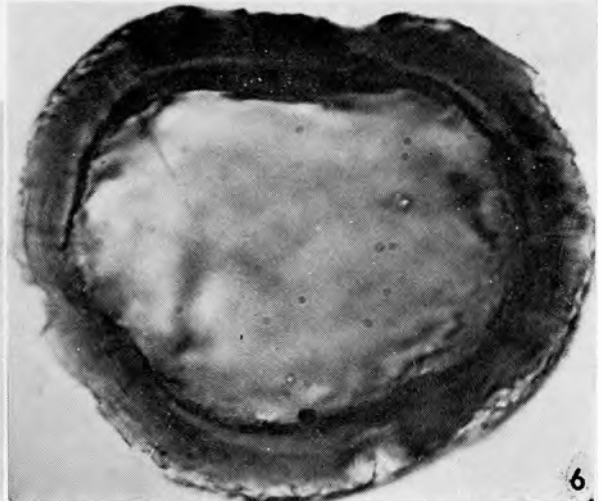
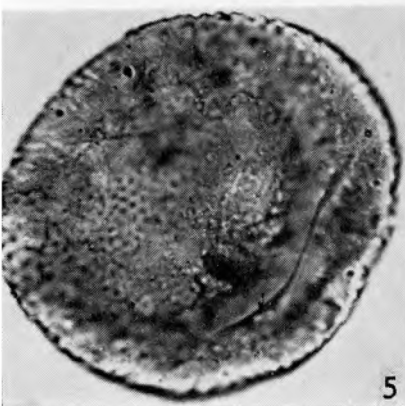
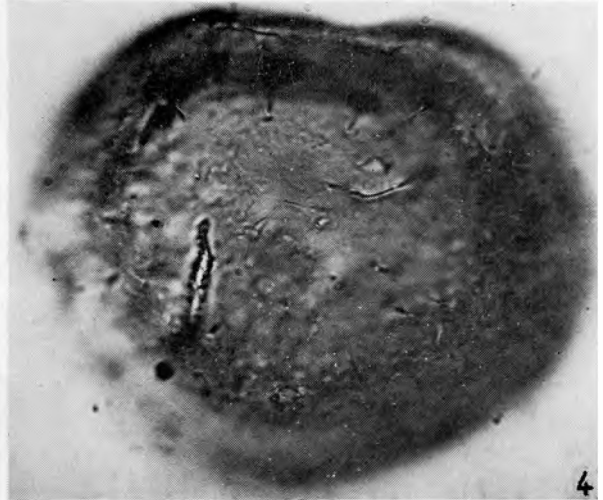
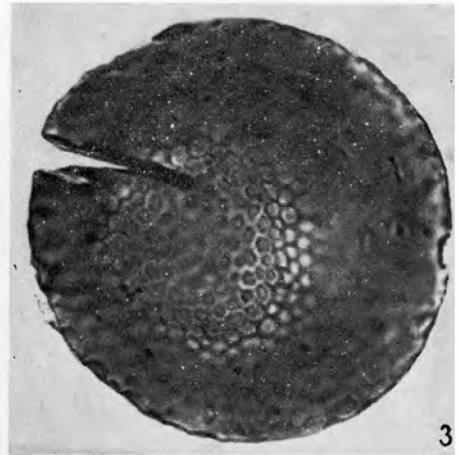
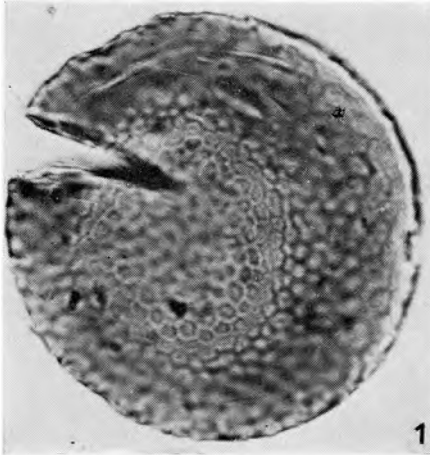
Geology of Poland. V. III, part 2a — Triassic

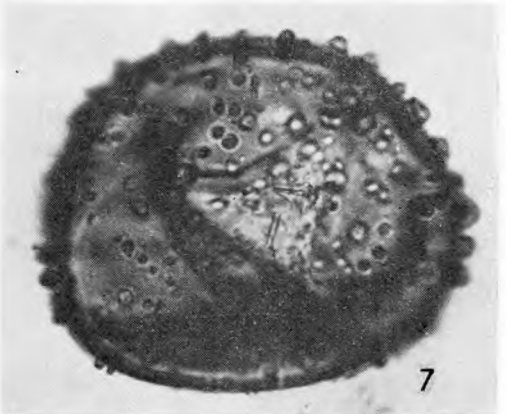
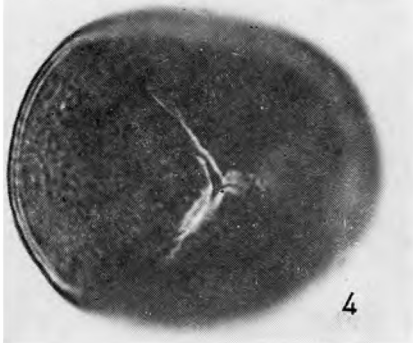
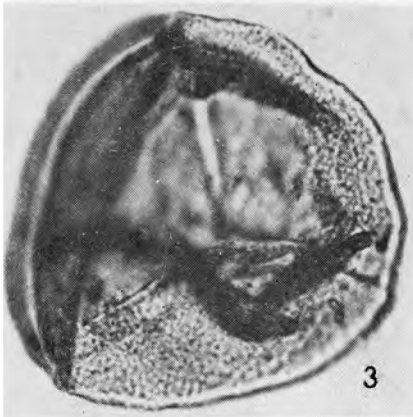
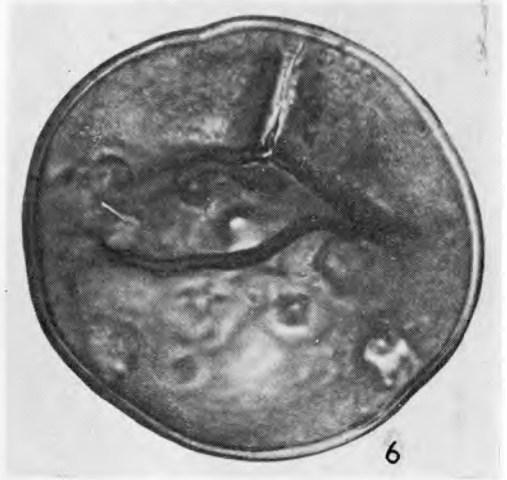
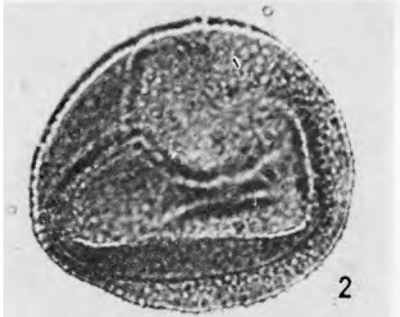
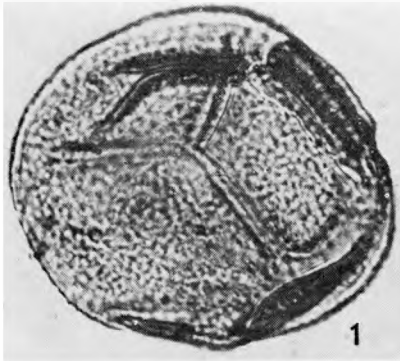


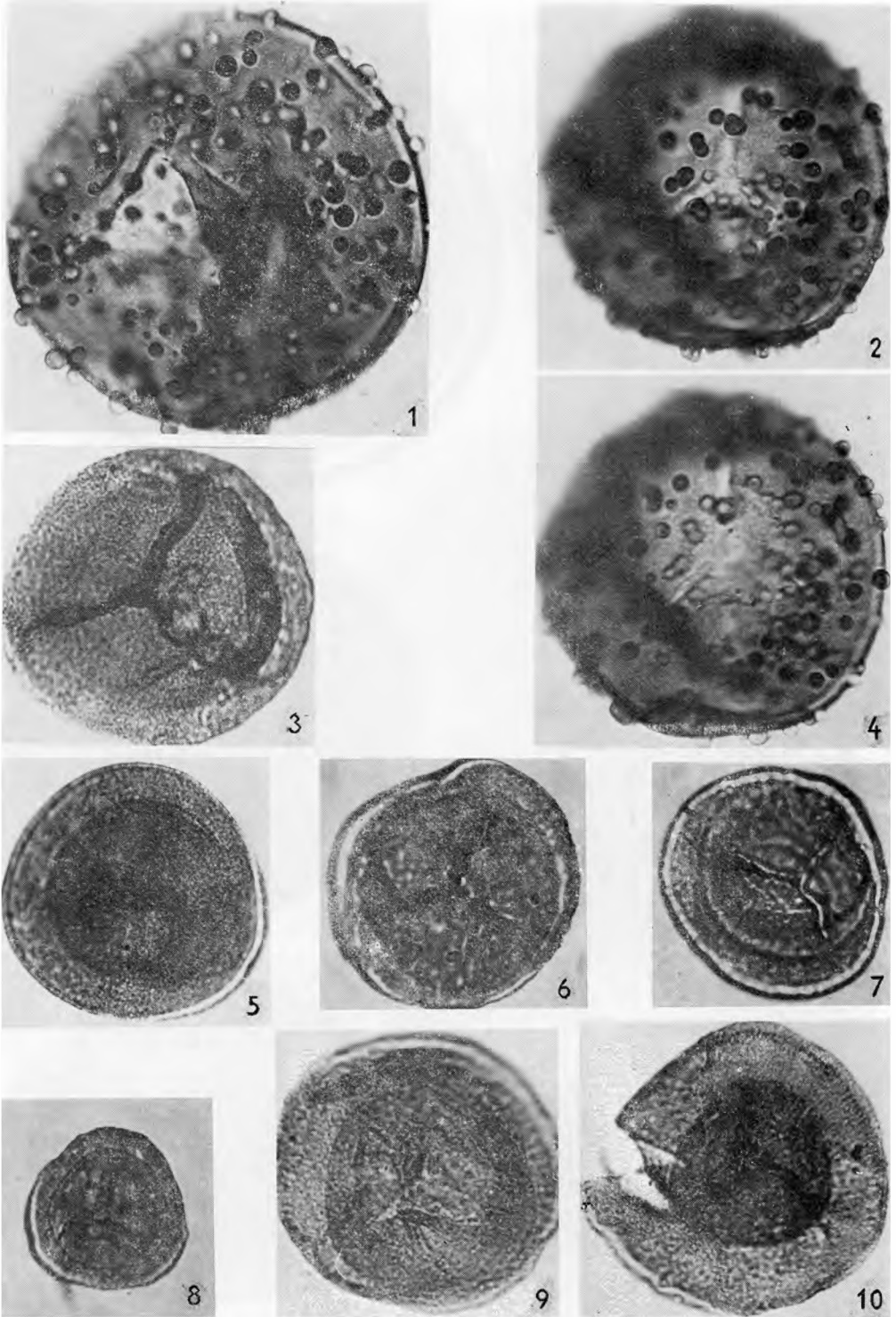


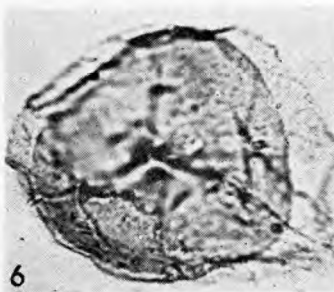
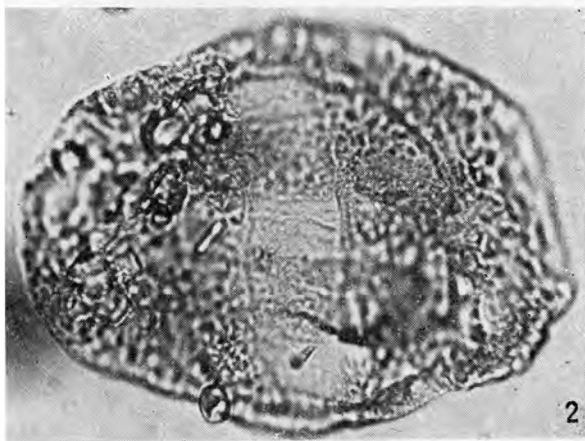
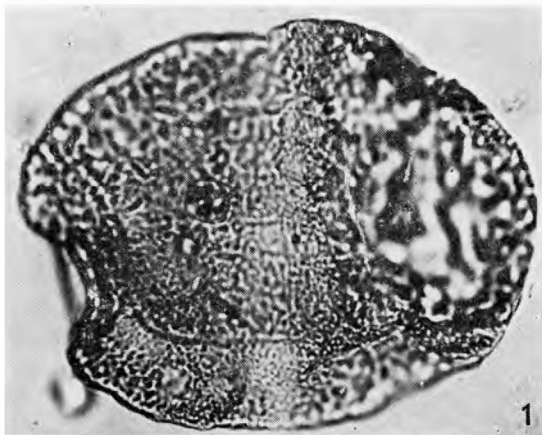


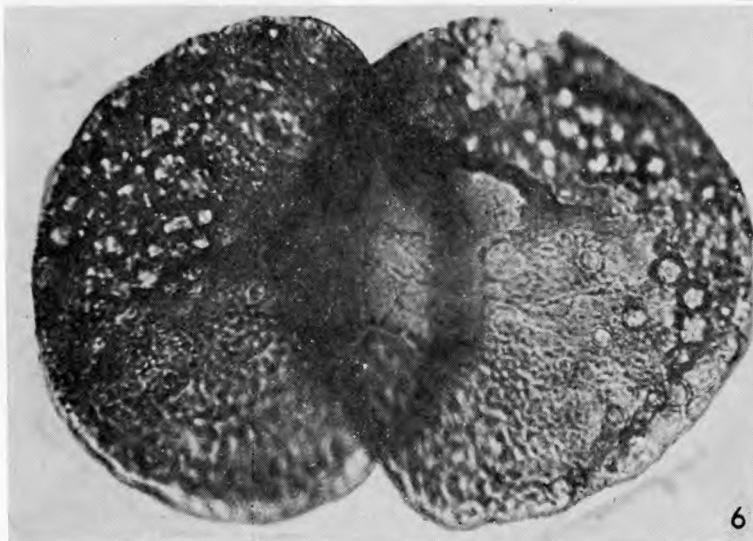
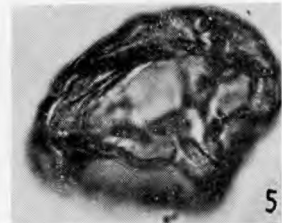
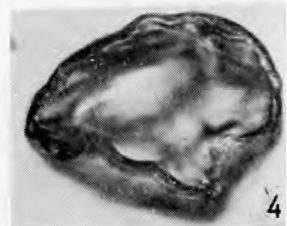
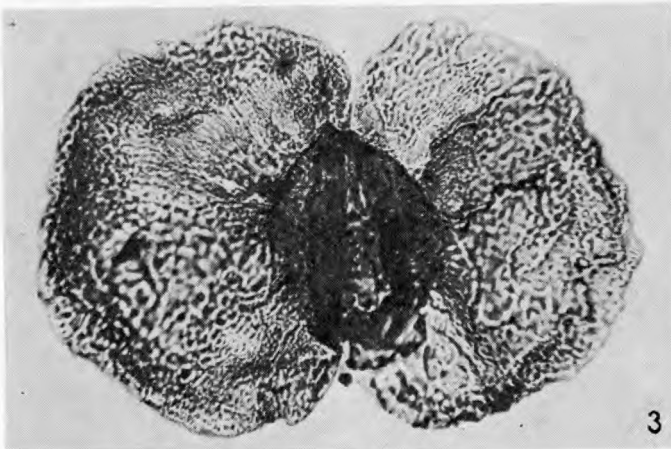
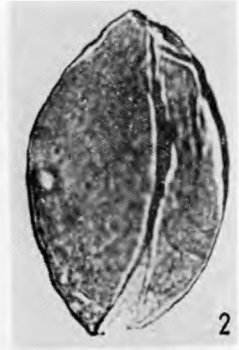
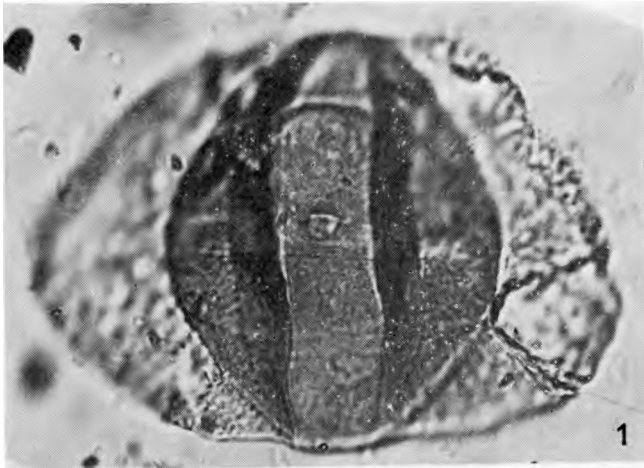


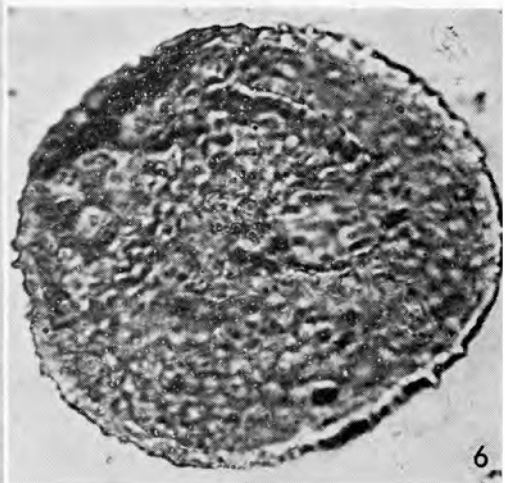
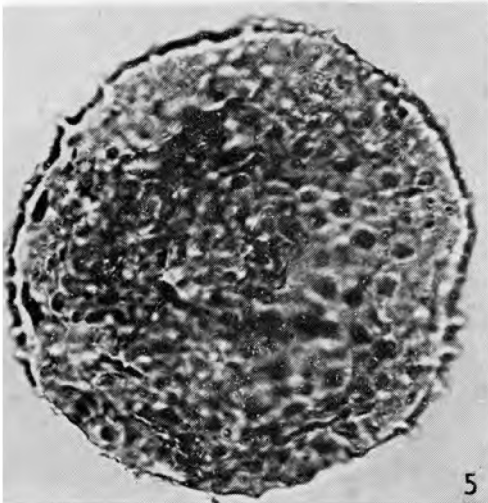
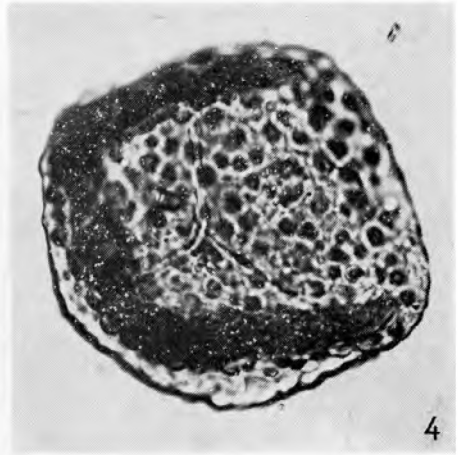
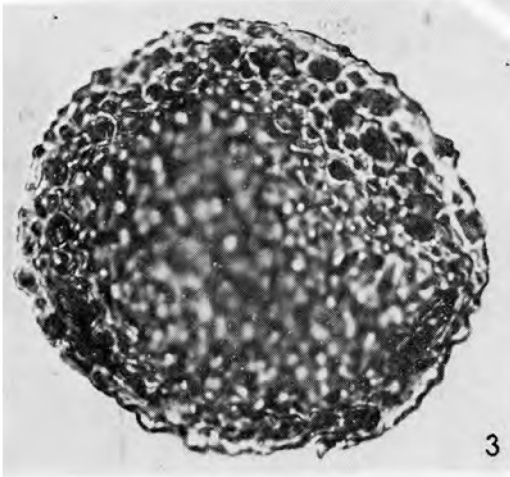
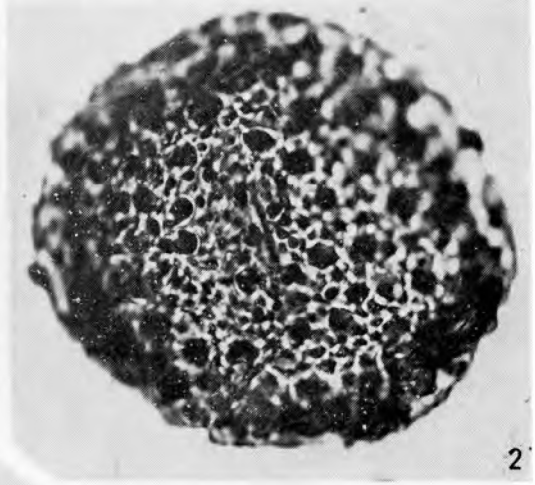
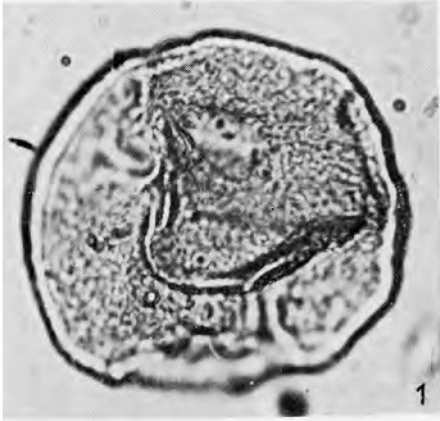


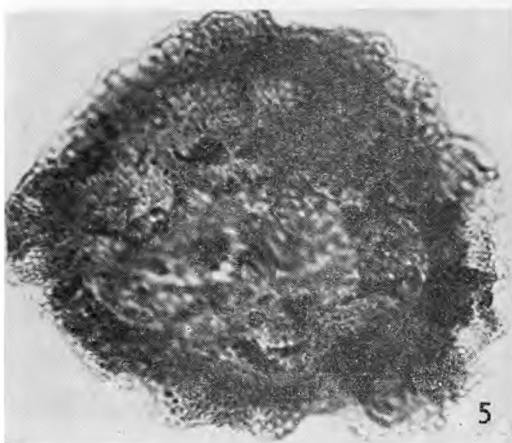
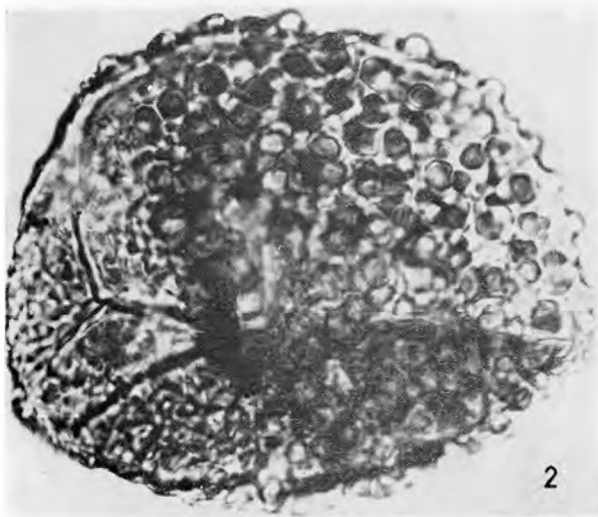
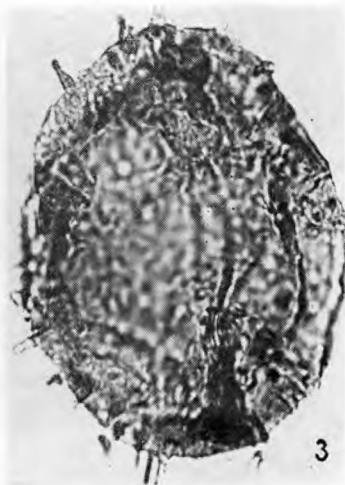
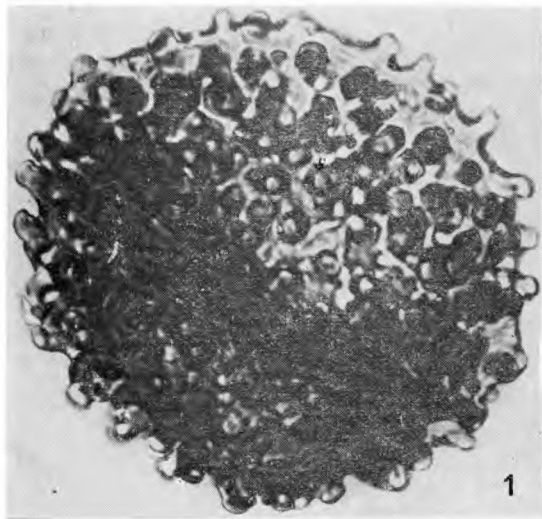


