A C T A P A L A E O N T O L O G I C A P O L O N I C A
Vol. 26 1981 No. 1

RYSZARD FUGLEWICZ and ANDRZEJ PREJBISZ

DEVONIAN MEGASPORES FROM NW POLAND

FUGLEWICZ R. and PREJBISZ A.: Devonian megaspores from NW Poland. Acta Palaeont. Polonica, 26, 1, 55—72, October 1981.

Fifteen megaspore species belonging to eleven genera are described; of these three genera (*Heliotriletes*, *Oncodisporites* and *Pomeranisporites*) and eleven species are new.

K e y w o r d s: Megaspores, Devonian, Poland.

Ryszard Fuglewicz, Instytut Geologii Podstawowej, Uniwersytet Warszawski, Al. Żwirki i Wigury 93, 02-089 Warszawa, Poland; Andrzej Prejbisz, Zakład Nauk Geologicznych, Polska Akademia Nauk, Al. Żwirki i Wirgury 93, 02-089 Warszawa, Poland. *Received: May 1979.*

INTRODUCTION

A thick sequence of Devonian deposits have been pierced in Miastko locality, NW Poland by the Miastko-1 borehole situated close to the junction of the Precambrian and Palaeozoic platforms. These 805 m thick sediments overlie with angular discordance some Ordovician (Llandeilian or Caradocian) rocks (Bednarczyk 1974) and are disconformably overlain by breccias tentatively ascribed by Pokorski (1976) to the Rotliegendes or Zechstein. These rest under anhydrites which belong undoubtedly to the lowermost Zechstein (the Werra Cyclothem).

The great thickness of the Devonian sequence from Miastko-1 and the almost complete recovery of the core make this borehole an important one for solving the geological problems concerning the Koszalin—Chojnice zone which is of special interest from the geotectonical point of view.

The abundance and the perfect preservation of the Devonian megaspores enabled the authors to describe these for the first time in Poland. The megaspores are included in fifteen species belonging to eleven genera. Three genera and eleven species are new.

The method employed to recover the megaspores was that described by Fuglewicz (1977). The SEM micrographs were made in the Nencki Institute of Experimental Biology in Warsaw, and in the Oil and Gas

Prospecting Enterprise in Wołomin. The transmitted light micrographs were made by A. Prejbisz. The type and figured specimens are stored in the Institute of Geology, Warsaw University (abbreviated IGP).

Acknowledgements. — Both authors are grateful to the Managers of the Oil and Gas Prospecting Enterprise in Piła for the core material.

LITHOLOGY OF DEVONIAN SUCCESSION

The lithology and the fossil content of the Devonian deposits of the Miastko-1 borehole vary considerably (fig. 1). The dominating rock types are sandstones and mudstones with clayey intercalations; conglomerate beds are rare. Within the lower part of the section, there occur anhydrites. Above the depth 2,300 m there appear beds of limestones and marls. The proportion of carbonates increases in the younger deposits, but they are always subordinate and in most cases sandy or marly.

Certain features of the deposits between the base of the Devonian succession and the depth 2,360 m, such as variegated colour, inclined bedding and occurrence of such fauna as *Lingula* and ostracodes, are indicative of fresh-water and brackish environments. The deposits of the upper part of the profile contain thin beds of marine clayey mudstones and marly limestones alternating with brackish sediments of sandstones and mudstones. At least seven horizons of marine deposits and the same number of brackish ones may be discerned. This part of the section was distinguished by Dadlez (1978) as the Miastko complex.

The predominance of terrigenous rocks, long-lasting influence of continent and small proportion of carbonates make the Devonian deposits of the Miastko-1 section distinct from other Devonian profiles of the Koszalin—Chojnice zone. These sediments represent probably the littoral zone of the Devonian sea (Łobanowski 1968).

The type of sedimentation of the Devonian deposits and the fauna contained in these implie that during the Middle Devonian there must have been a relation between the basin of the Koszalin—Chojnice area and that of the Central Devonian Field of the Russian Platform.