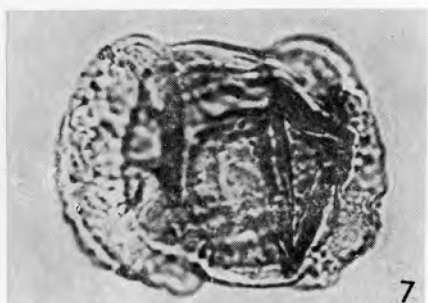
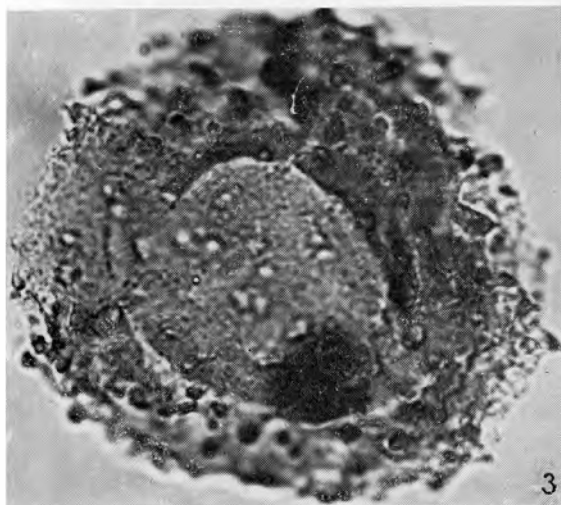
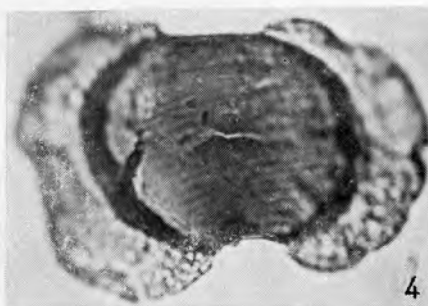
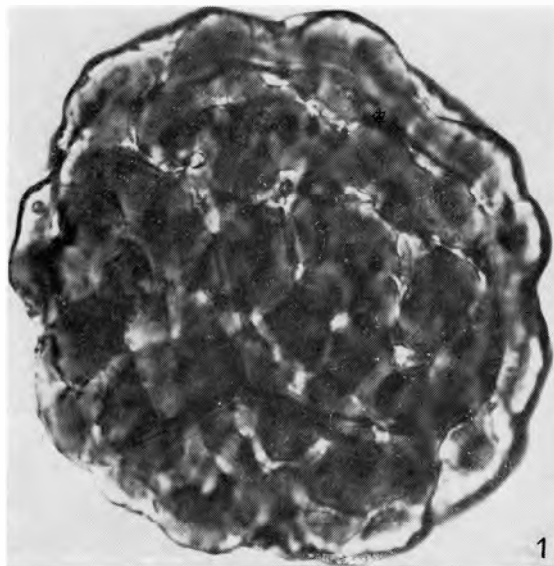


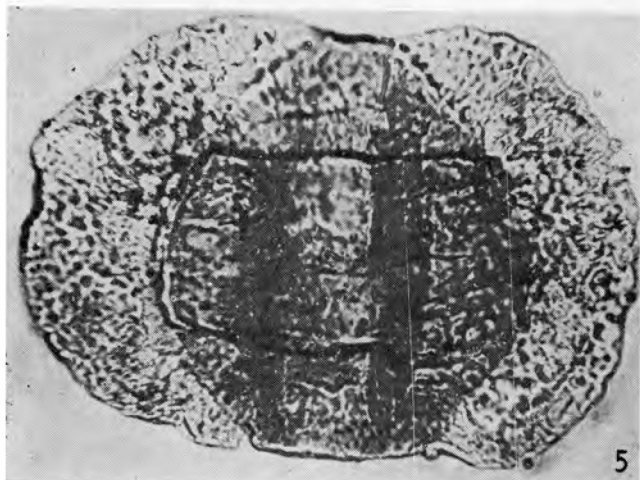
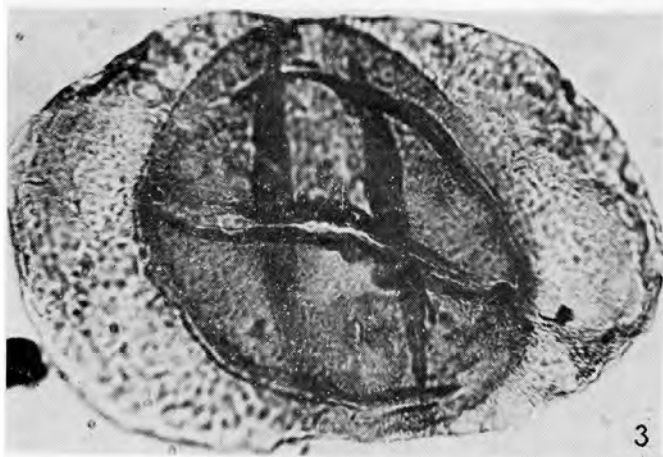
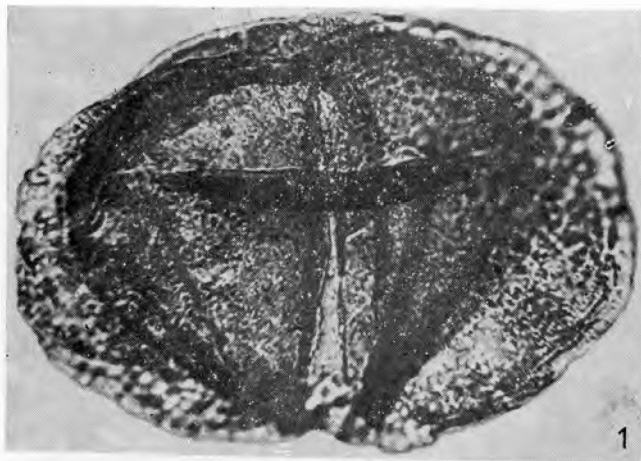


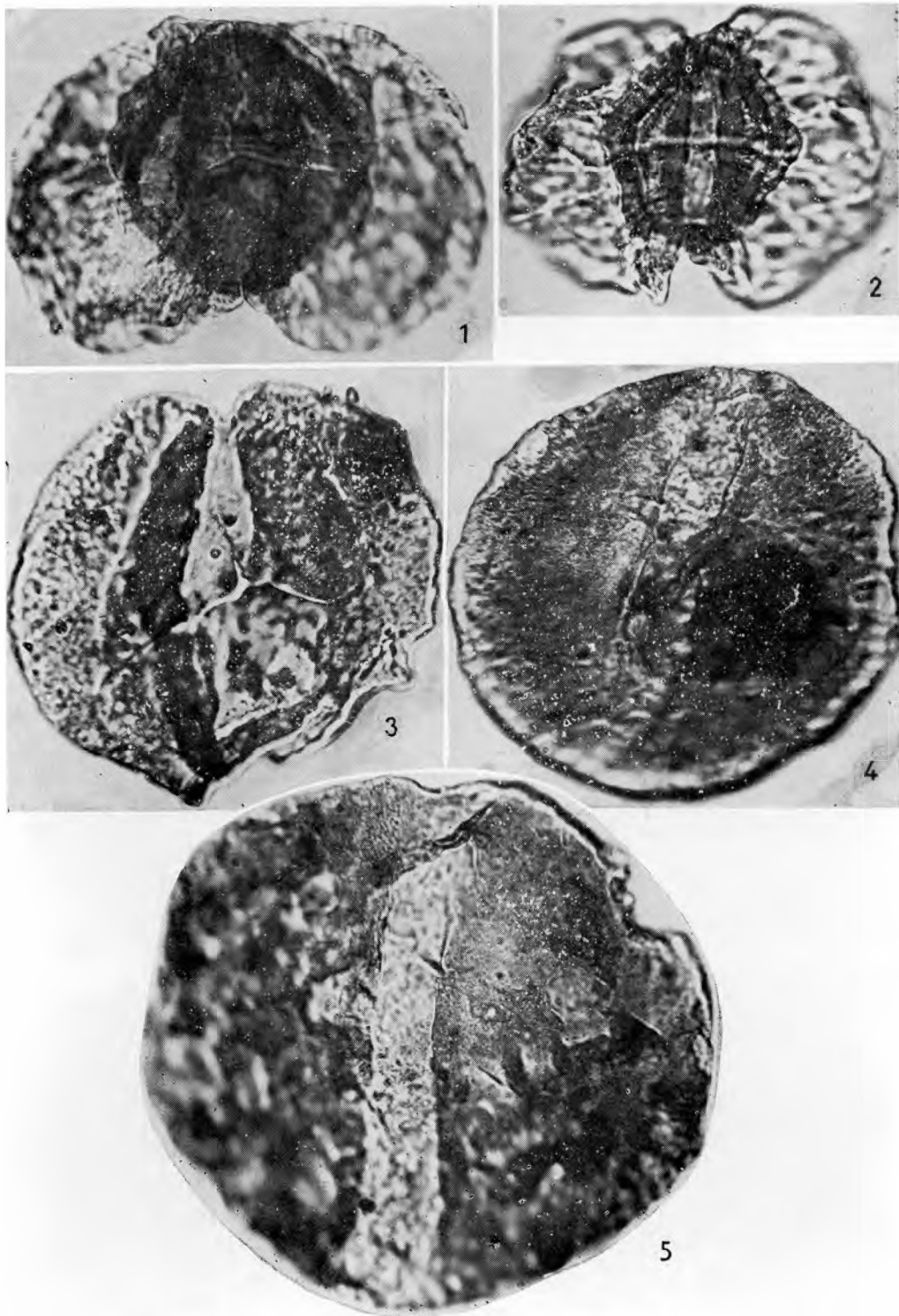


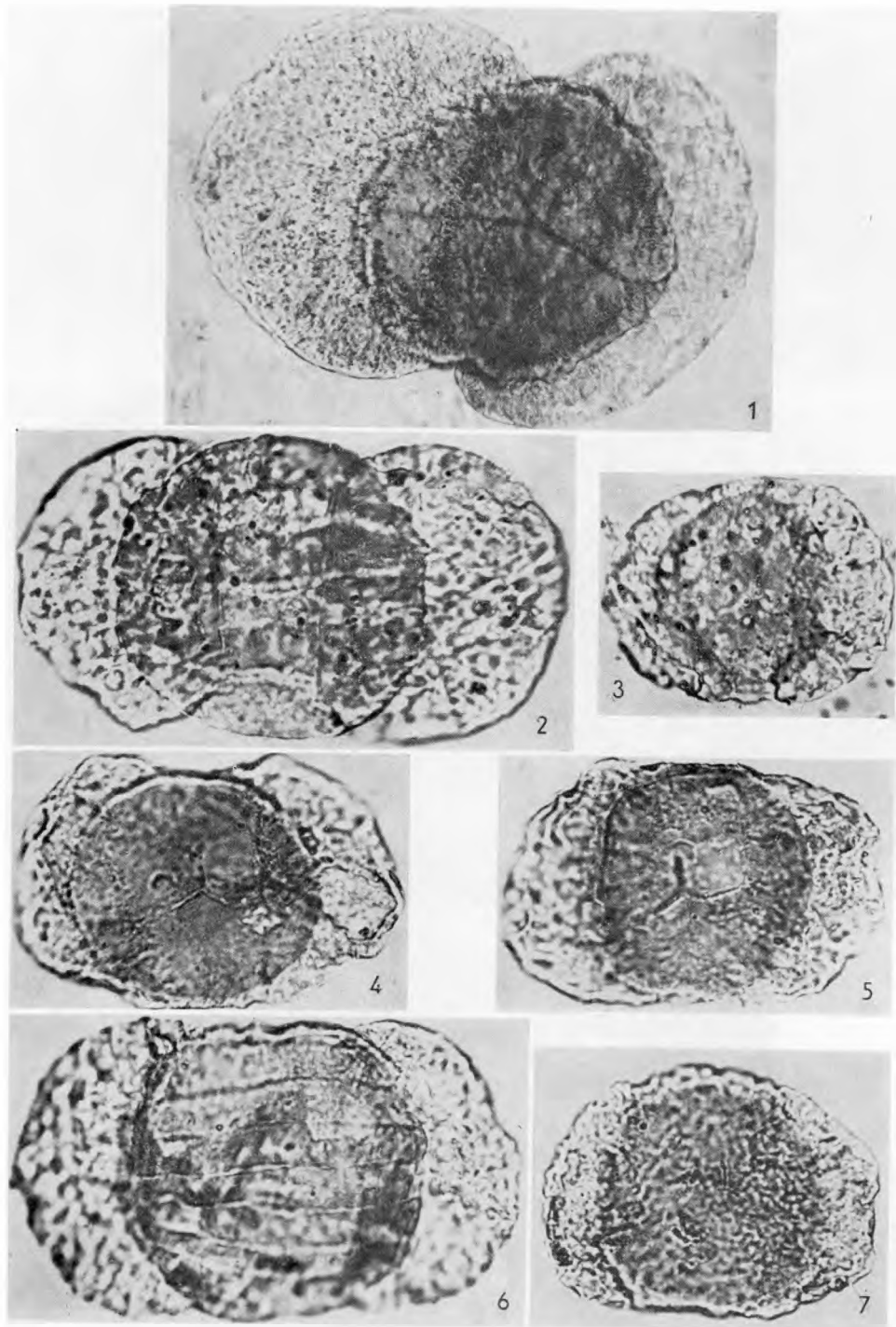


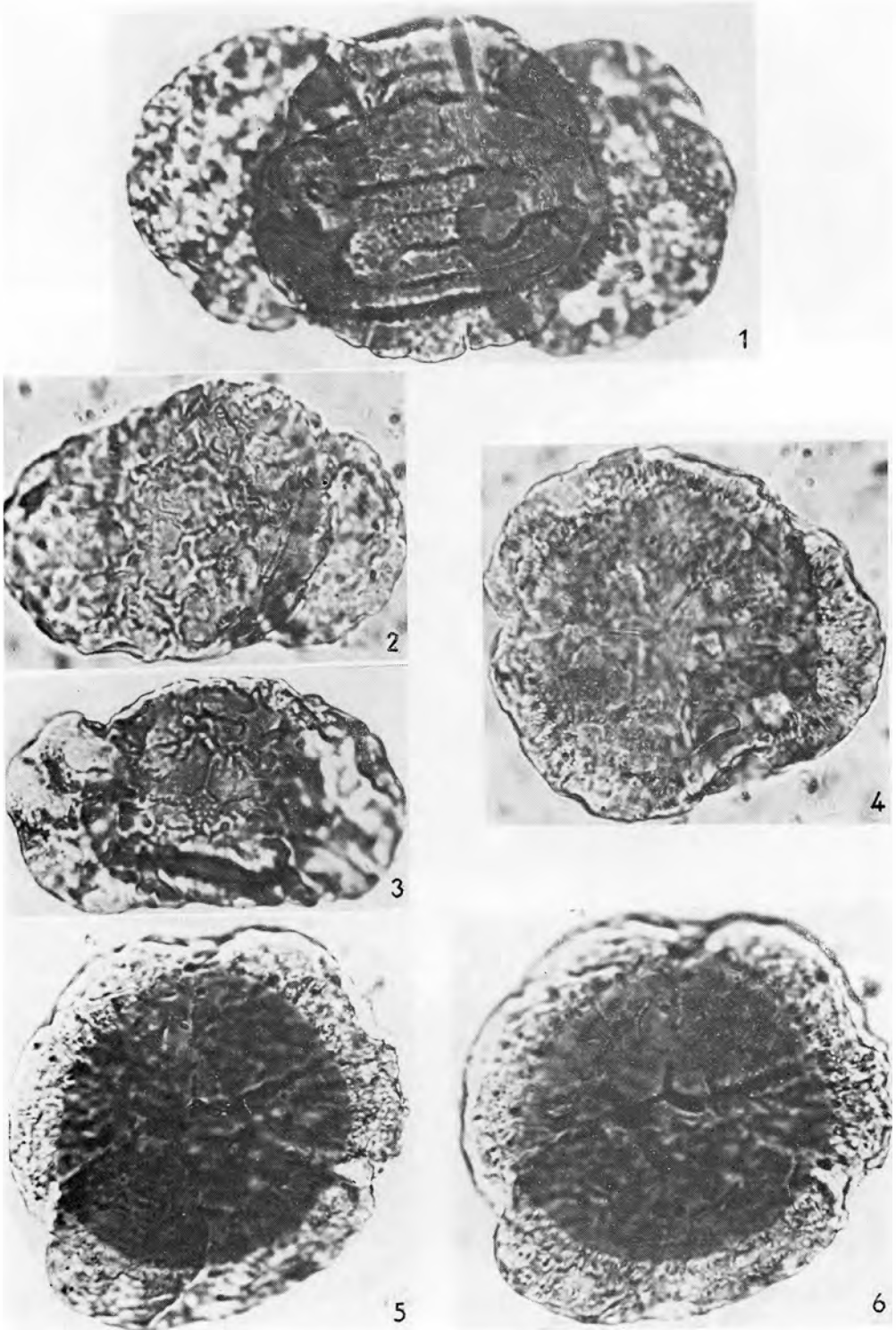


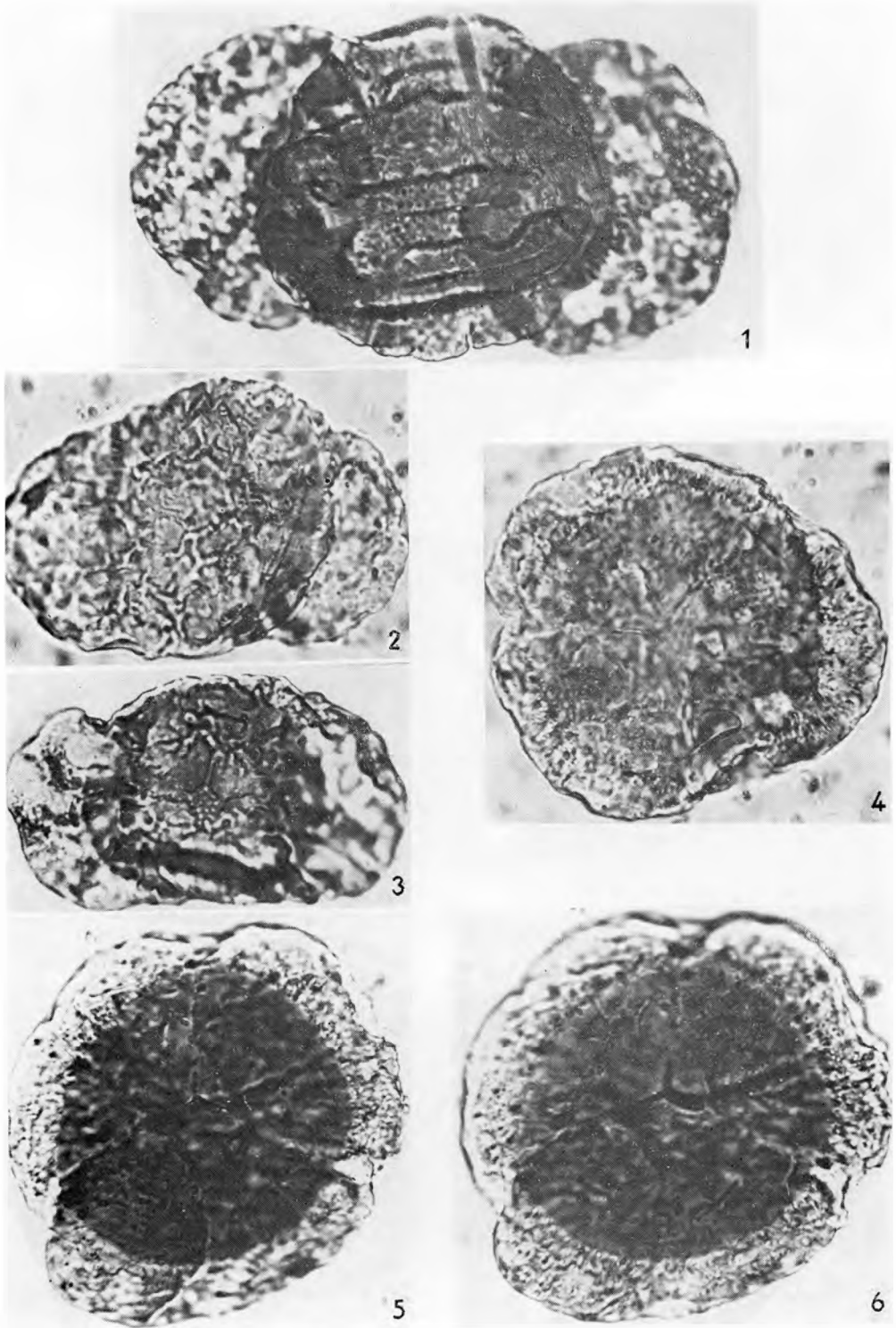


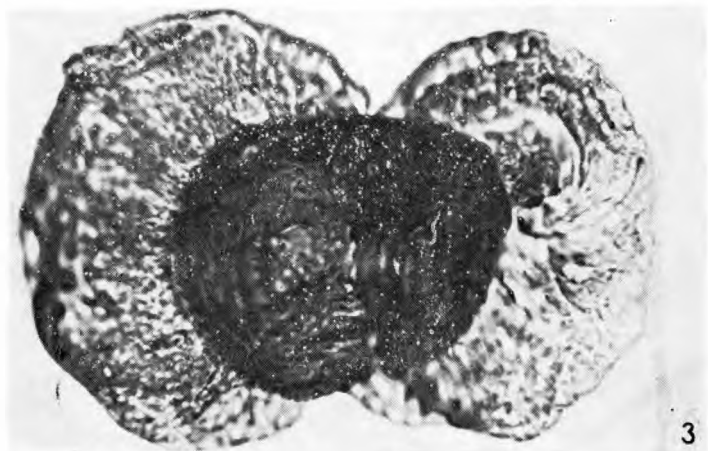
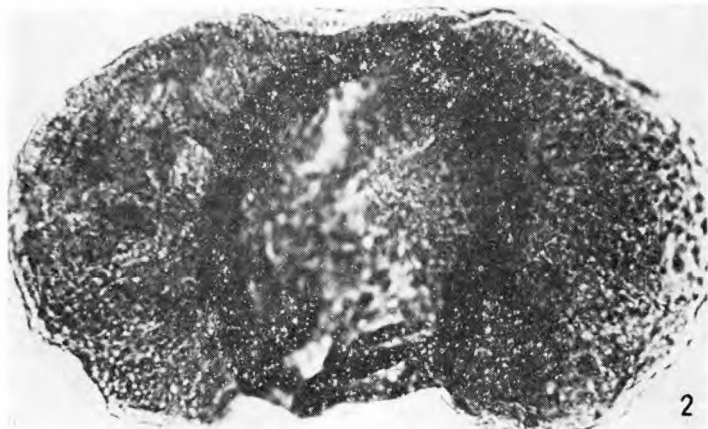
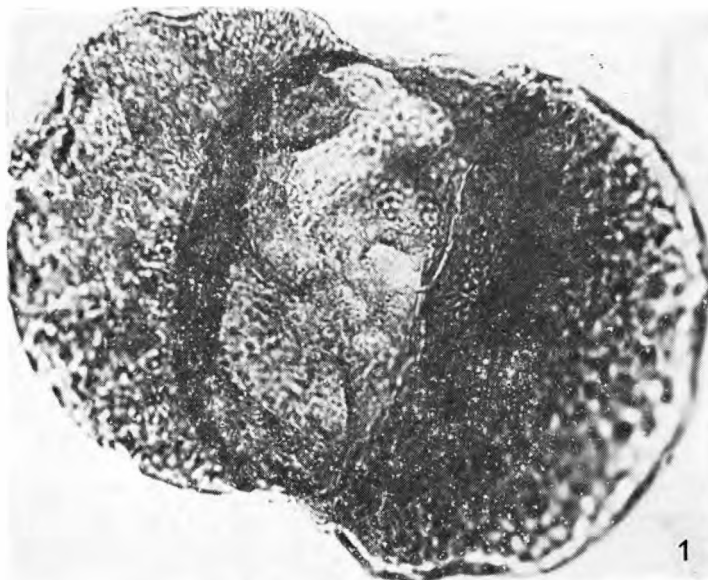


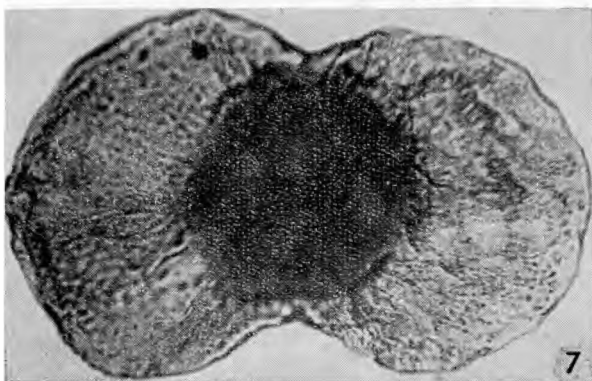
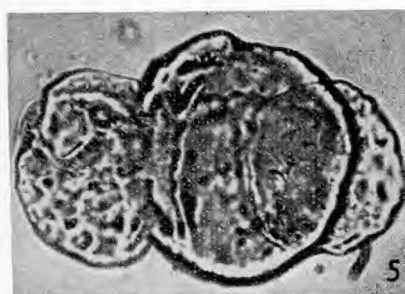
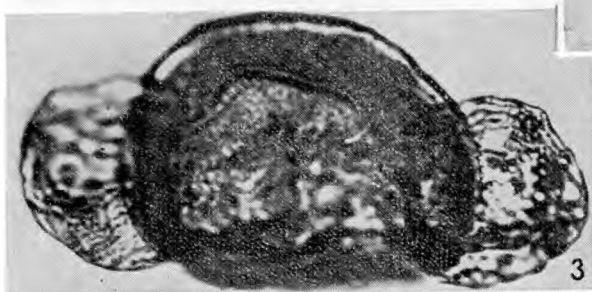


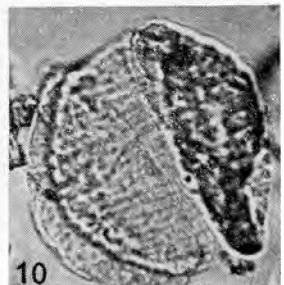
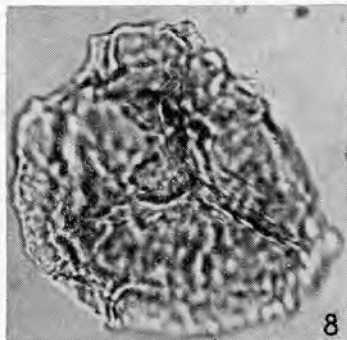
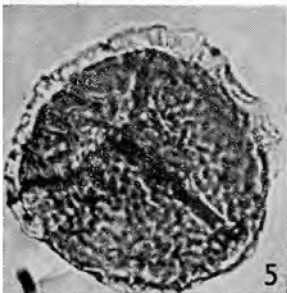
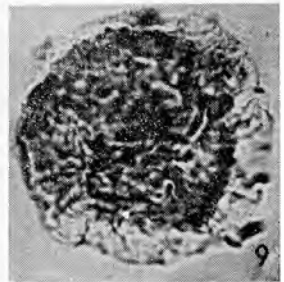
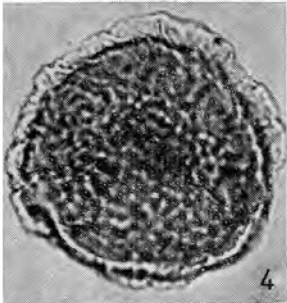
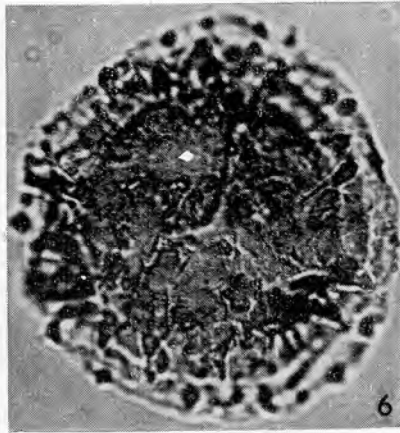
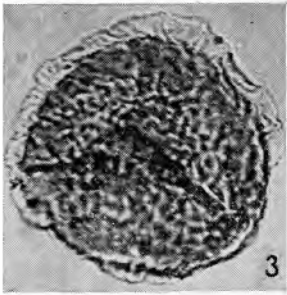
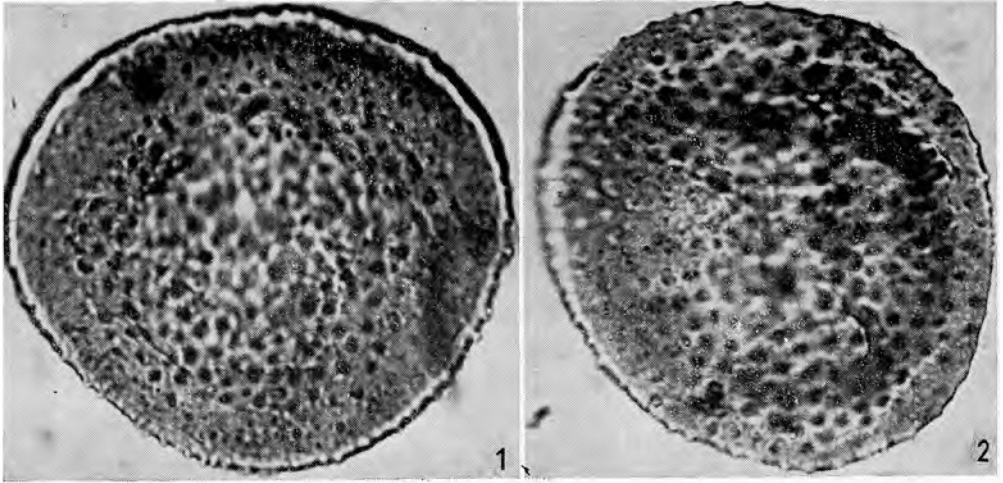


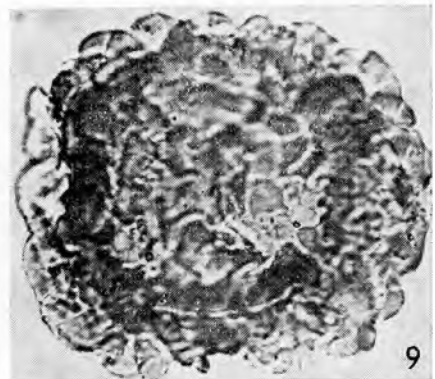
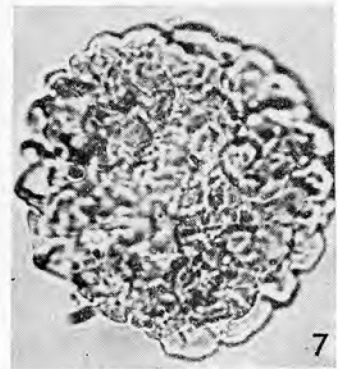
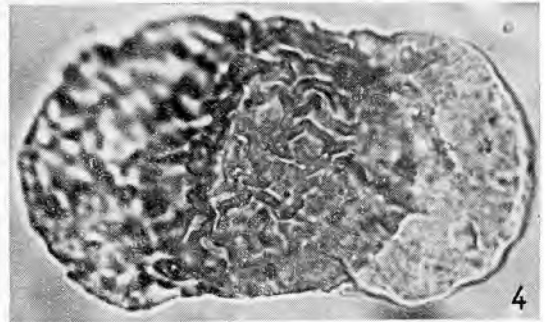
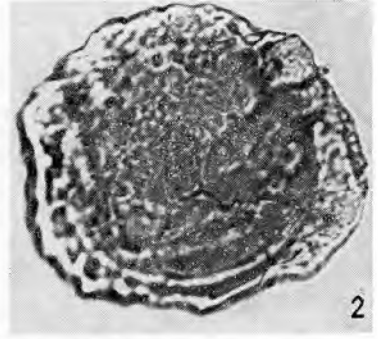
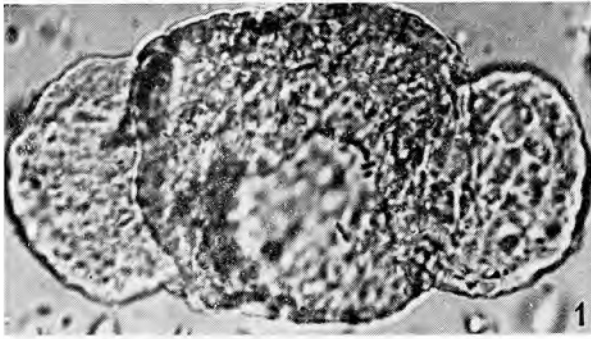


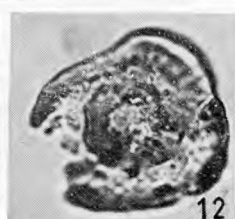
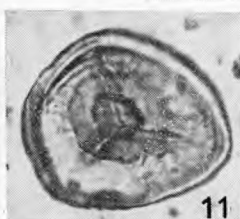
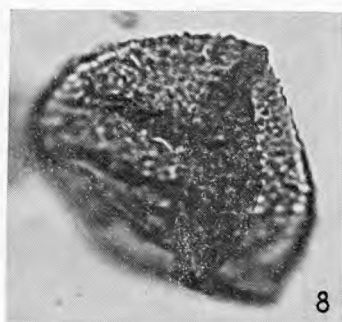
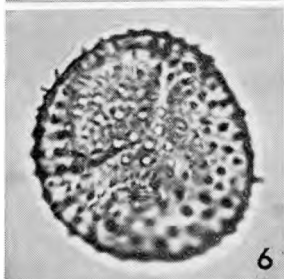
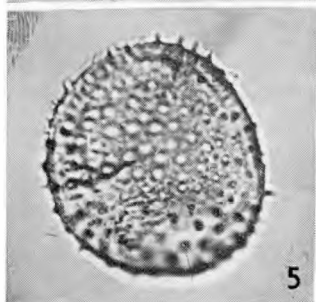
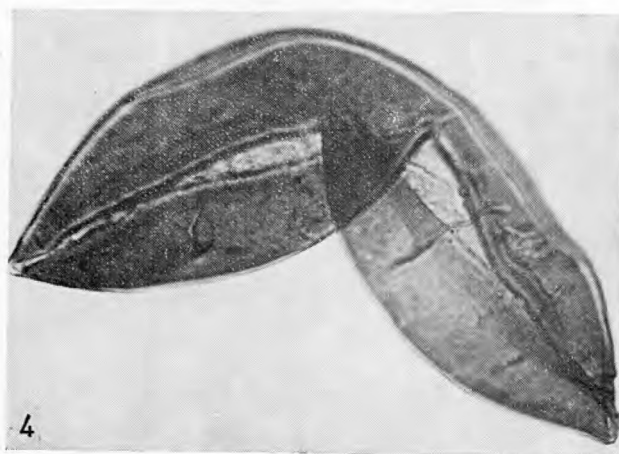


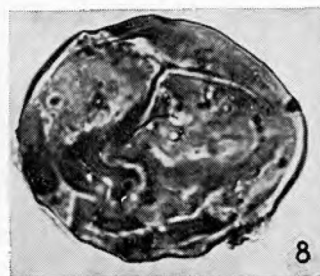
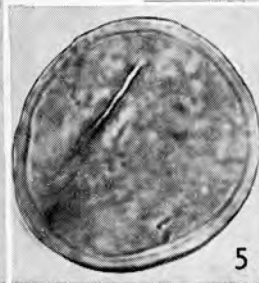
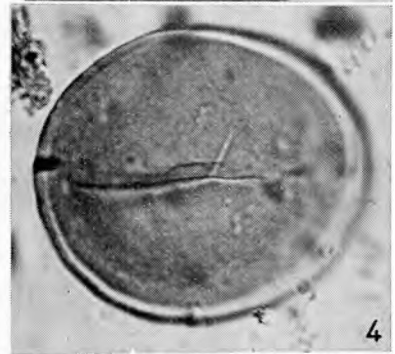
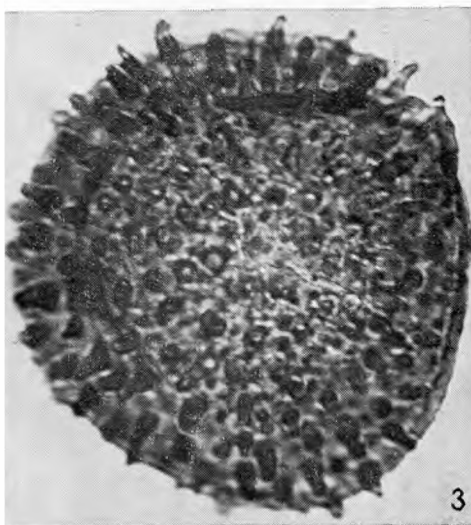
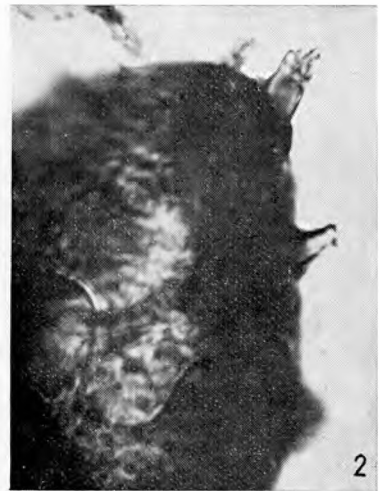
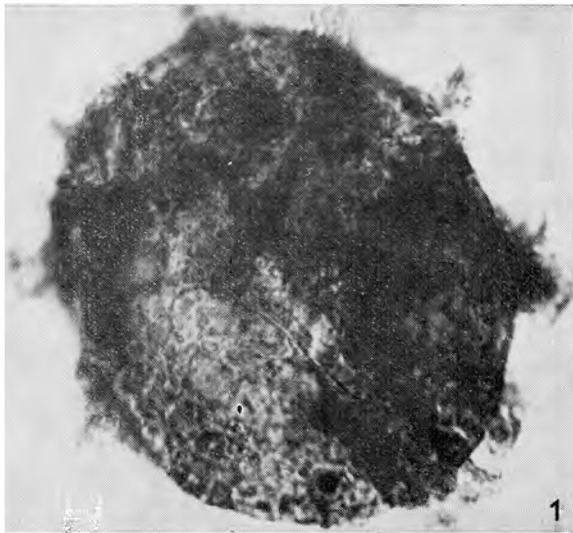


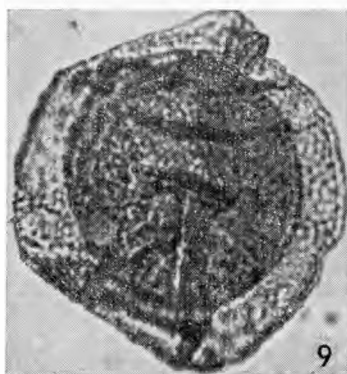
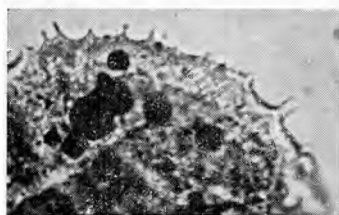
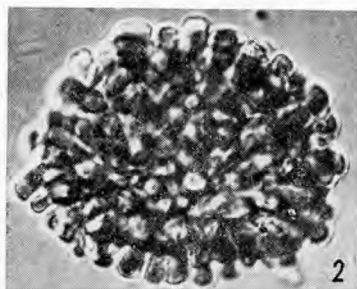


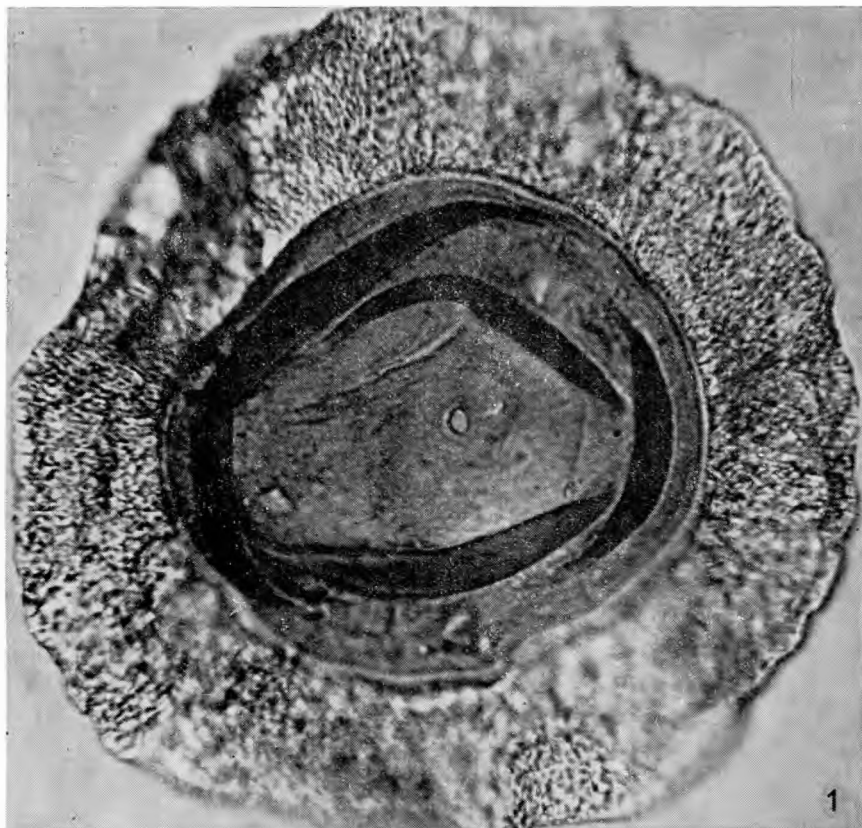




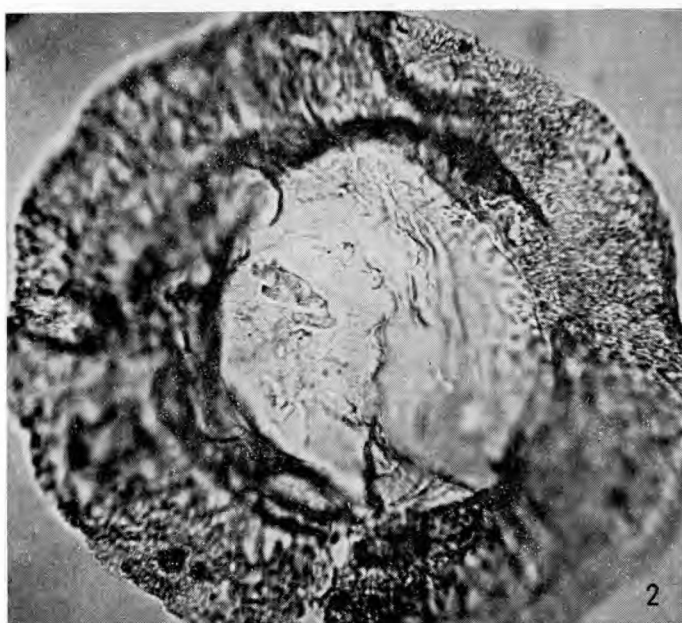




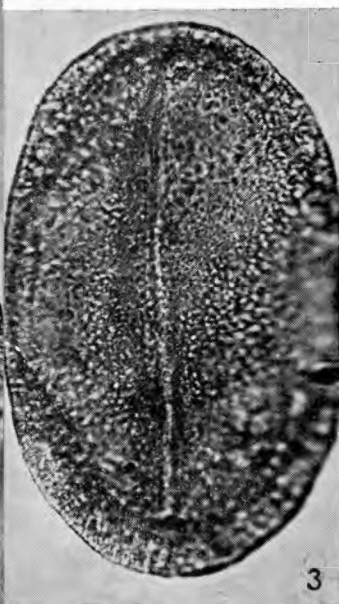




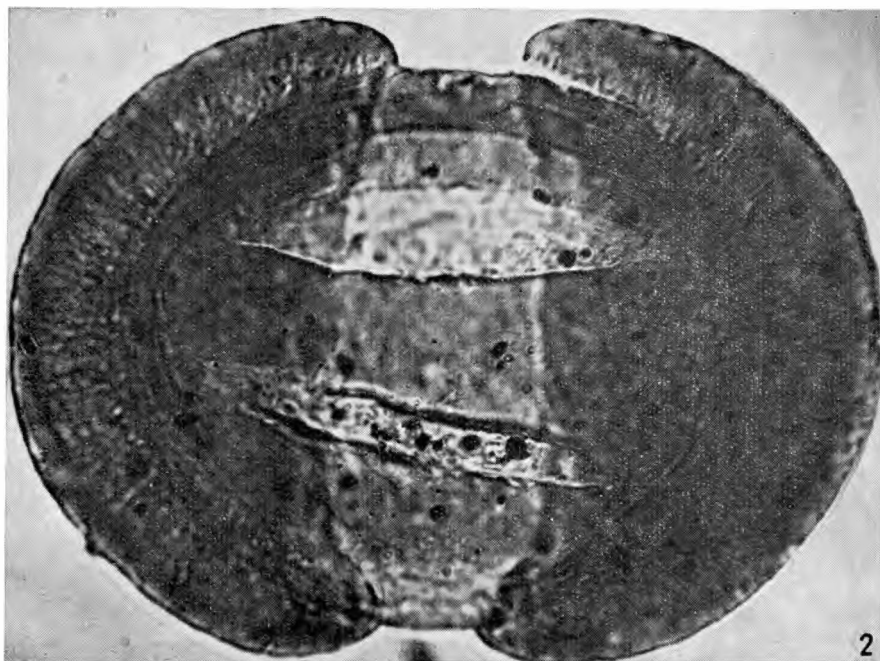
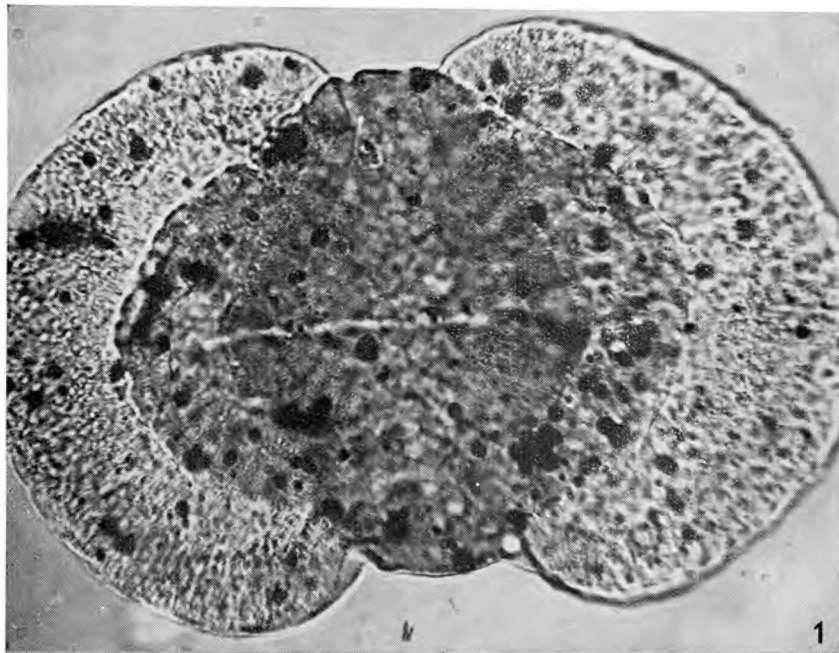
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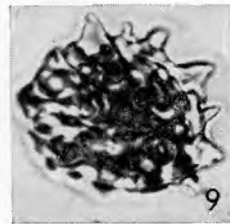
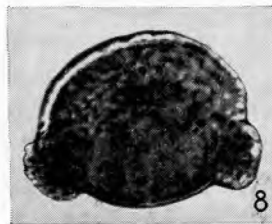
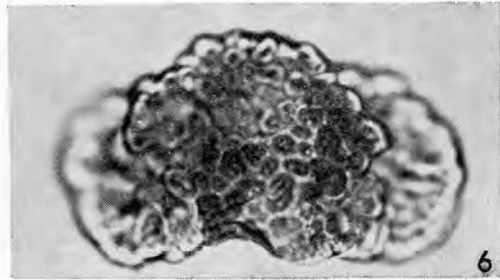
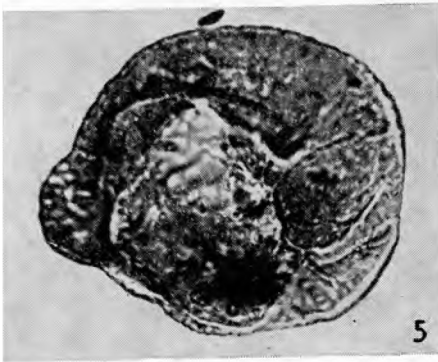
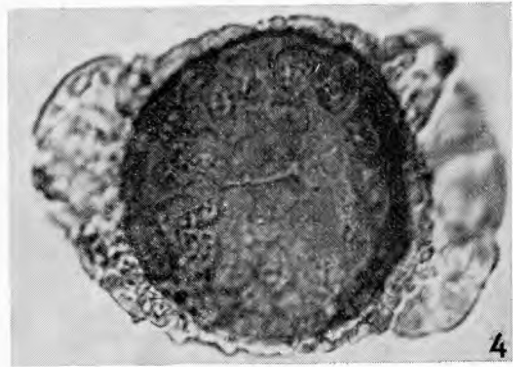
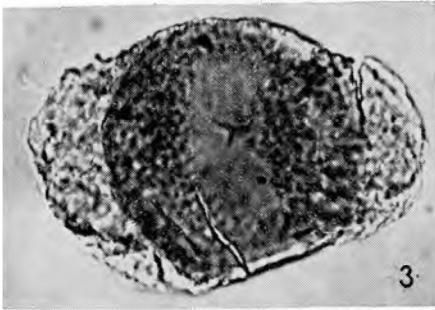
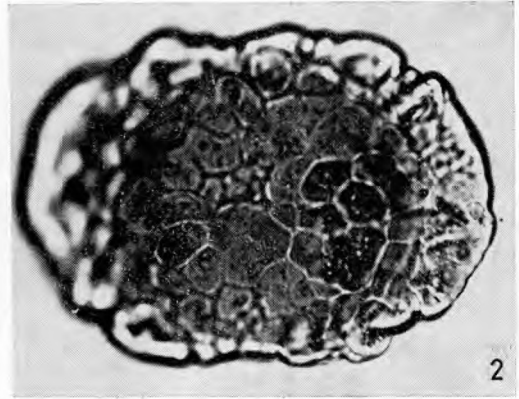
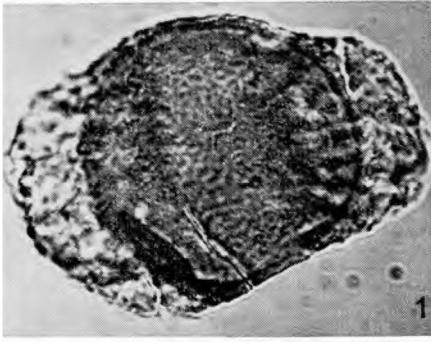