STRATIGRAPHY

The biostratigraphy of the Devonian rocks of the Miastko-1 borehole was discussed in three papers basing on different groups of fossils. Łobanowski (1968) presented stratigraphic division of these sediments based on brachiopods. This author distinguished only the Eifelian and Givetian stages because the fauna was distinctly impoverished. Stasińska (1969), basing on tabulate corals, distinguished the Frasnian Stage. New information on stratigraphy of the succession discussed was provided by palyno-

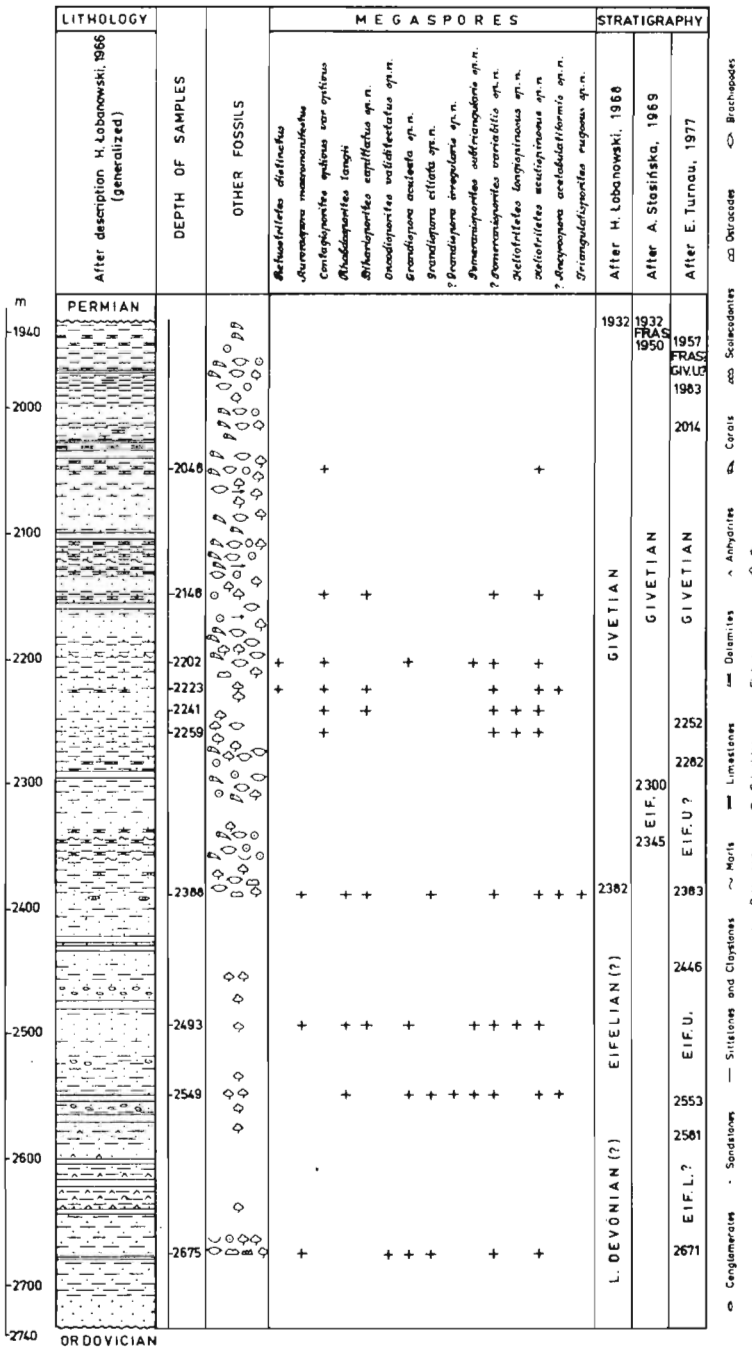


Fig. 1. Lithology, fossils and stratigraphical range of the megaspore-bearing deposits in the Miastko-1 borehole.

logical investigations (Turnau 1977, MS); this author distinguished five spore zones and presented new suggestions concerning the age of the sequence.