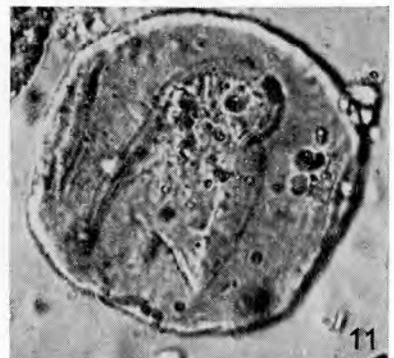
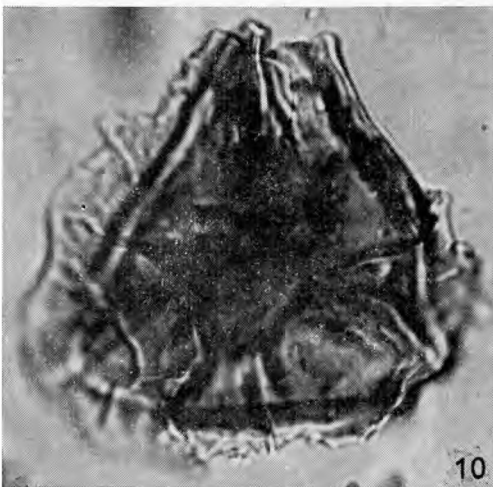
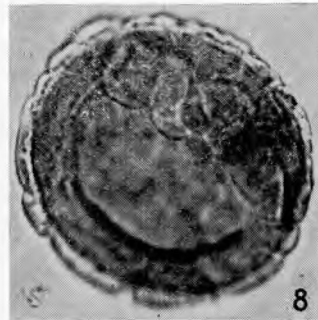
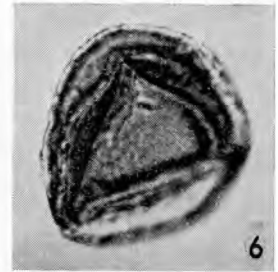
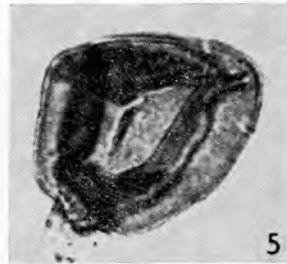
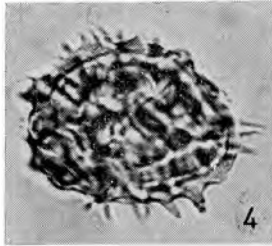
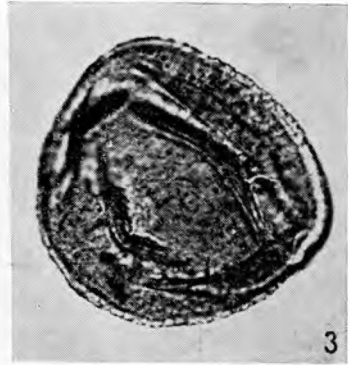
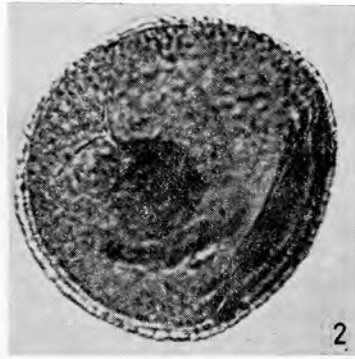
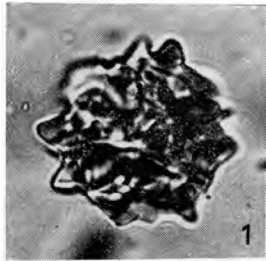
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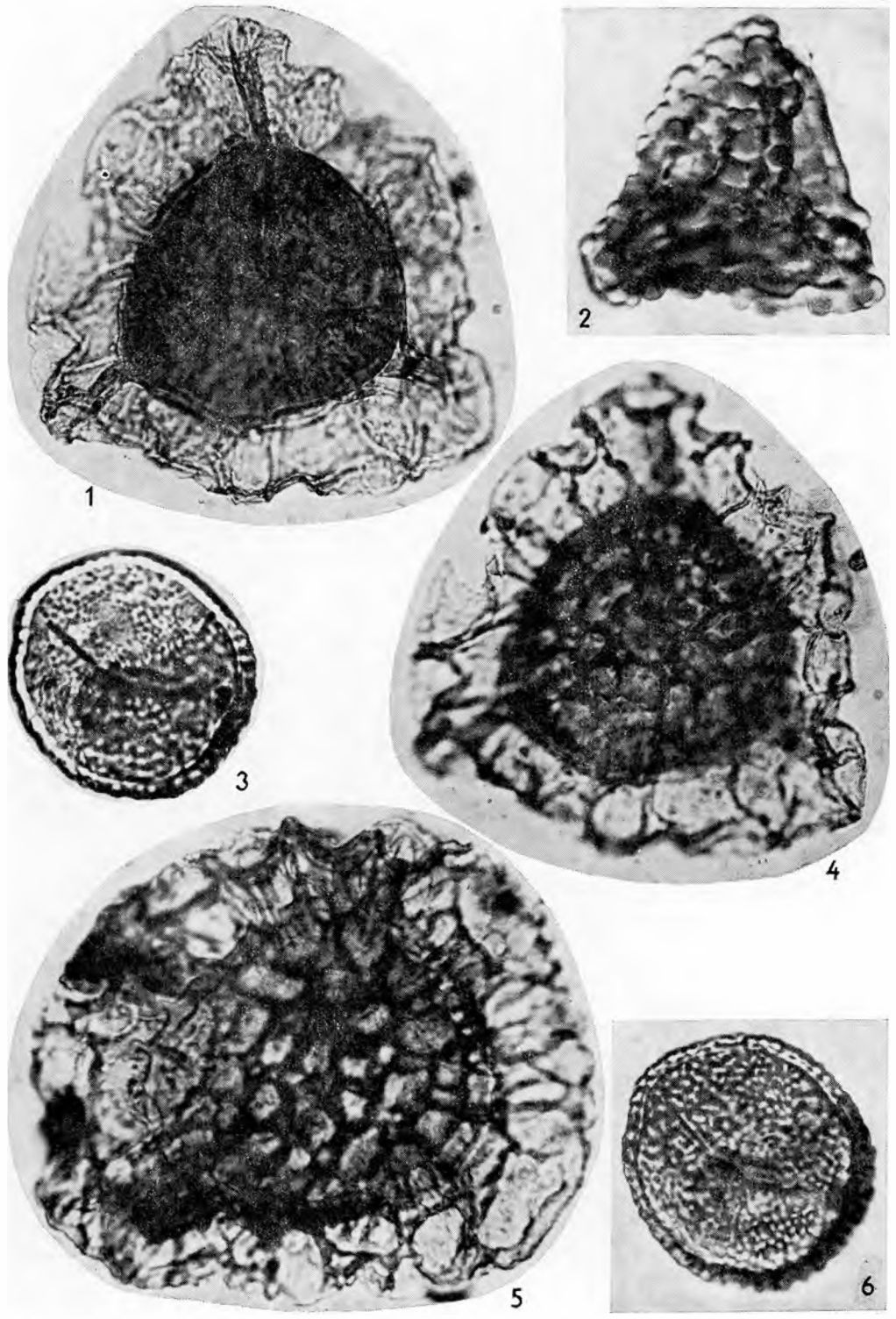


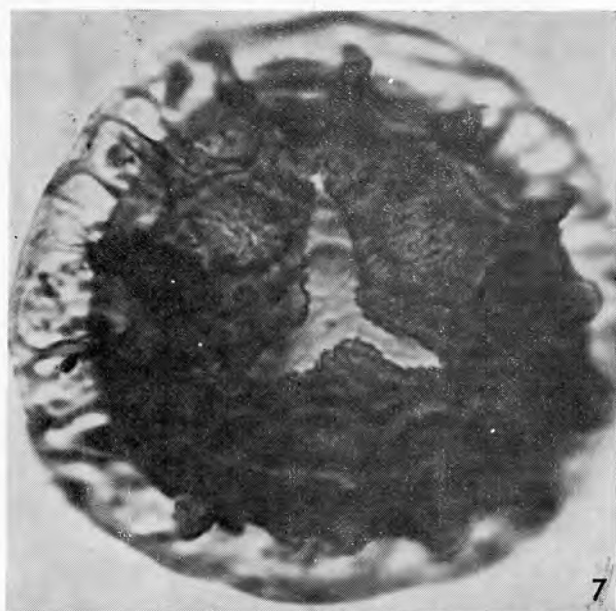
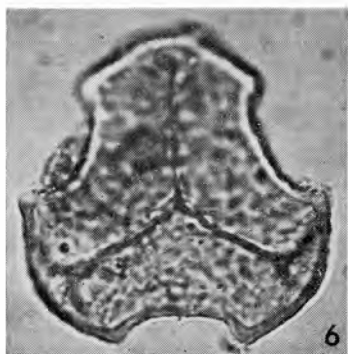
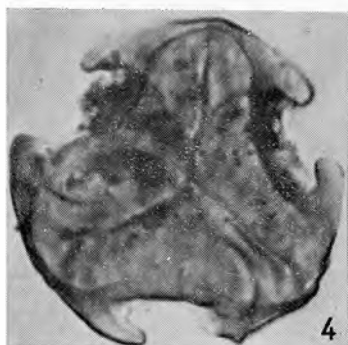
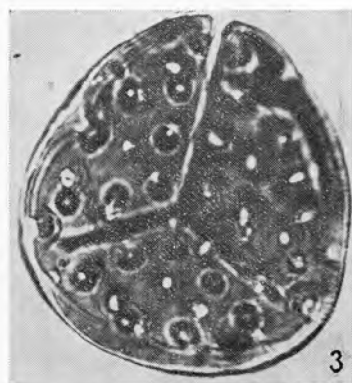
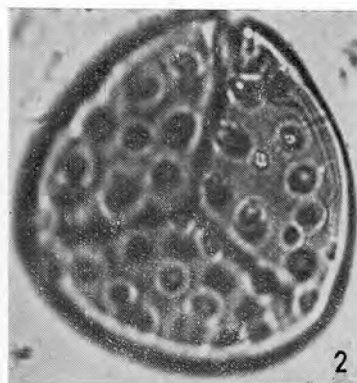
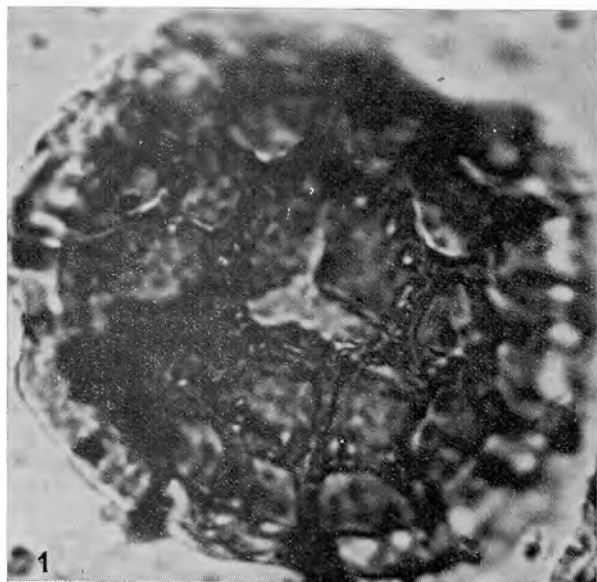
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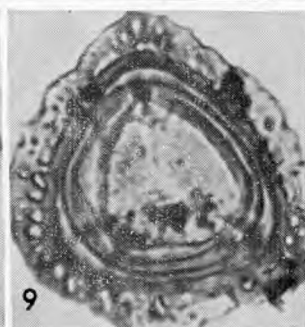
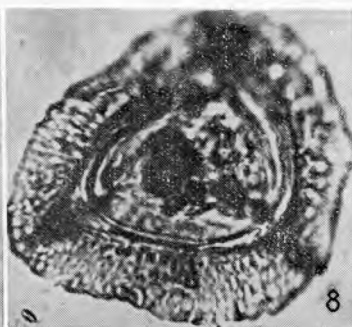
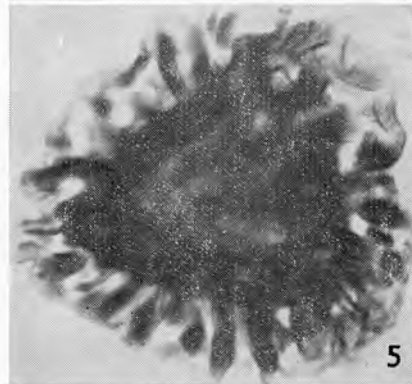
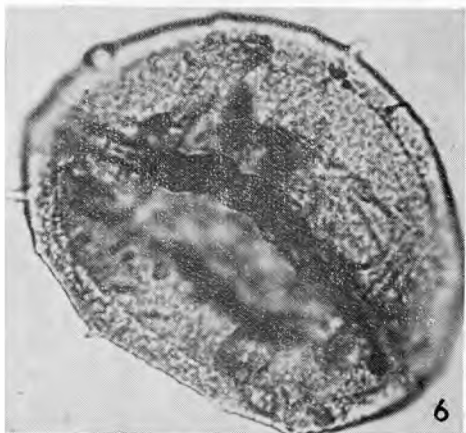
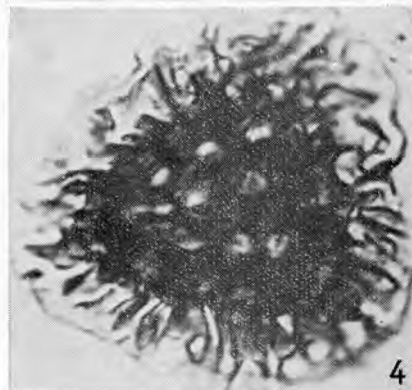
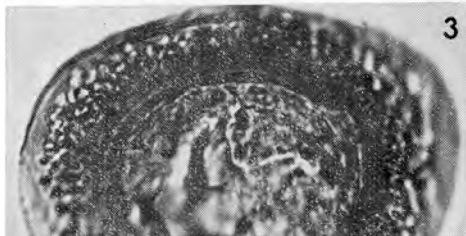
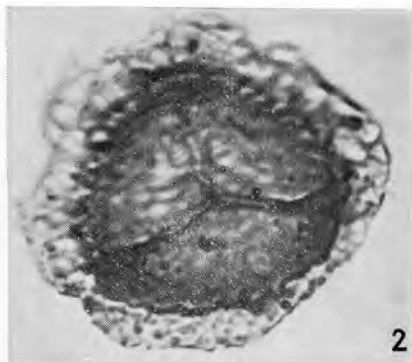
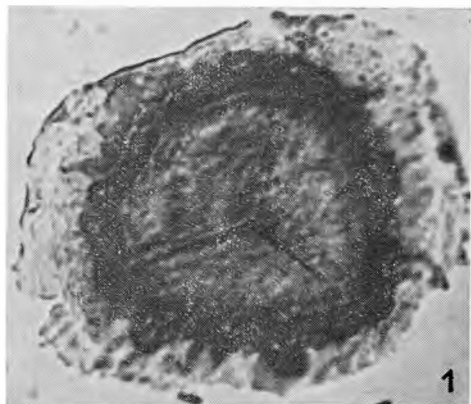


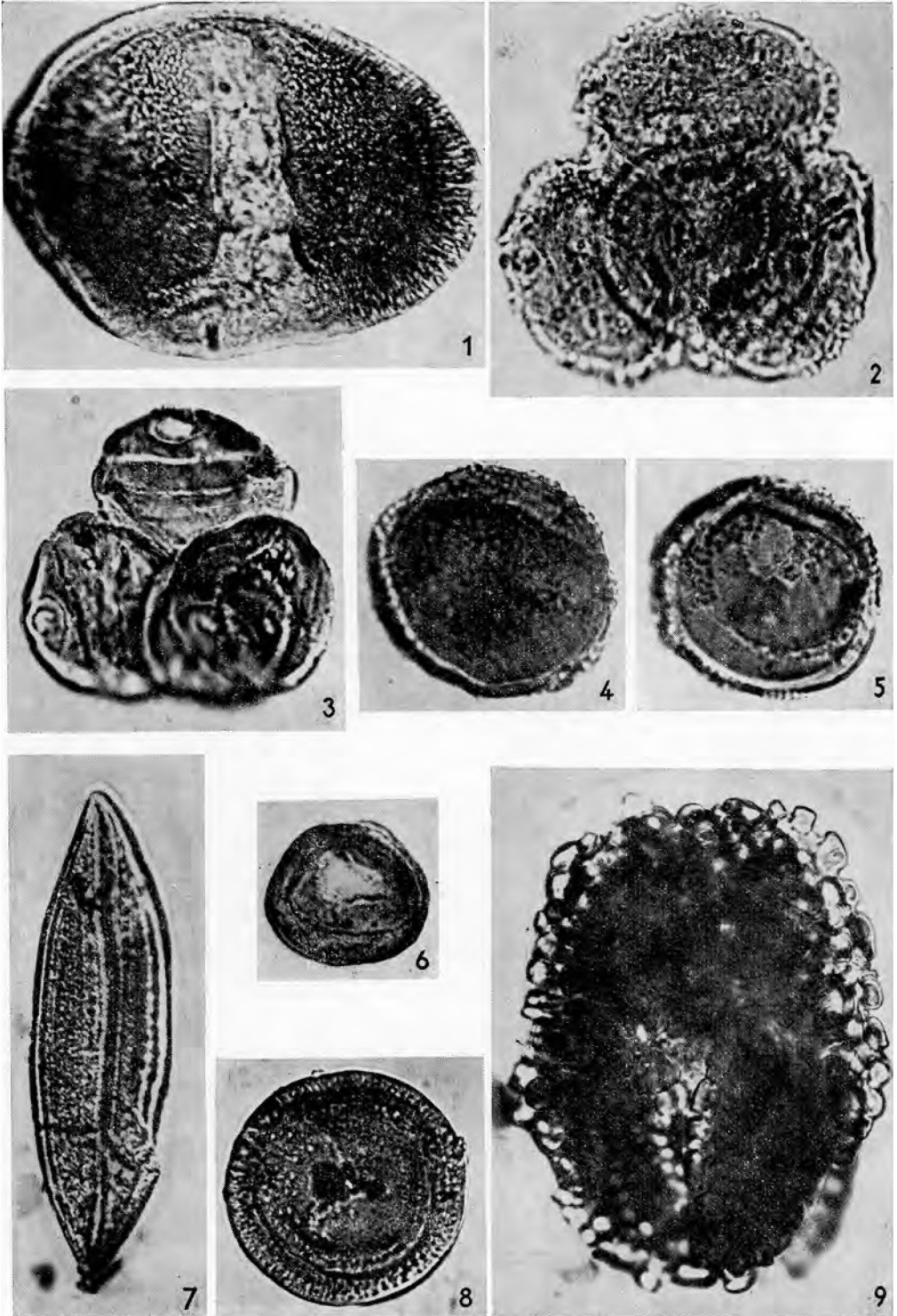


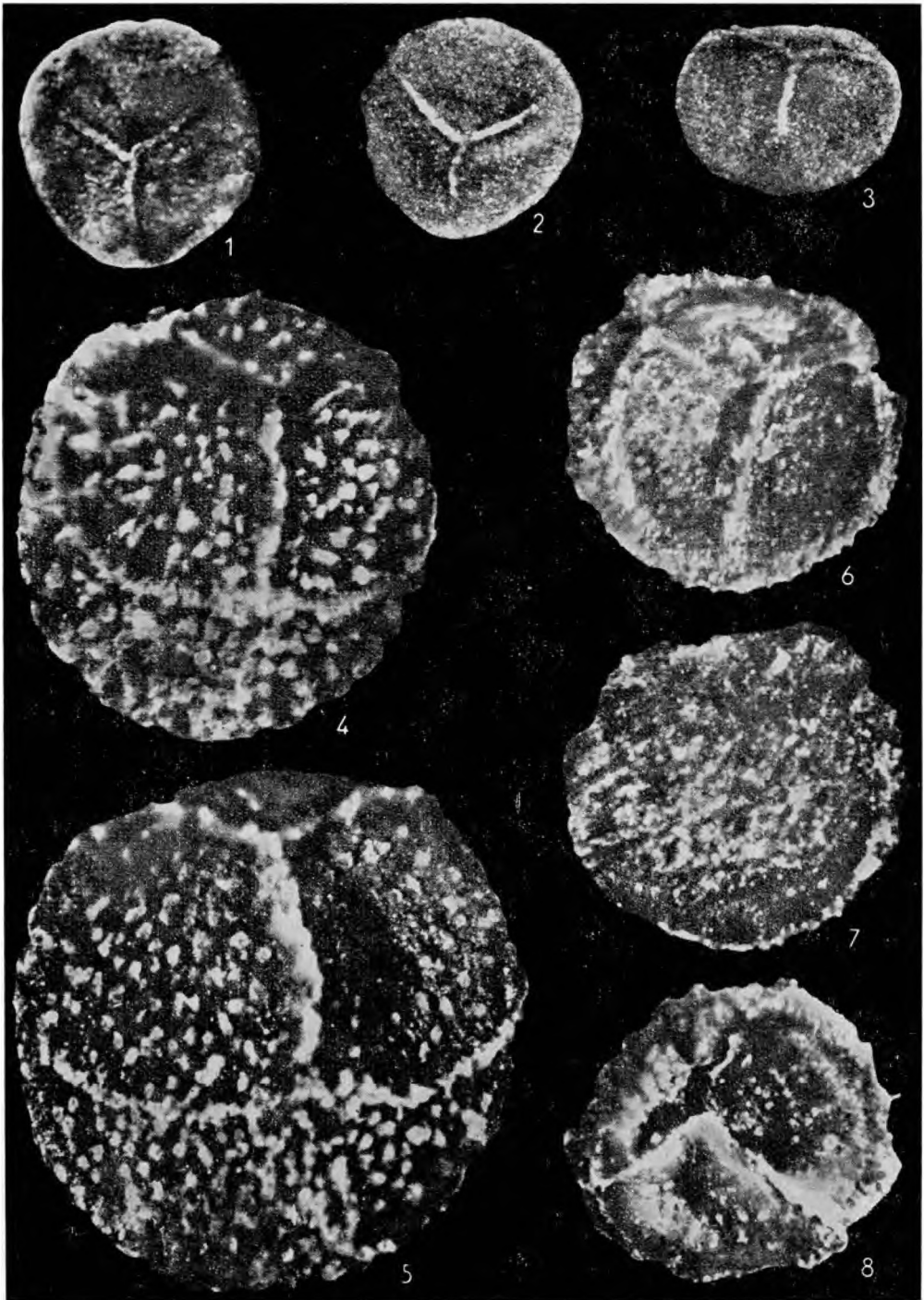


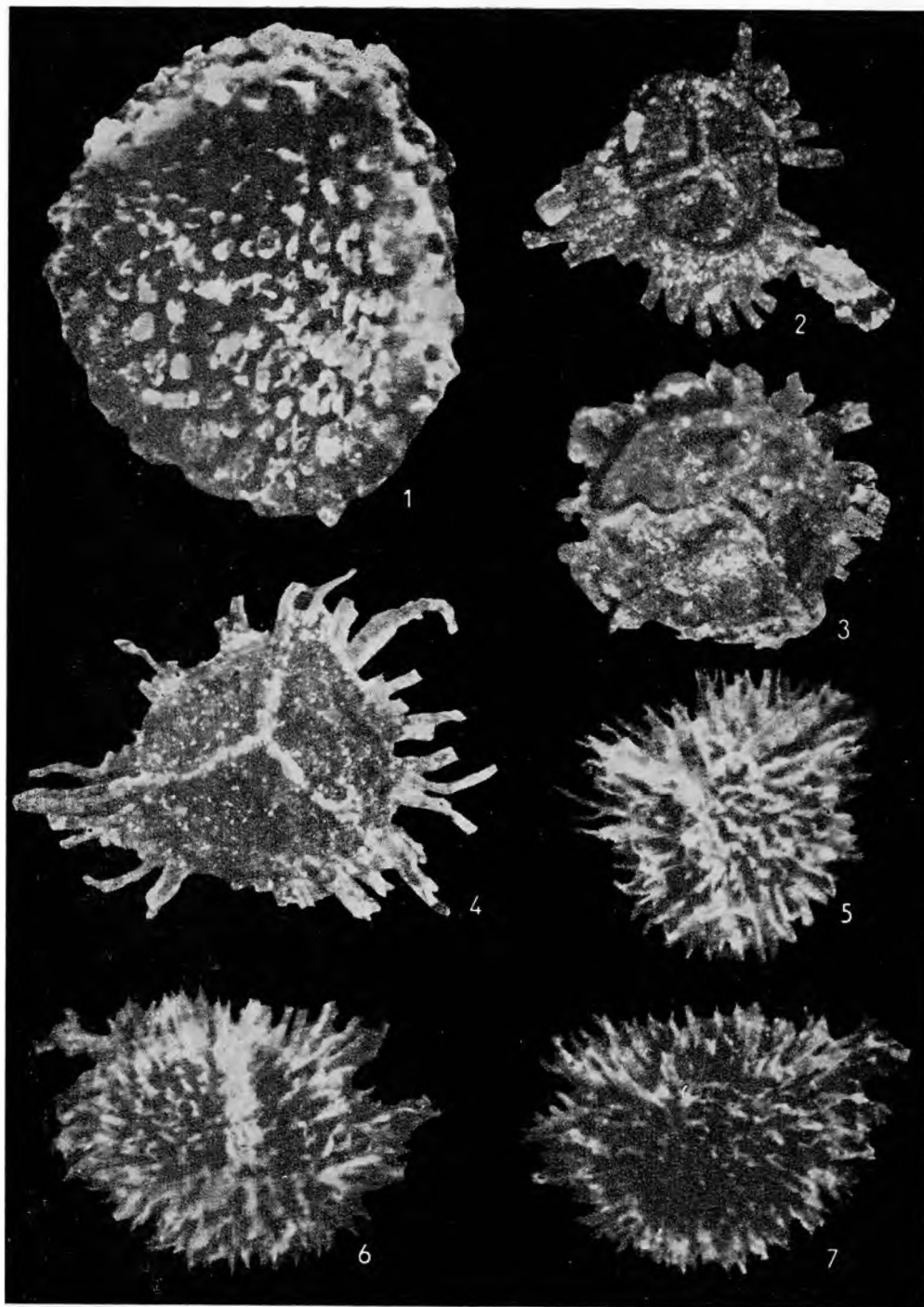


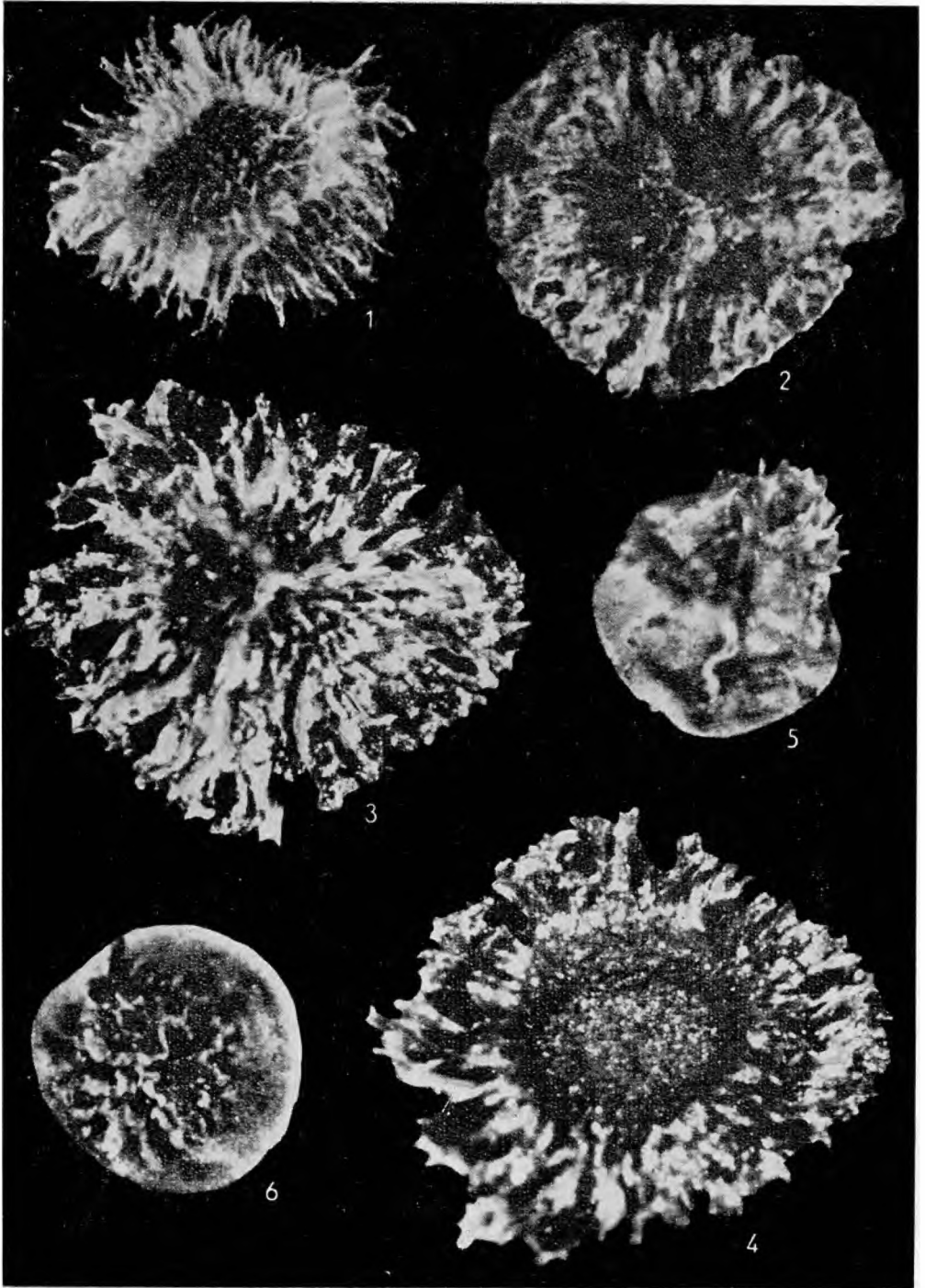


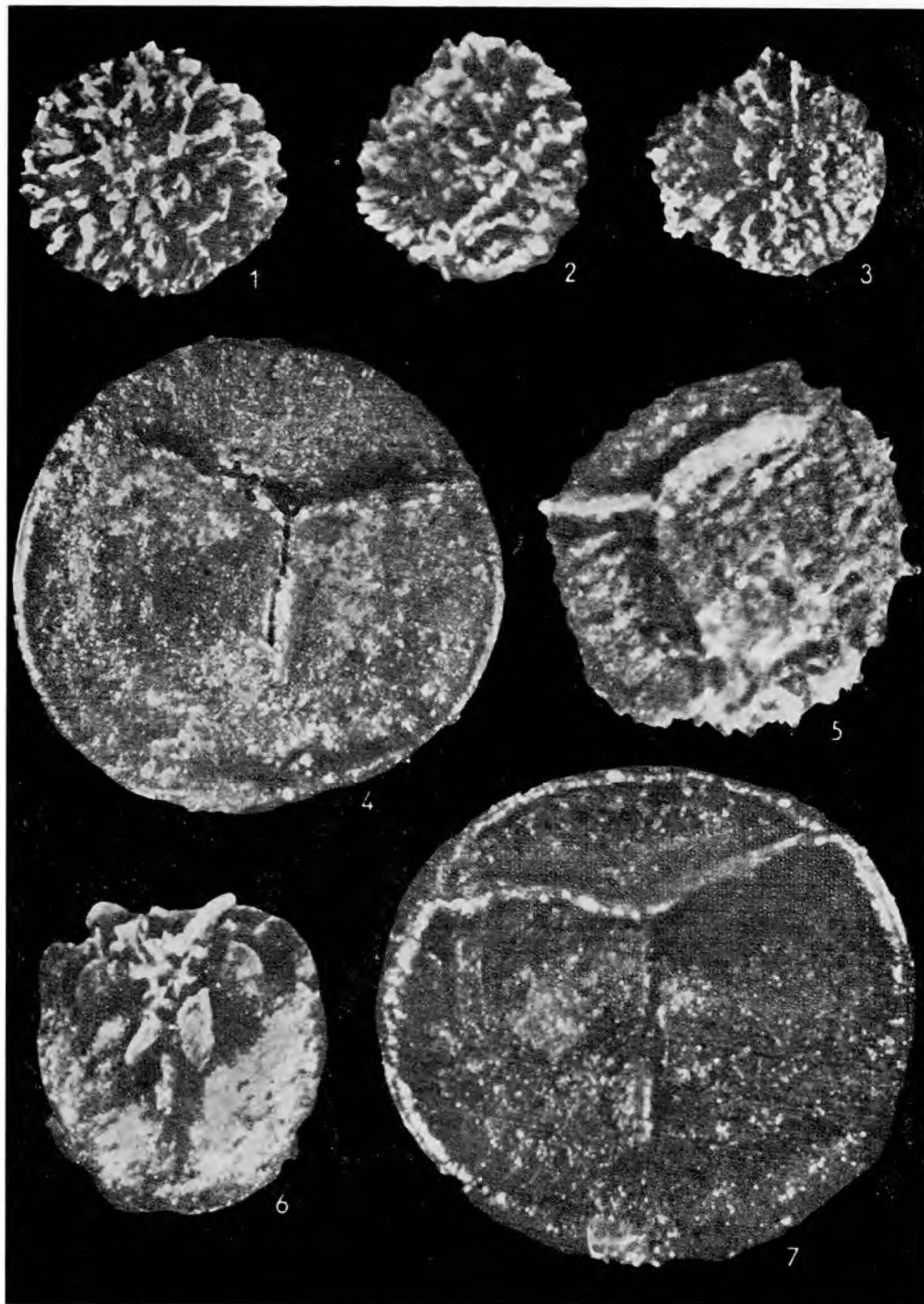


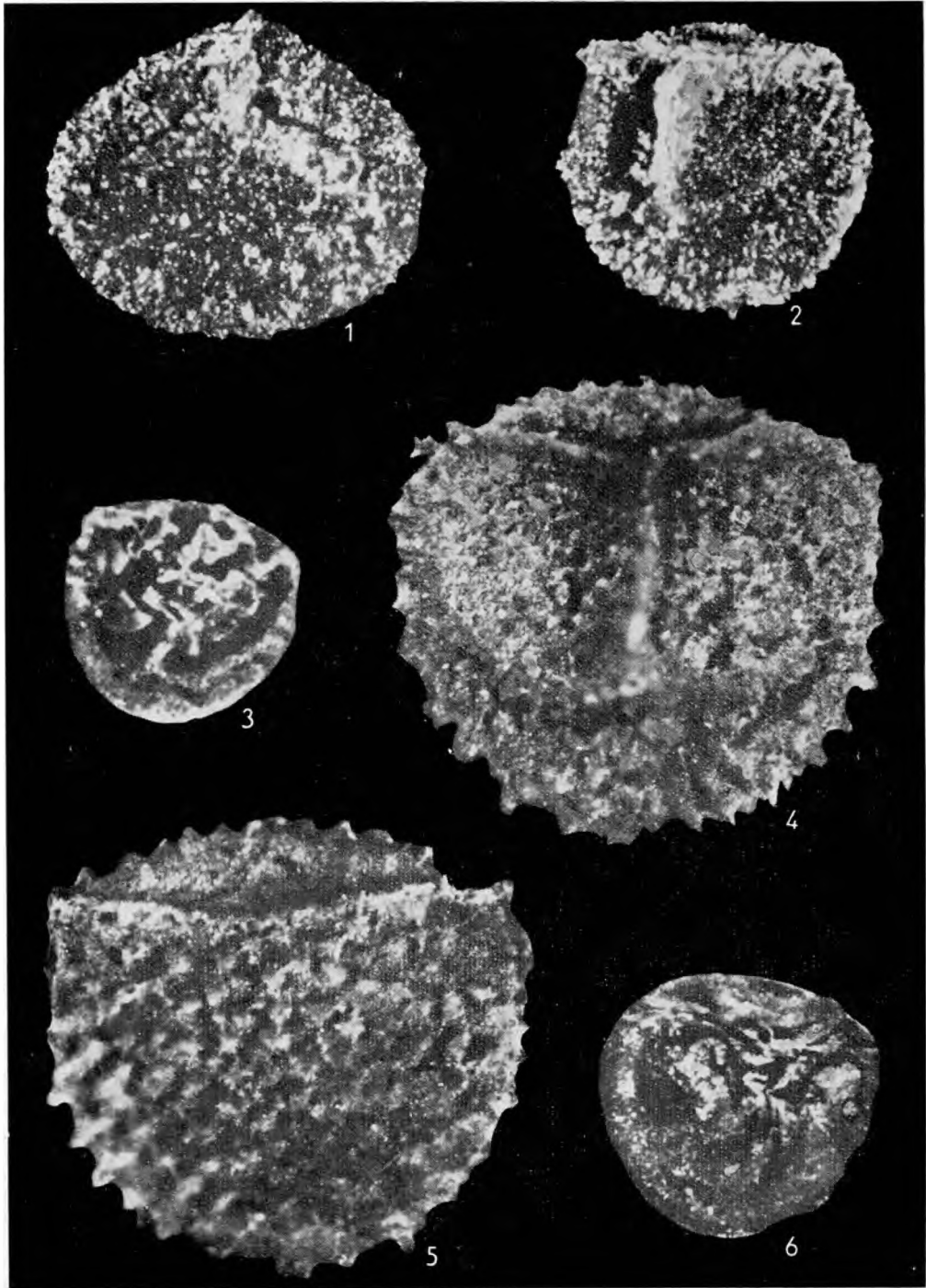


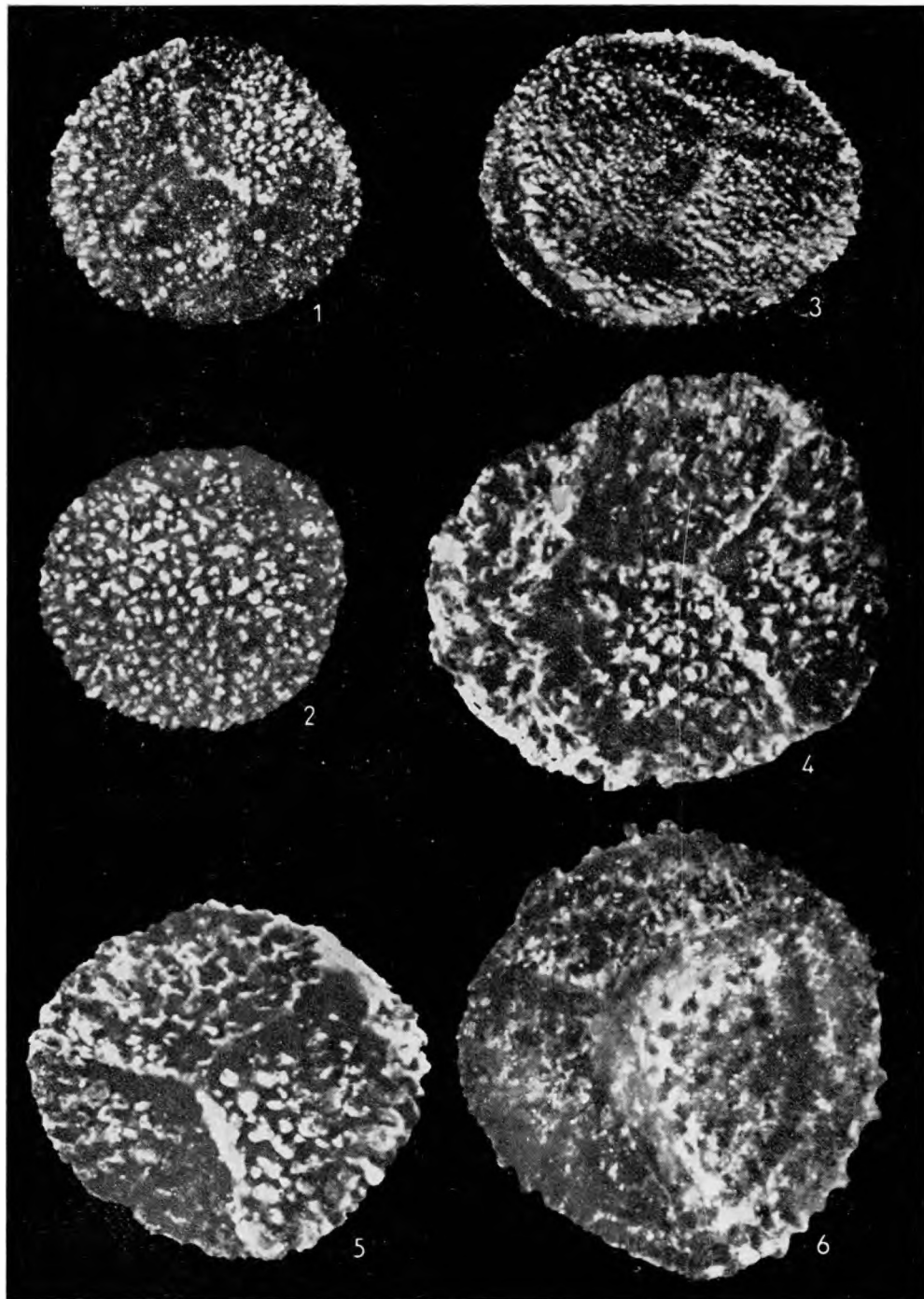


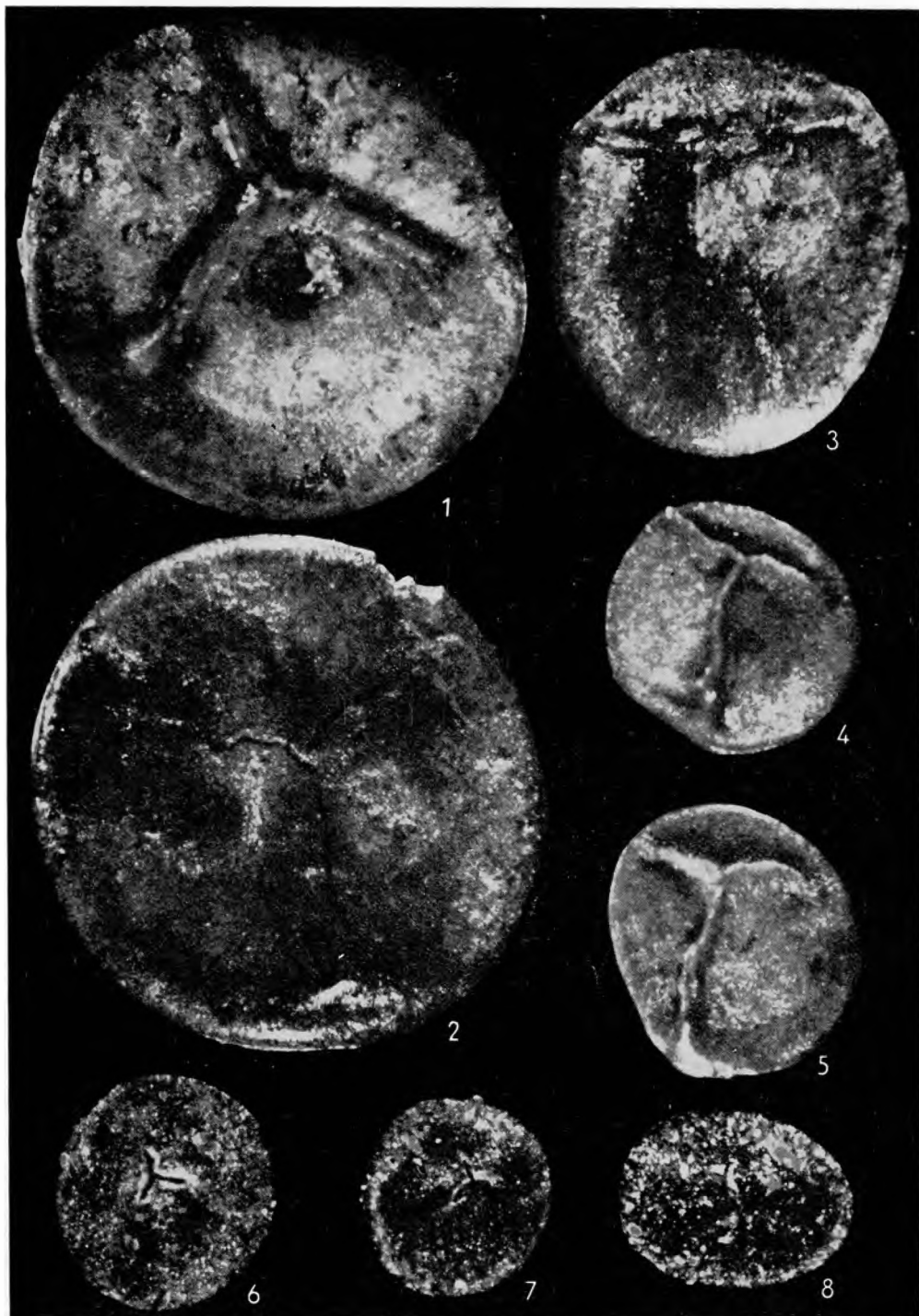