The present megaspore study does not allow the authors to attitude towards the stratigraphic schemes mentioned (fig. 1). The occurrence of such species as *Contagisporites optivus* (Chibrikova) Owens var. *optivus* Owens, *Retusotriletes distinctus* Richardson and *Rhabdosporites langii* (Eisenack) Richardson confirms the opinion that Givetian and Frasnian sediments are present in the Miastko-1 section. The lack of a megaspore based stratigraphic scheme for the Devonian of Europe does not allow more precise age determinations to be made.

DESCRIPTIONS

The described spores are large; there occur numerous megaspores *s.s.* and some species characterised by an unusual ornamentation.

Genus *Retusotriletes* Naumowa, 1953 emend. Streel, 1964
Retusotriletes distinctus Richardson, 1965
(pl. 9: 2; pl. 13: 6)

1976. *Retusotriletes distinctus* Richardson; Chi and Hills: 692, pl. 1: 2 (here earlier synonymy included).

Material. — Ten specimens.

Dimensions (in microns):

Diameter of megaspores	267—440
Length of trilete rays	0,8 R
Width of trilete rays	4—6
Width of curvaturae	6—10

Description. — Megaspores of subcircular amb, trilete mark distinct, tectate. Curvaturae well developed, thickened. Exine surface finely punctate.

Remarks. — The Polish specimens seem to be identical with those described by Richardson (1965), from which they differ in being larger and lacking the darkening at the proximal pole. The size of the Polish megaspores approximates that of *R. distinctus* from the Arctic Canada (Chi and Hills 1976).

Genus *Auroraspora* Hoffmeister, Staplin and Malloy, 1955
Auroraspora macromanifestus (Hacquebard) Richardson, 1960
(pl. 14: 5)

1976. *Auroraspora macromanifestus* (Hacquebard) Richardson; Chi and Hills: 747, pl. 13: 12 (here earlier synonymy included).

Material. — More than one hundred specimens.

Dimensions (in microns):

Diameter of megaspores	116—418
Diameter of central area	80—232

Length of trilete rays	0.2R-R
Height of trilete rays	5—15
Width of trilete rays	5—18

Description. — Megaspores of subtriangular to circular amb. Trilete mark varies from hardly visible to well developed, with elevated tecta extending to spore equator. Height of the tecta diminishes gradually from apex to spore equator. Curvaturae absent. In transmitted light two exine layers are visible: intexine thin, smooth, forms subtriangular to circular central body; exoexine thin, smooth, often folded.

Remarks. — The Polish specimens are most similar to those described by Chi and Hills (1976) from Arctic Canada.

Genus *Contagisporites* Owens, 1971
Contagisporites optivus (Chibrikova) Owens var. *optivus* Owens, 1971
(pl. 9: 1, 10; pl. 13: 1)

1976. *Contagisporites optivus* (Chibrikova) Owens var. *optivus* Owens; Chi and Hills: 762, pl. 16: 3 (here earlier synonymy included).

Material. — More than one hundred specimens.

Dimensions (in microns):

Diameter of megaspores	209—400
Length of trilete rays	0.5R—0.9R
Width of trilete rays	6—25
Height of trilete rays	10—30
Width of curvaturae	6—14
Length of appendages	ca.2

Description. — Megaspores of subtriangular to circular amb. Trilete mark usually well developed with straight, ridgelike tecta. Contact area distinctly delimited by thickened arcuate ridges. Trilete rays extending nearly to equator. At the junction of arcuate ridges and trilete rays the latter raise distinctly. Megaspores camerate, intexine smooth, enveloped by infrapunctate exoexine. Diameter of intexine 1/2 to 2/3 of spore diameter.

Remarks. — All specimens of *C. optivus* of the abundant Polish material represent exclusively *C. optivus* (Chibrikova) Owens var. *optivus* Owens, 1971.

Genus *Rhabdosporites* Richardson, 1960
Rhabdosporites langii (Eisenack) Richardson, 1960
(pl. 12: 3, 5; pl. 13: 3)

1976. *Rhabdosporites langii* (Eisenack) Richardson; Chi and Hills: 759, pl. 16: 1, 2 (here earlier synonymy included).

Material. — A few tens of specimens.