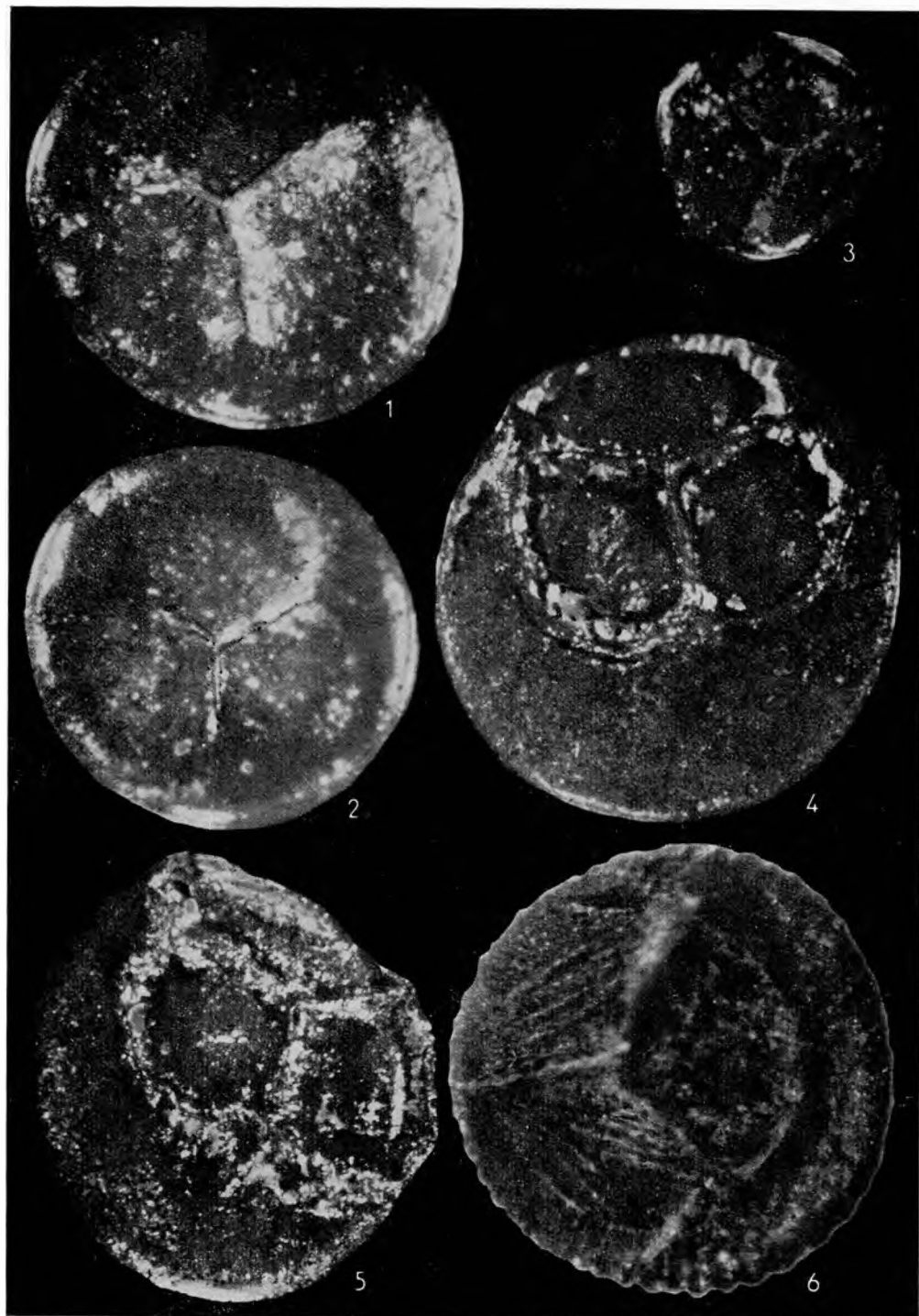


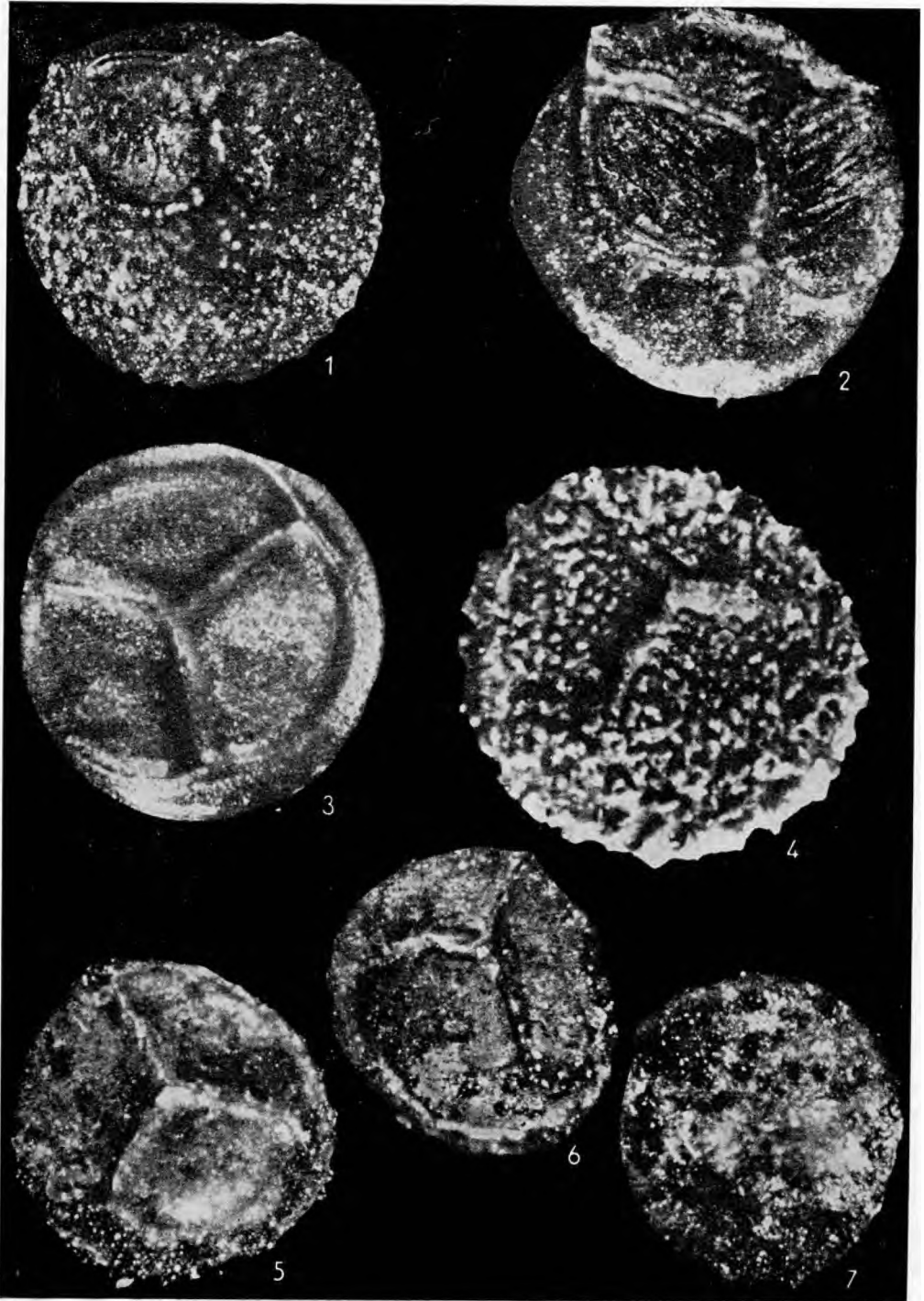


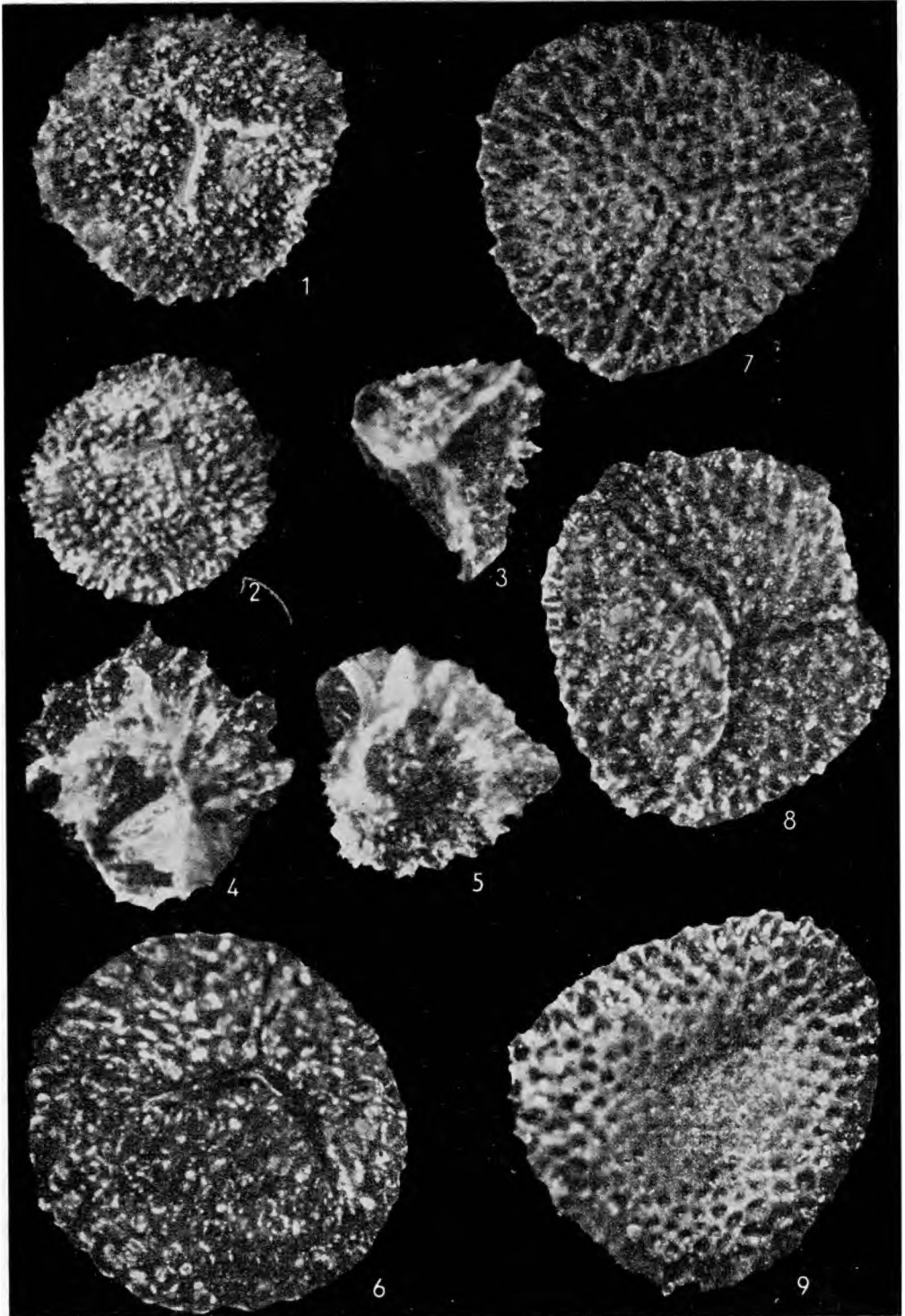








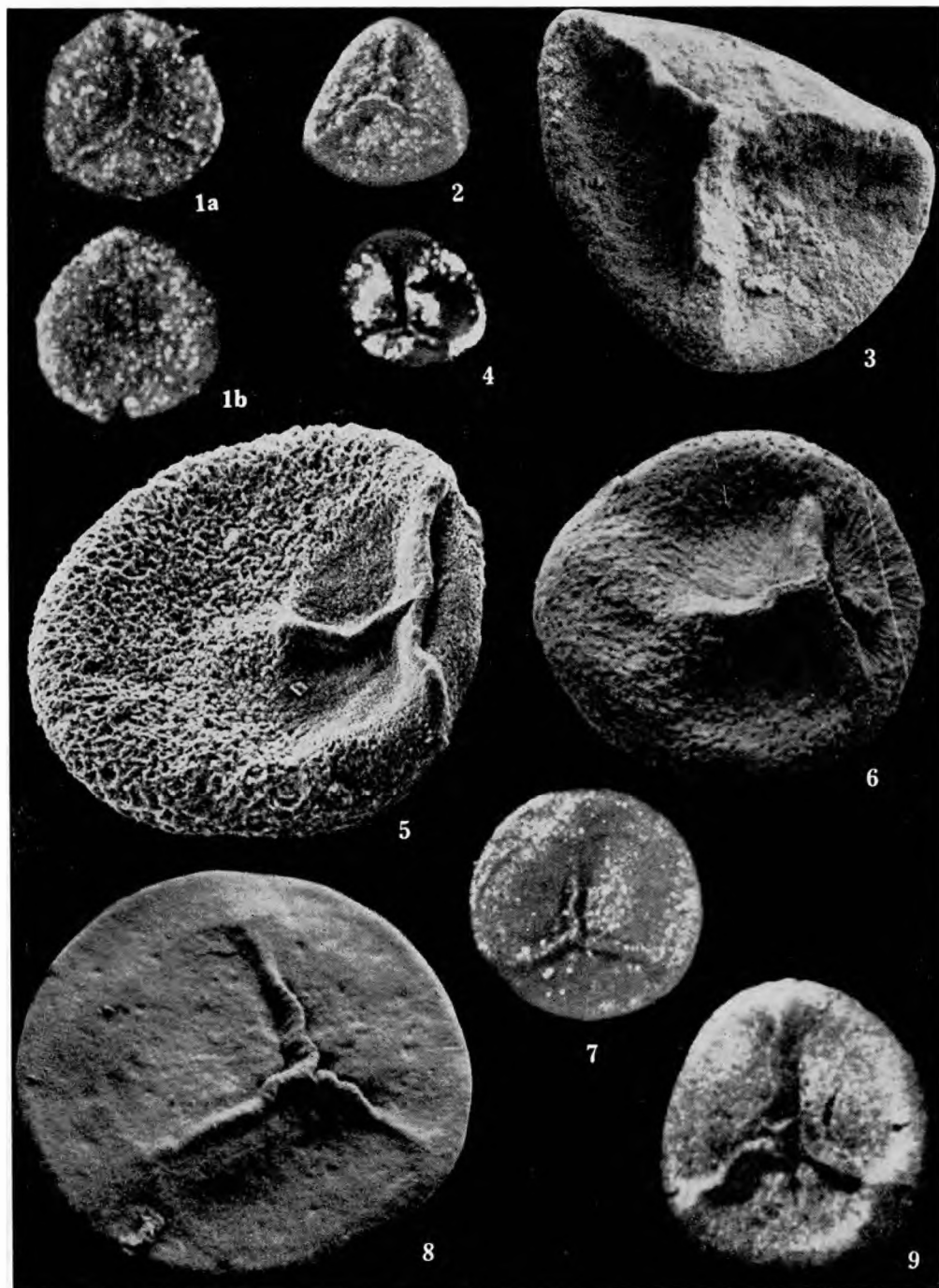


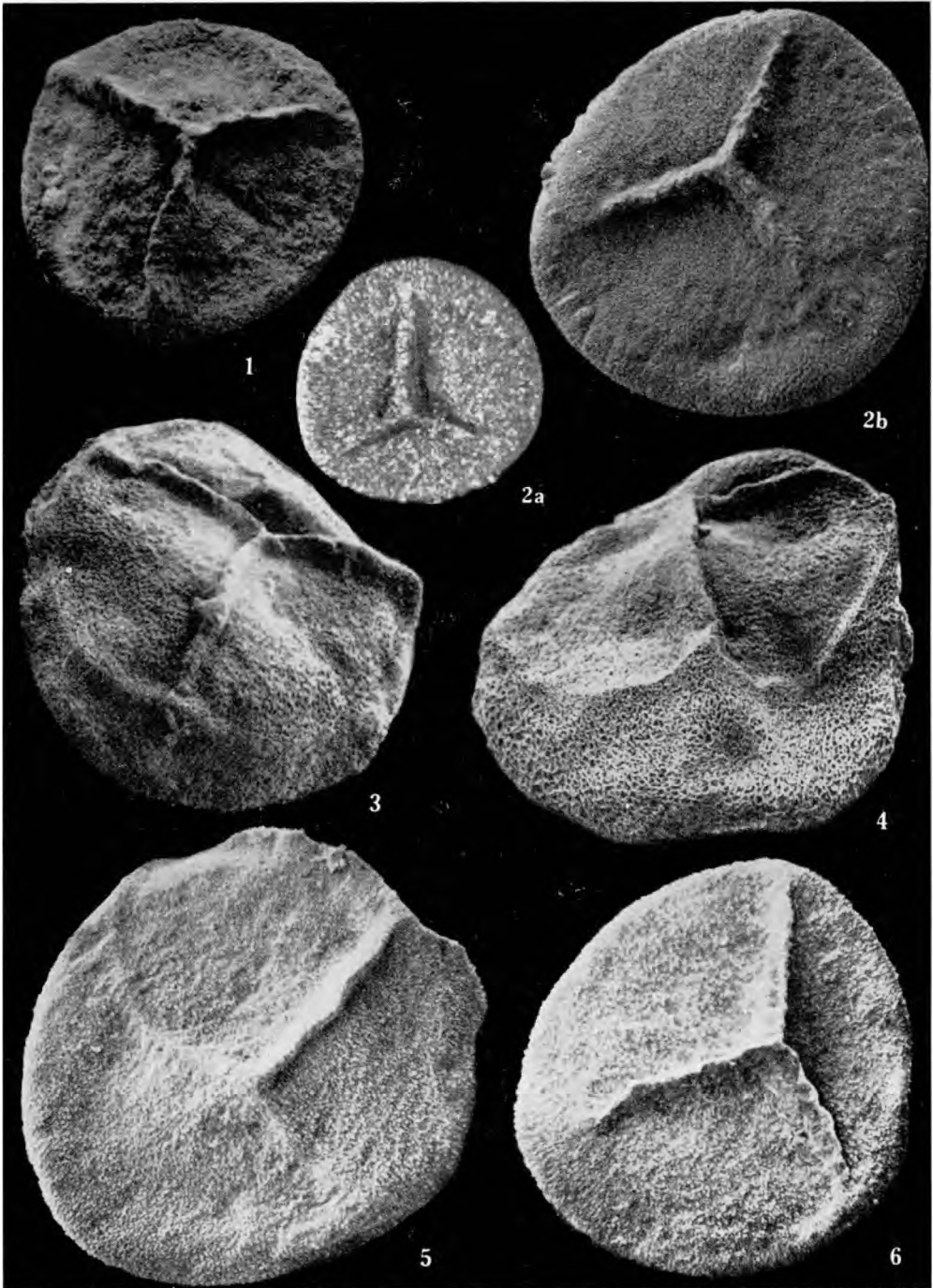


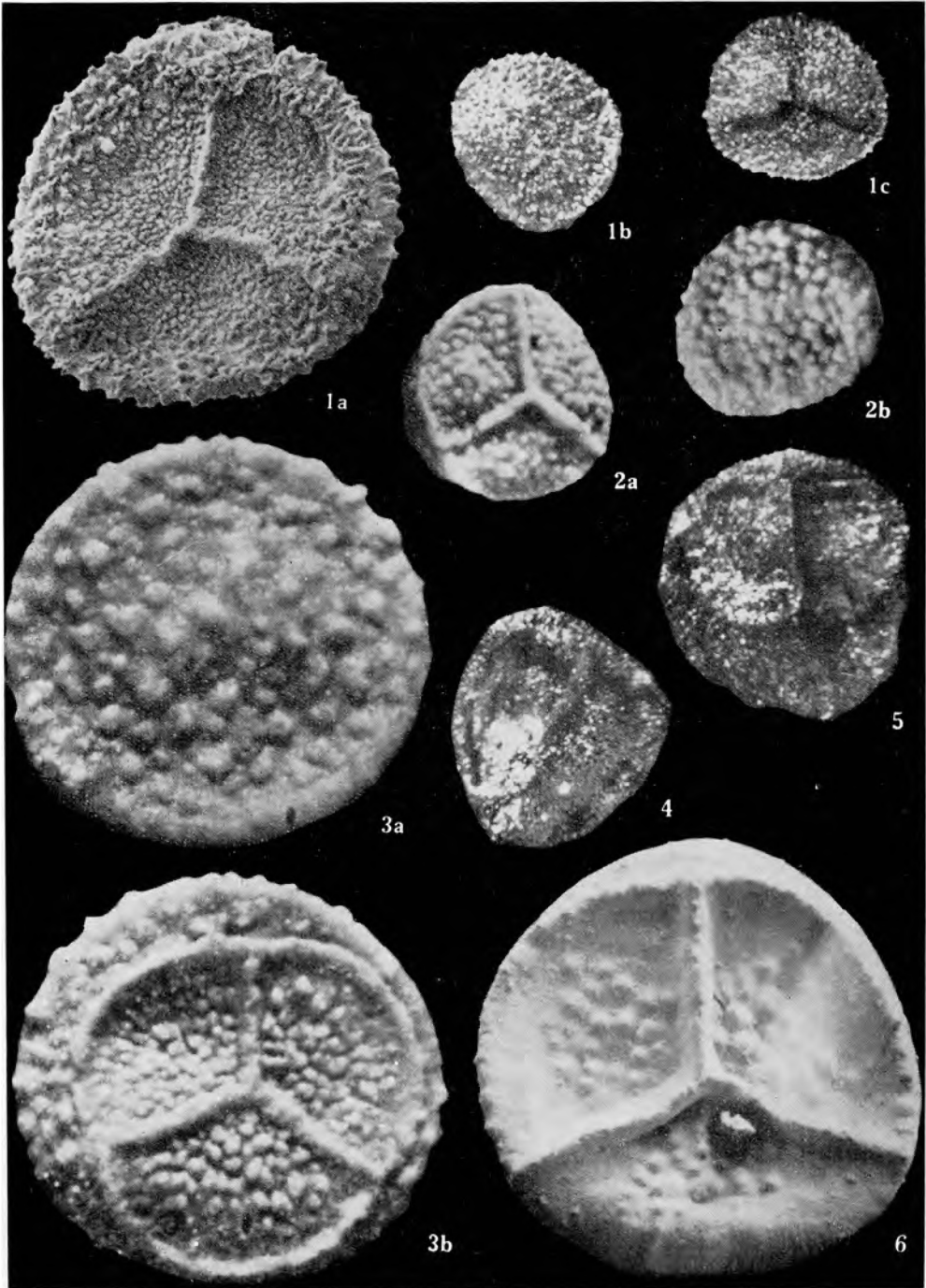
Geology of Poland. V. III, part 2a — Triassic

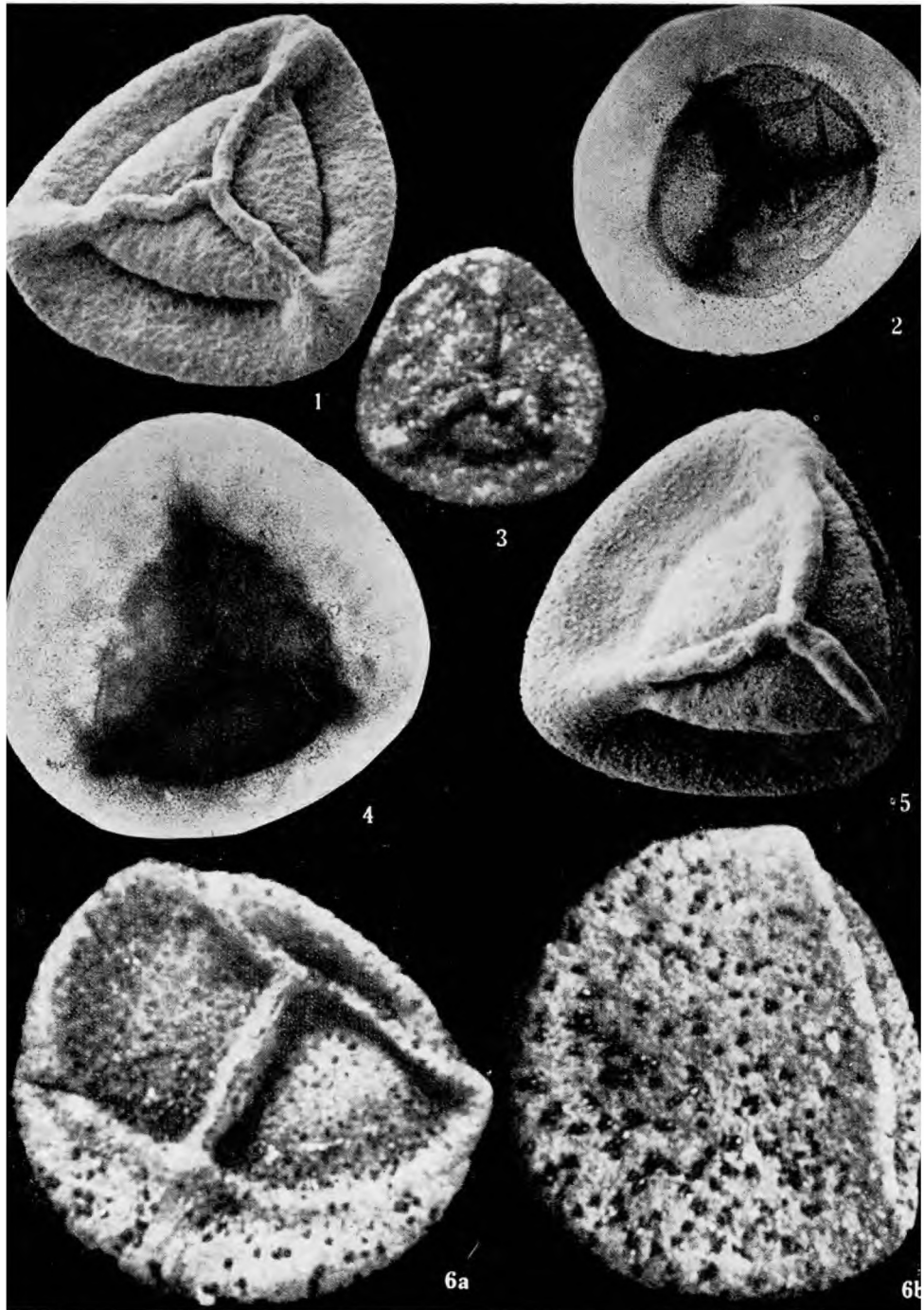


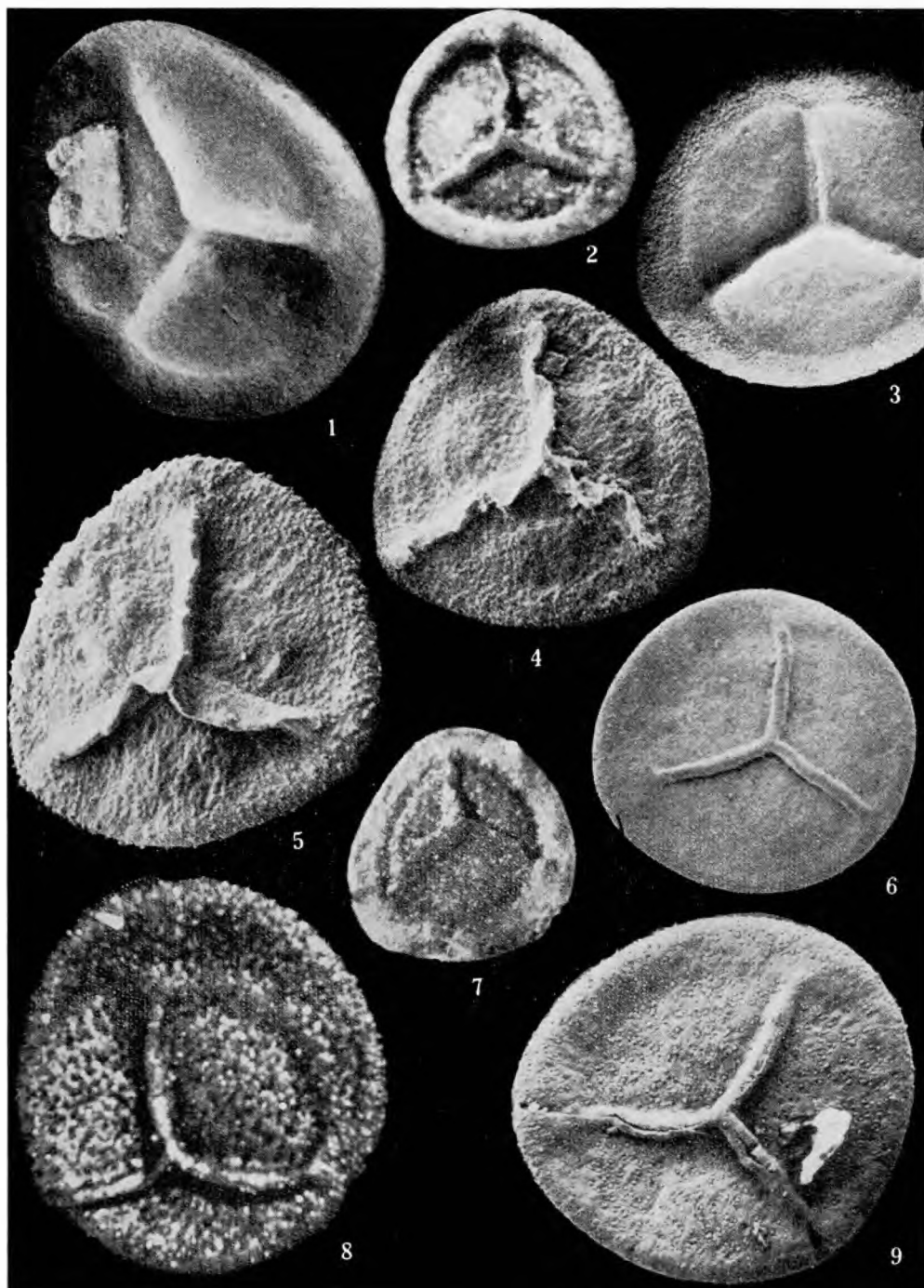


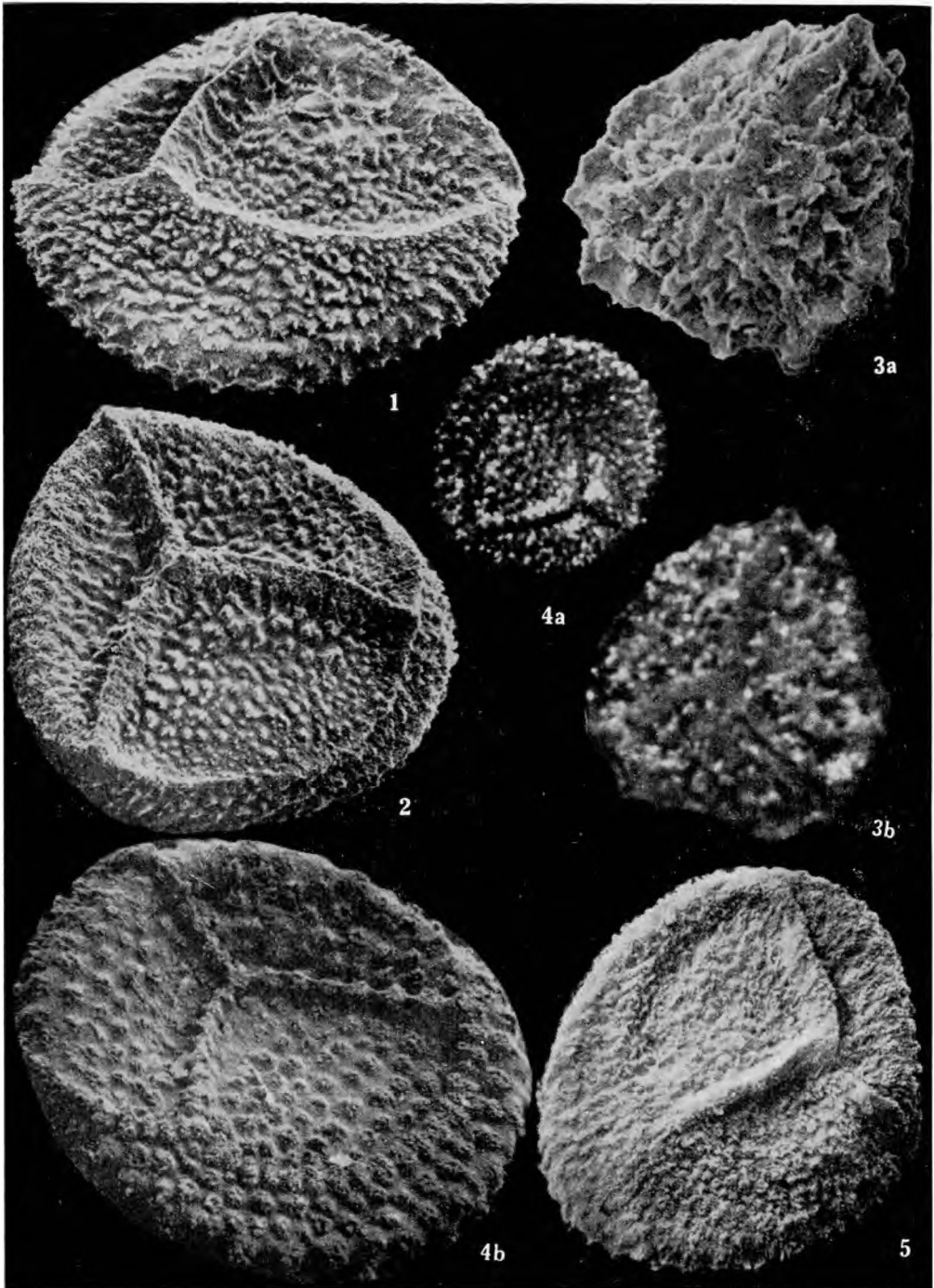


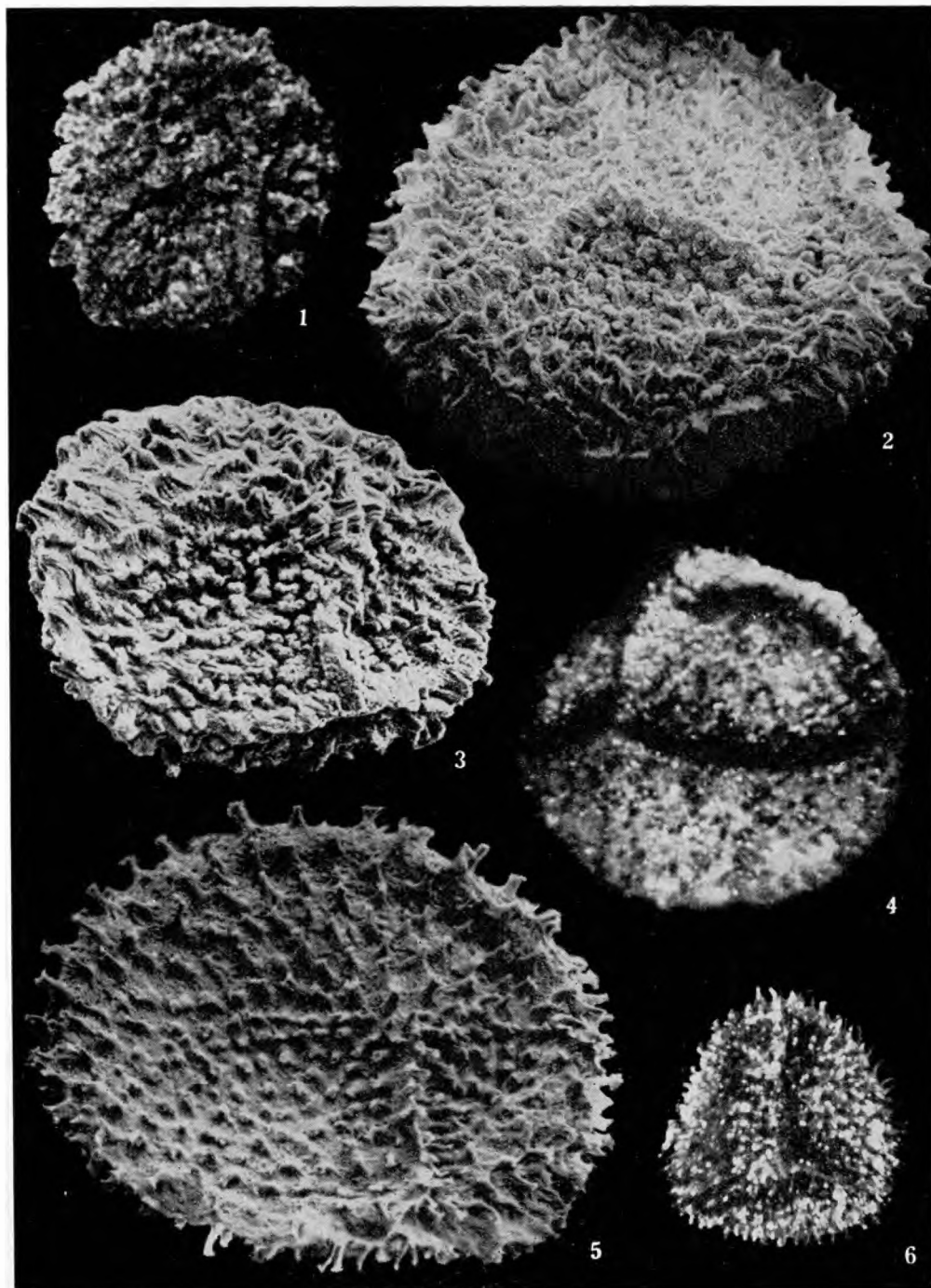


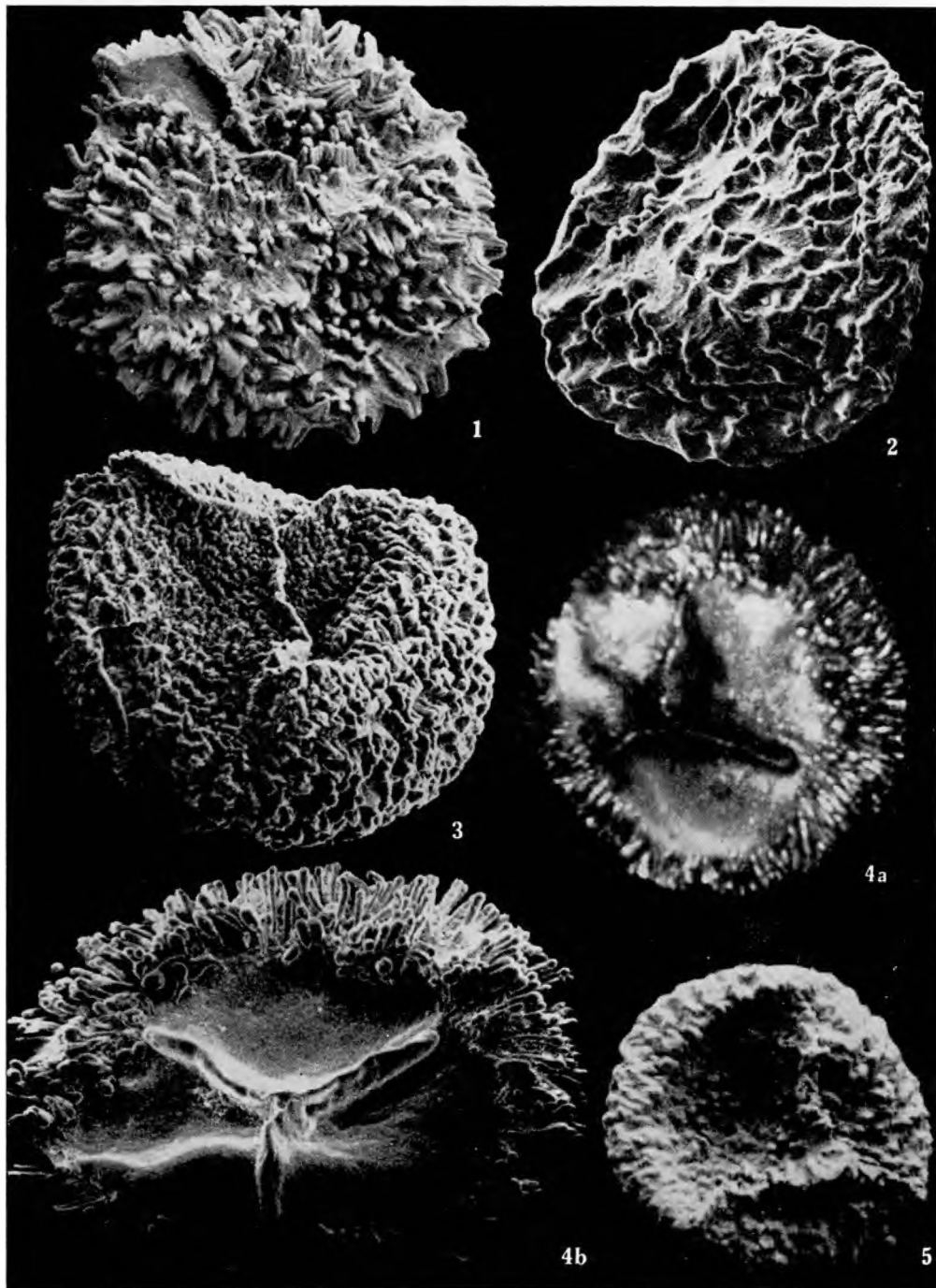


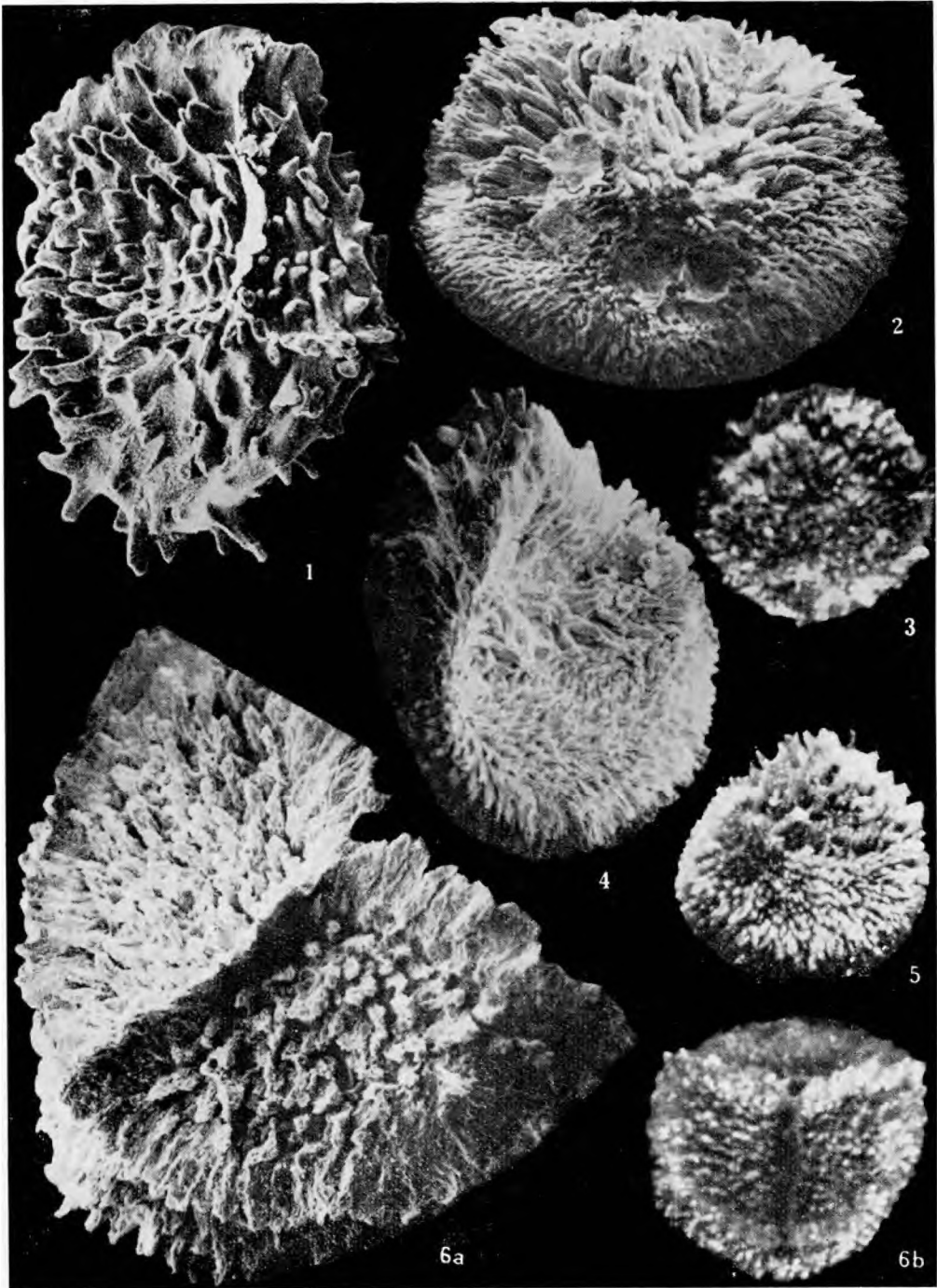


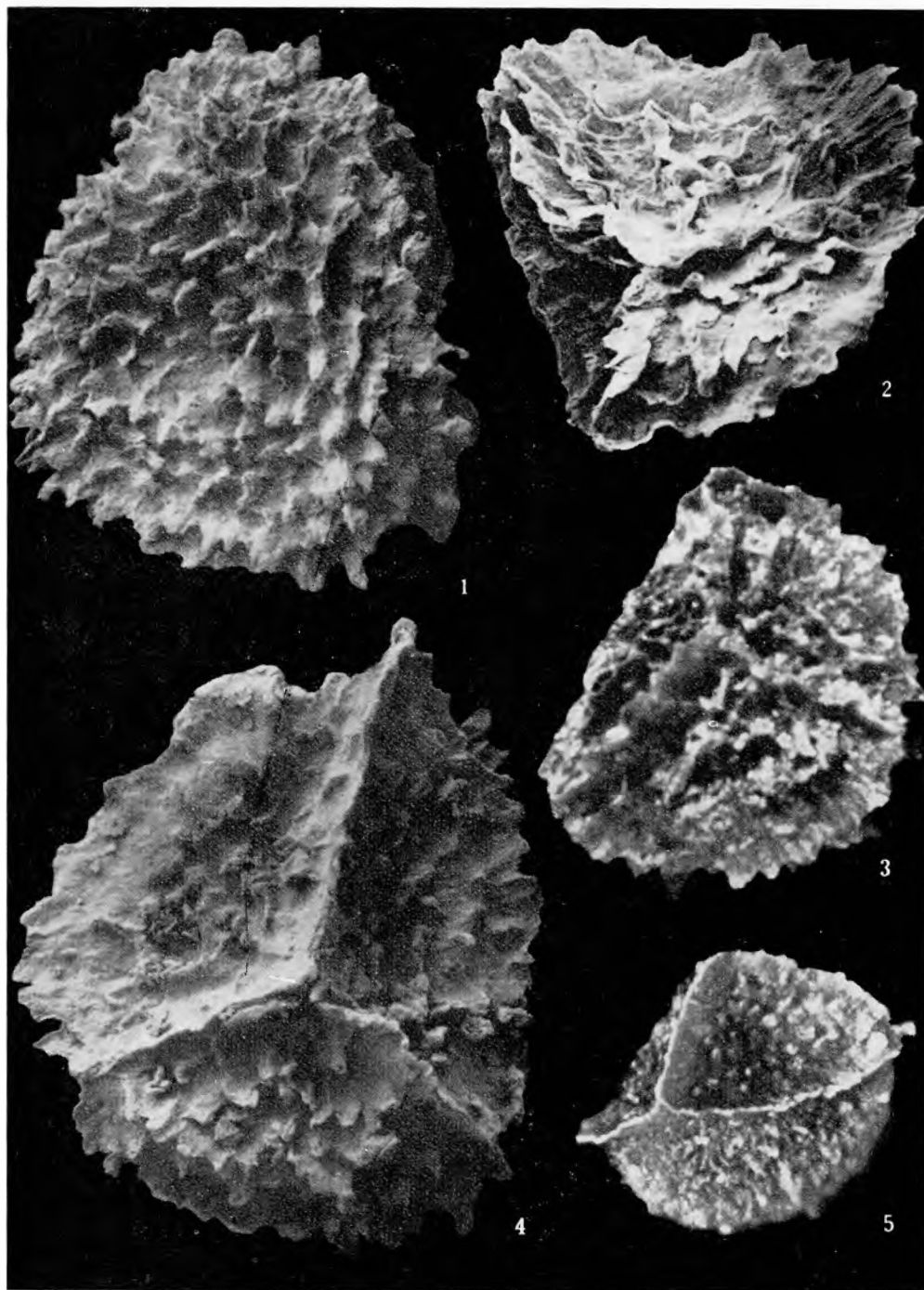


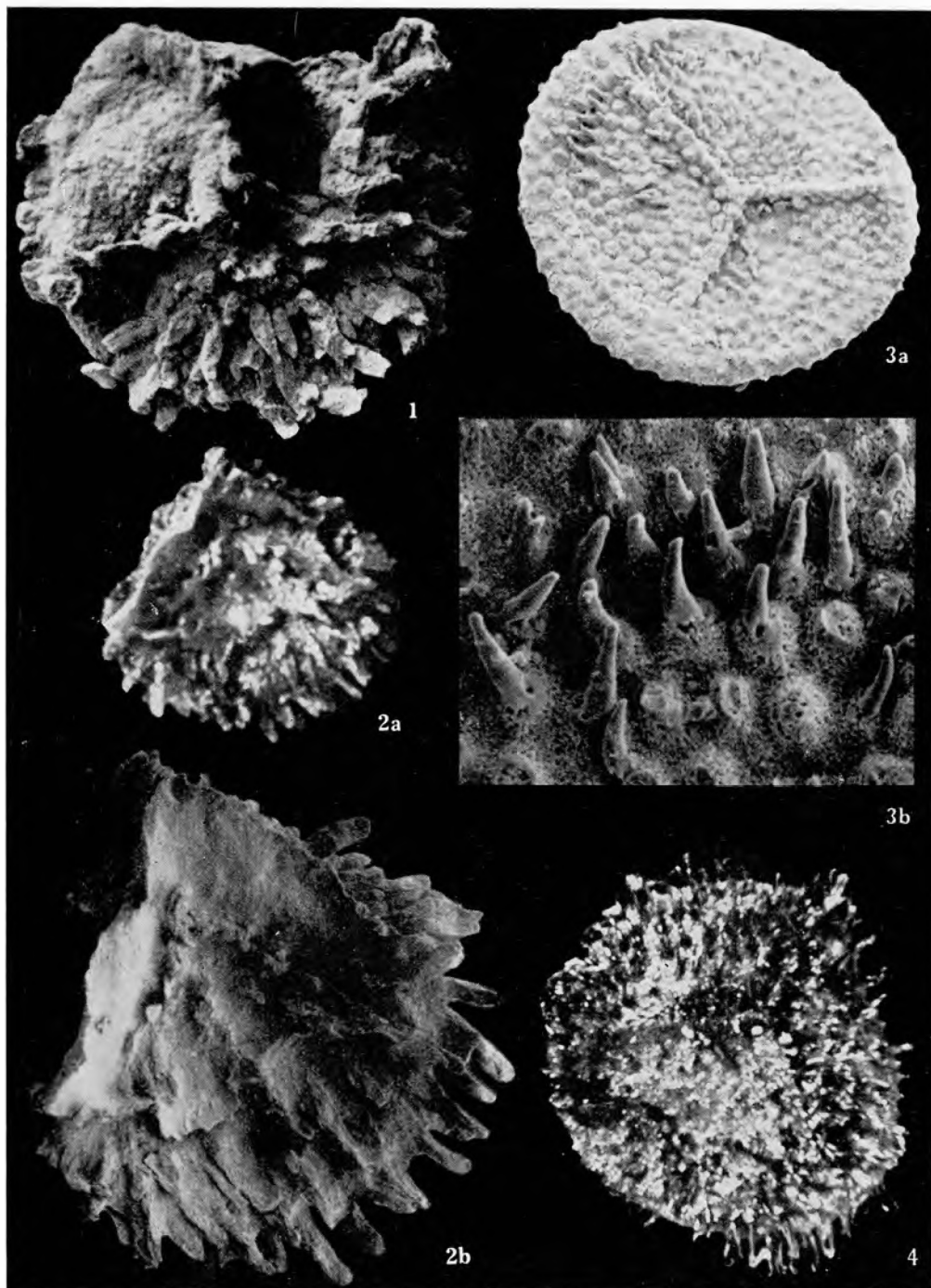


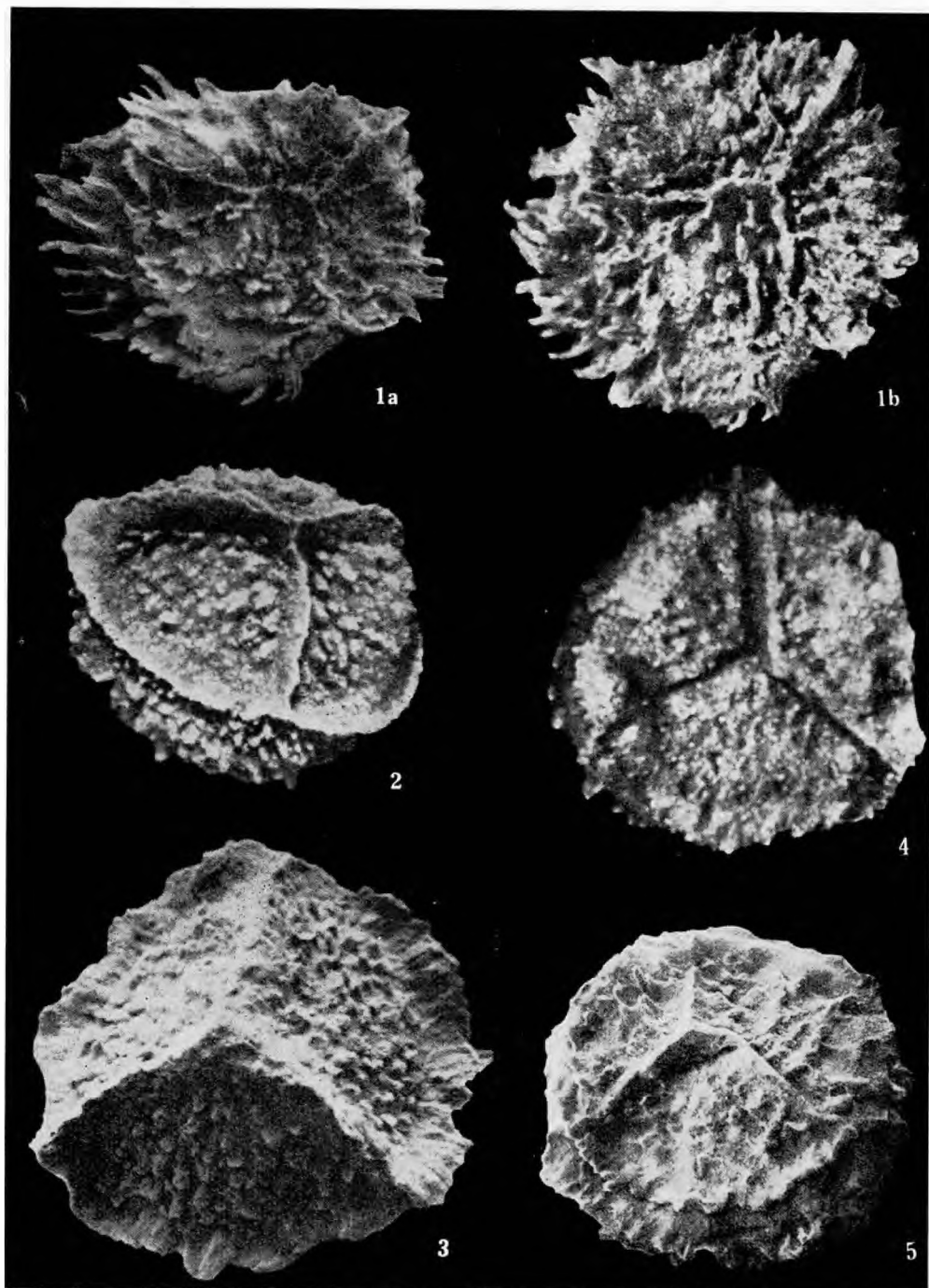


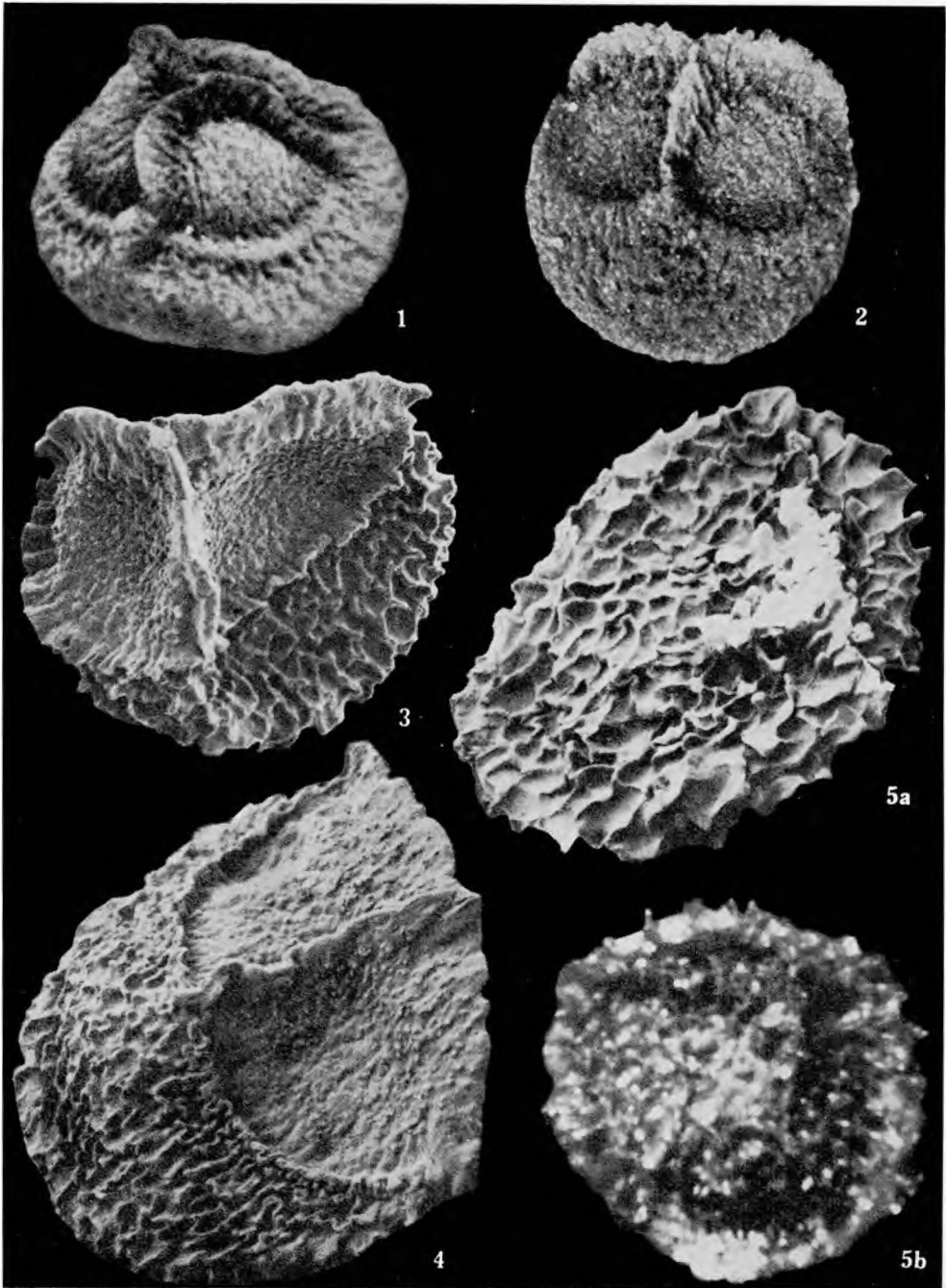




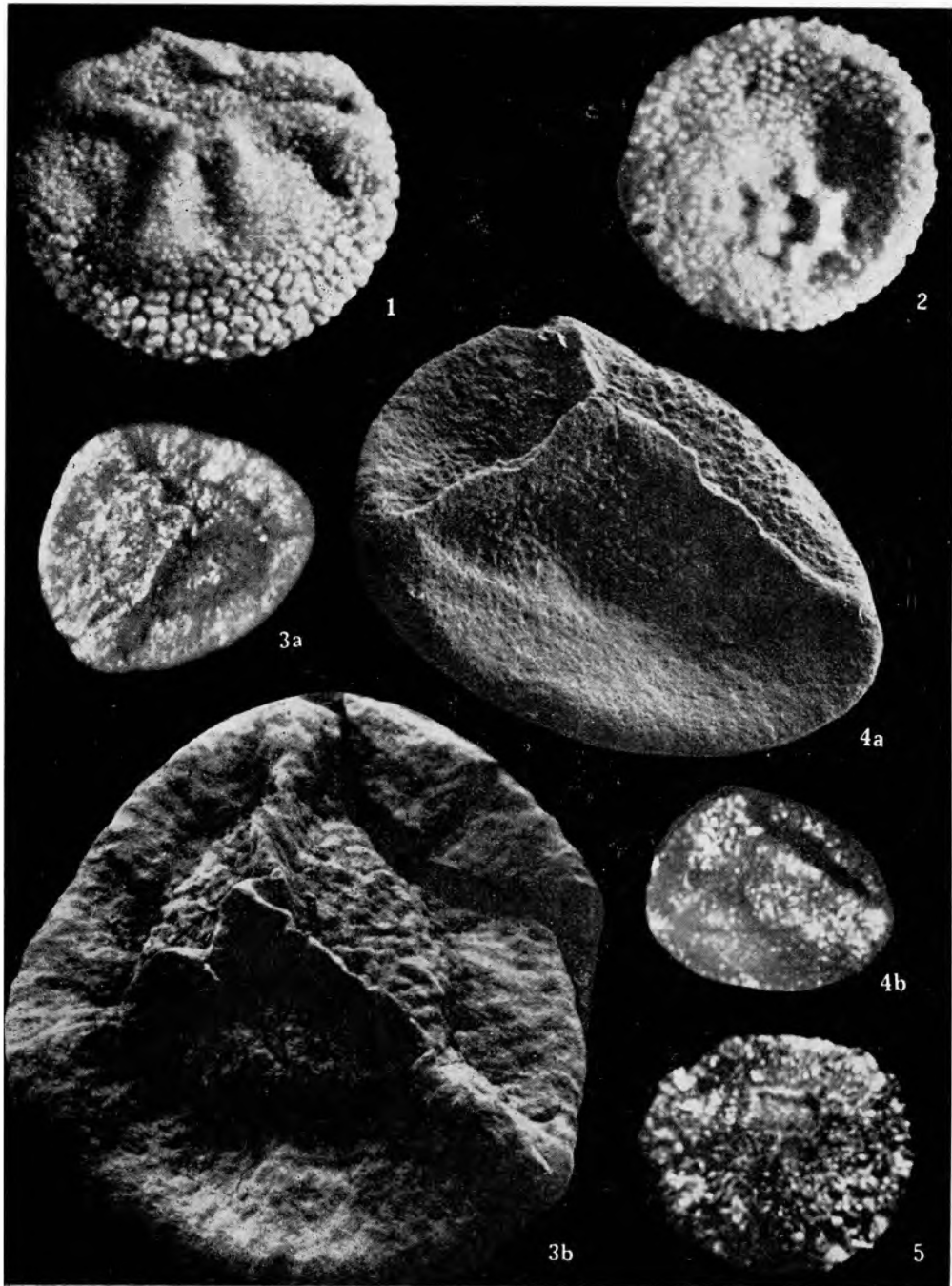


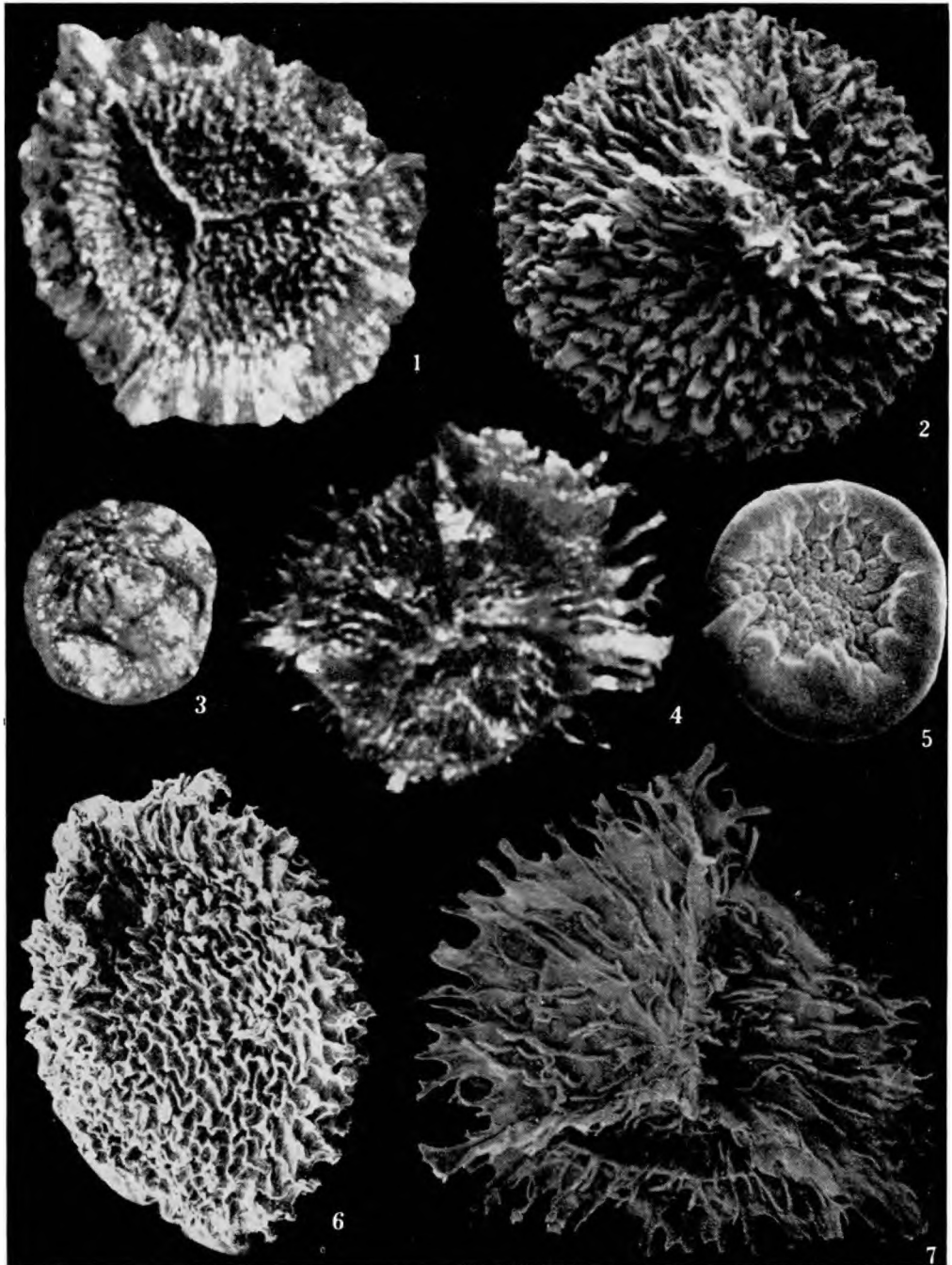




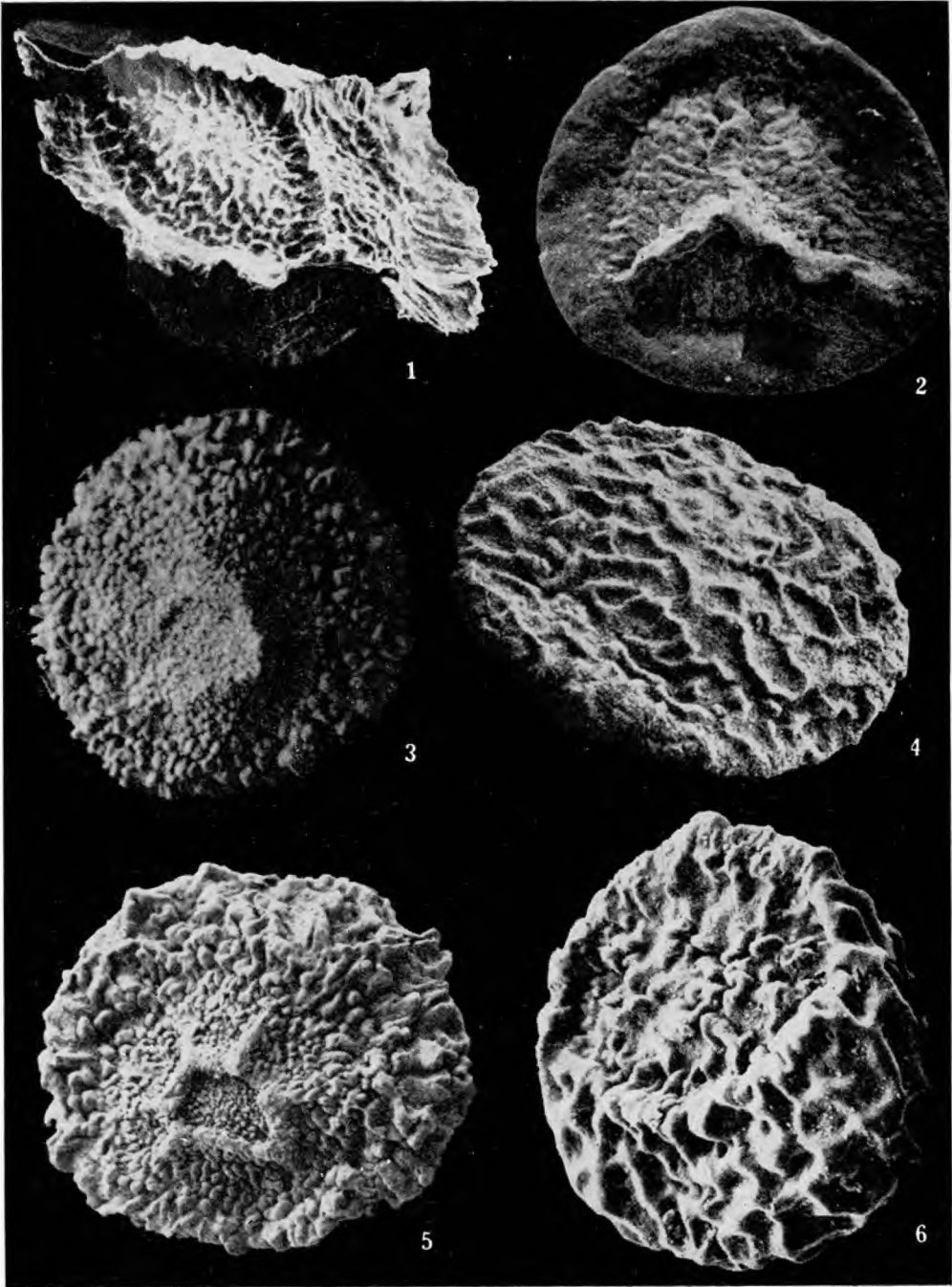


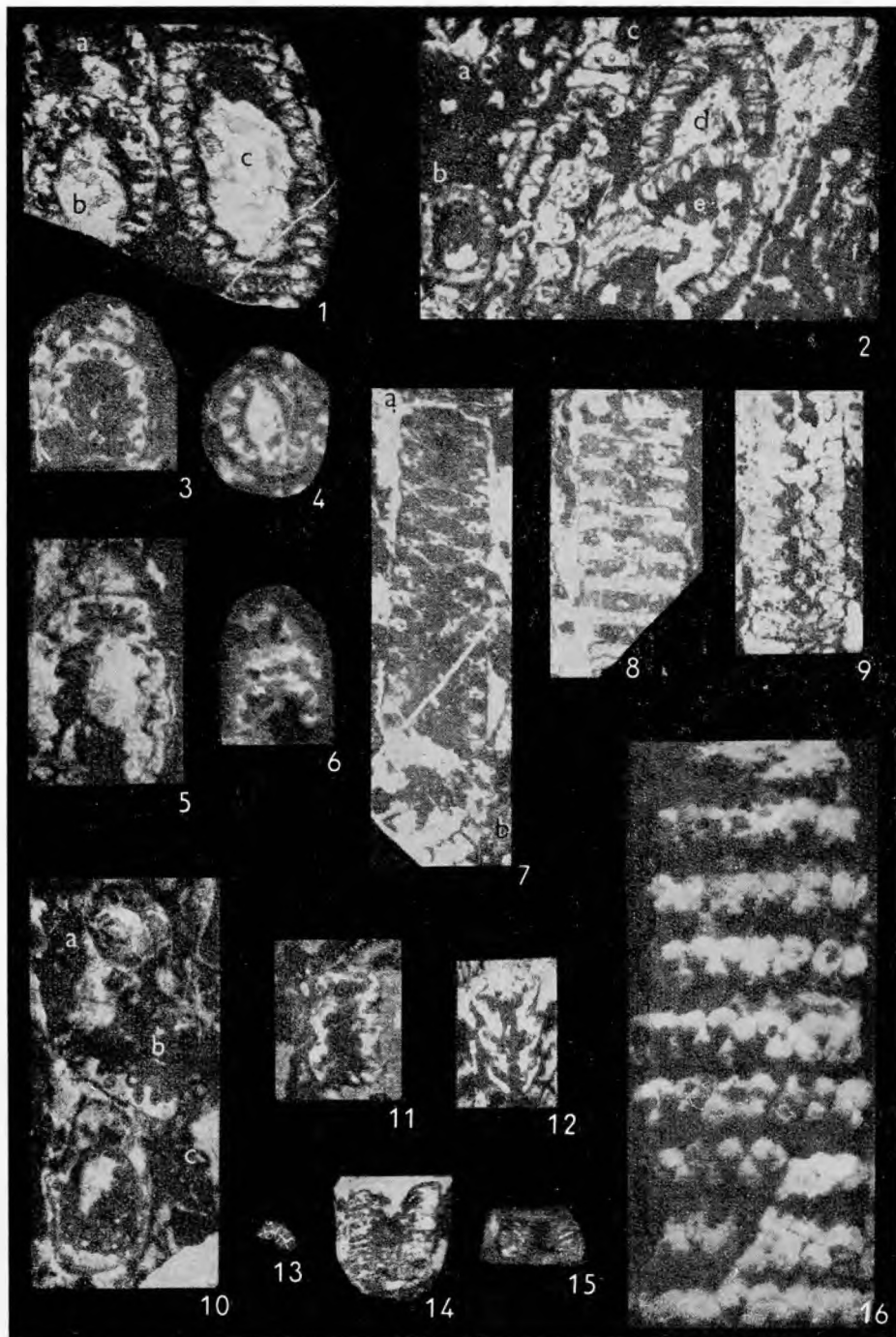


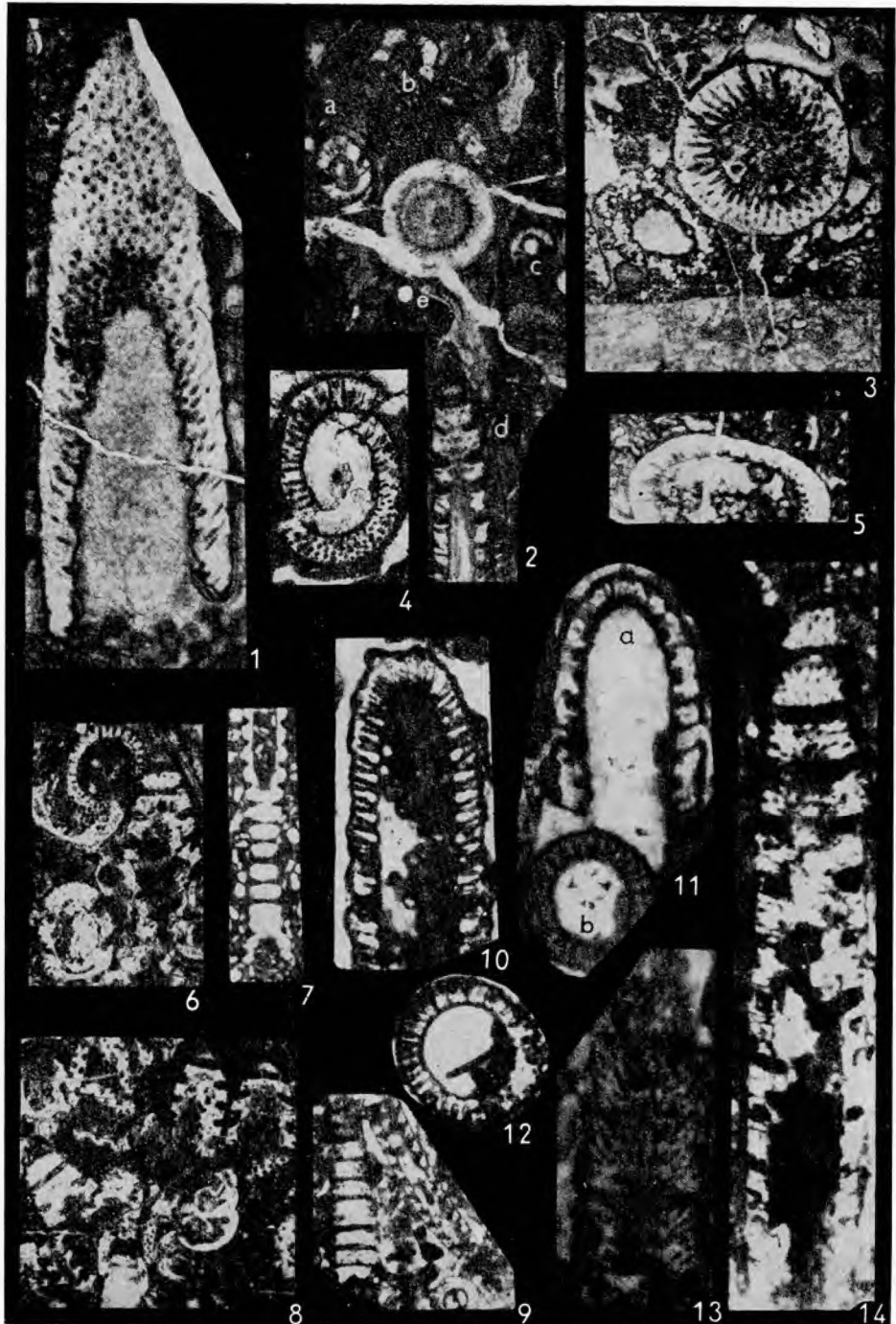


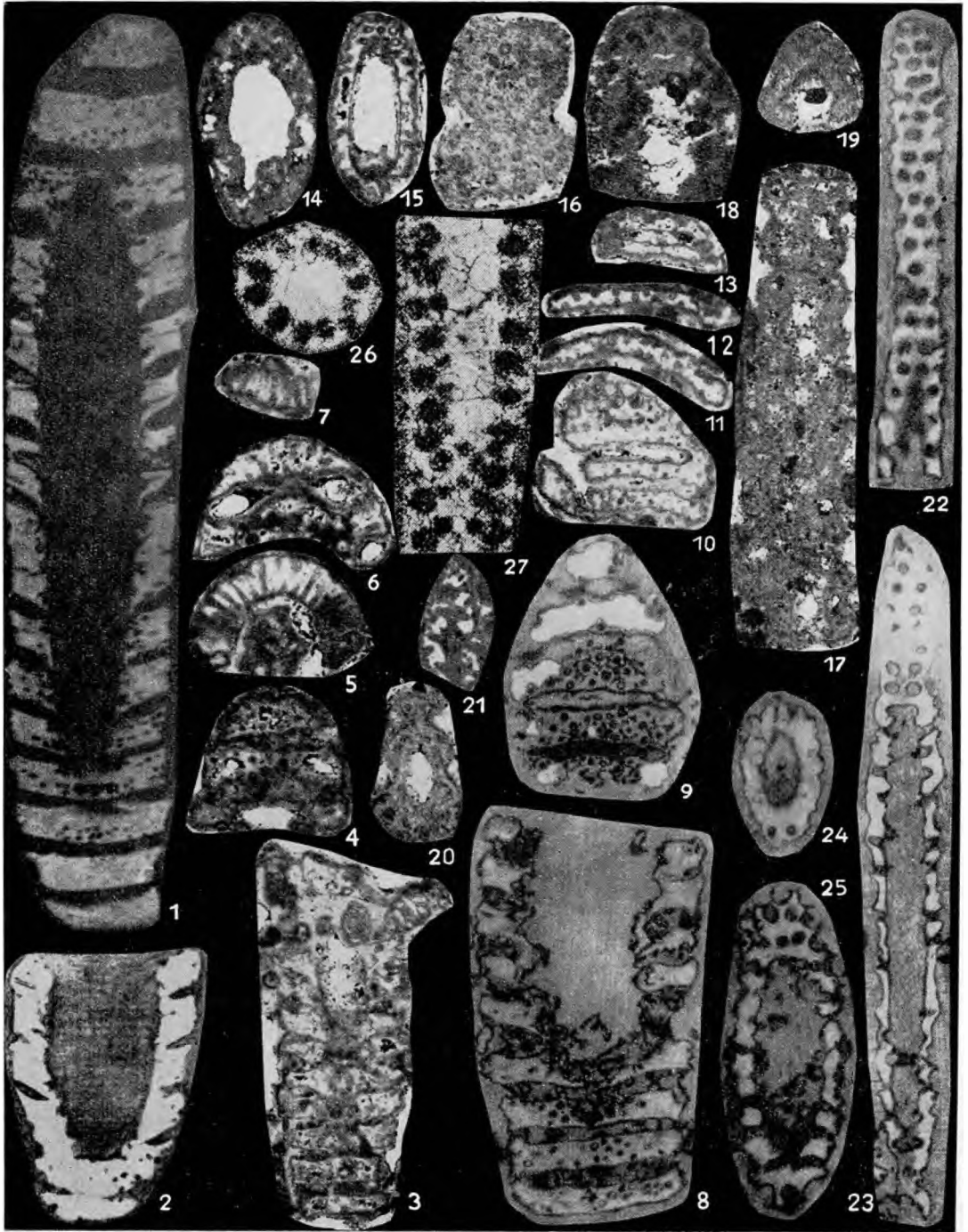


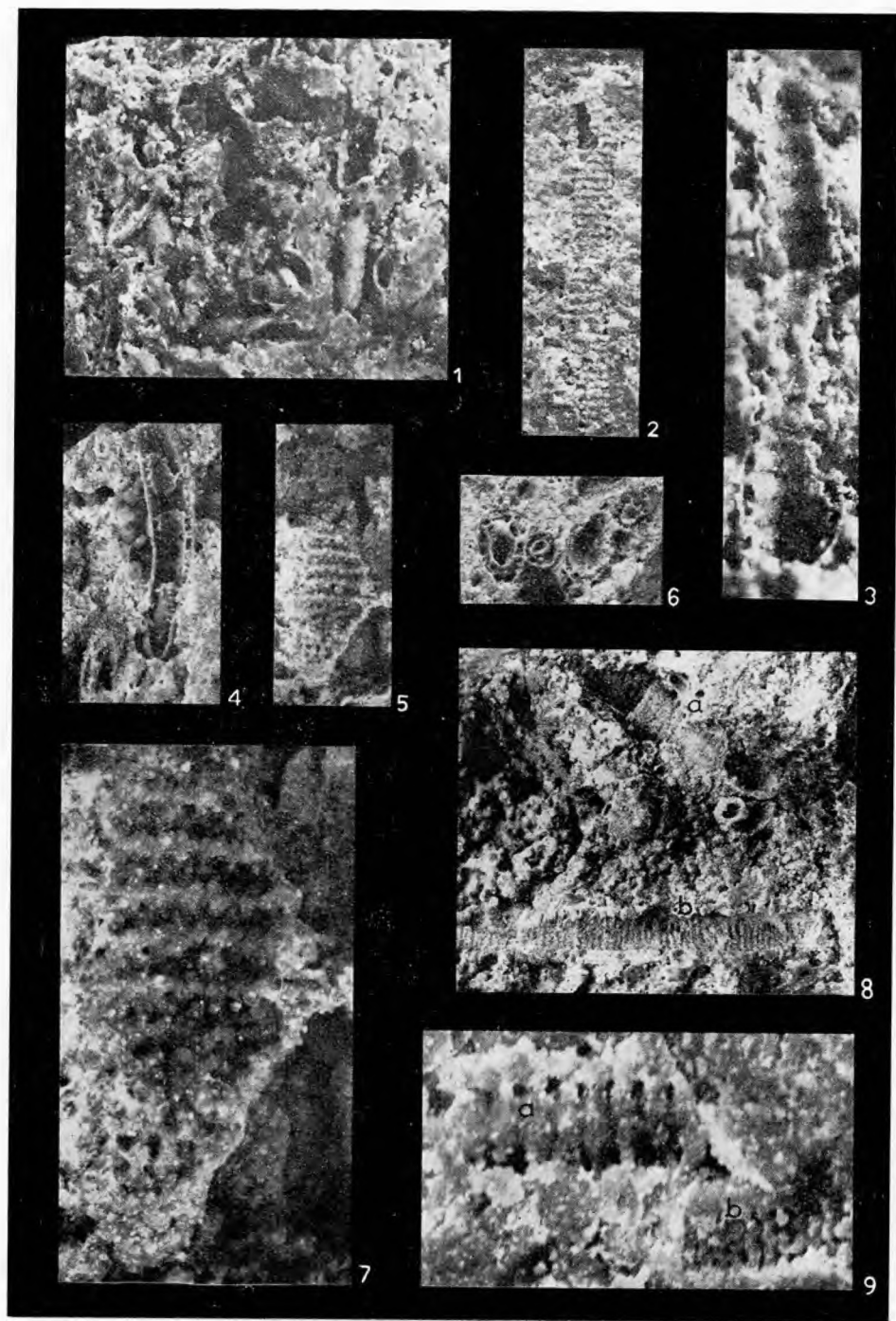












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