Dimensions (in microns):

Diameter of megaspores	130—440
Diameter of central area	76—240
Length of appendages	ca.1

Description. — Megaspores of circular amb. Trilete mark and curvaturae poorly developed. Surface of central area smooth. Megaspores camerate; intexine smooth, diameter 1/2 to 2/3 of spore diameter. Exoexine ornamented with very fine, parallel sided appendages. Distally, exoxine often folded.

Remarks. — The Polish specimens are most similar to those described by Richardson (1960) from the Middle Devonian deposits of Scotland, but they differ in being much larger.

Genus *Biharisporites* Potonié, 1956

Biharisporites capillatus sp.n.

(pl. 10: 1, 10; pl. 13: 4, 5)

Holotype: IGP/80; pl. 10: 1.
Type horizon: Eifelian-Givetian?
Type locality: Miastko-1 borehole, depth 2,388.5 m, Poland.
Derivation of the name: *Lat. capillatus* — covered by hairlike appendages.

Diagnosis. — Trilete mark weak. Contact faces smooth. Exine outside contact faces covered with hairlike appendages.

Material. — A few tens of specimens.

Dimensions (in microns):

Diameter of megaspores	220—696
Length of trilete rays	0.3R—0.7R
Height of trilete rays	3—6
Width of trilete rays	3—5
Length of appendages	9—45
Width of appendages (at base)	2—12

Description. — Megaspores of circular amb. Trilete mark weak. Curvaturae mostly absent. Contact faces smooth, the remaining spore surface densely covered by long, thin, gradually tapering and sharp appendages; these are most densely set close to contact faces. In transmitted light exine appears two-layered. Intexine smooth, detached from exoexine in the region of equator and at distal side.

Remarks. — These megaspores are most similar to *Biharisporites arcticus* var. *productus* Chi and Hills, from which they differ by the ornament of much shorter and thinner appendages.

Genus *Oncodisporites* gen.n.

Type species: *Oncodisporites validitectatus* sp.n.
Derivation of the name: *Gr. oncos* — swelling.
Stratigraphical and geographical range: Eifelian?, Western Pomerania.

Diagnosis. — Trilete megaspores. Amb subtriangular. Trilete mark well developed. Central area encircled by a distinct zona. The entire spore surface ornamented by fine verrucae forming irregular clusters. At equator, there occur fingerlike appendages and verrucae.

Remarks. — The described genus is most similar to *Samarisporites* Richardson, 1965, but differs in being larger and having ornamented proximal surface.

Oncodisporites validitectatus sp.n.

(pl. 9: 3, 9, 11; pl. 12: 1)

Holotype: IGP/77; pl. 9: 11.
Type horizon: Eifelian?
Type locality: Miastko-1 borehole, depth 2.675.8 m, Poland.
Derivation of the name: *Lat. validitectatus* — having well developed tecta.

Diagnosis. — Megaspores of subtriangular amb. Trilete mark well developed. Contact faces encircled by a distinct zone with verrucae and fingerlike appendages at equator. Whole exine ornamented by densely set, fine verrucae.

Material. — Seventeen specimens.

Dimensions (in microns):

Diameter of megaspores	232—464
Length of trilete rays	R
Height of trilete rays	20—70
Width of trilete rays	13—25
Width of verrucae	3—5
Length of equatorial appendages	up to 14
Width of zona	up to 58

Description. — Megaspores of subtriangular amb. Trilete mark well developed in the form of raised, sinuous tecta diminishing in height towards the equator. Contact faces distinct, encircled by a relatively wide zona with more or less regularly distributed verrucae at equator. In some specimens exine weakly folded (pl. 9: 9, 11). Whole spore surface (the trilete mark included) ornamented by densely set verrucae which are distributed irregularly forming clusters (pl. 12: 1). Verrucae better developed at proximal spore side.

Remarks. — The variability in this species concerns the degree of development of the equatorial appendages and the degree of sinuosity of the tecta.

Genus *Grandispora* Hoffmeister, Staplin and Malloy emend. McGregor, 1973

Grandispora aculeata sp.n.

(pl. 12: 2, 6)

Holotype: IGP/78; pl. 12: 2.

Type horizon: Eifelian?

Type locality: Miastko-1 borehole, depth 2,675.8 m, Poland.

Derivation of the name: *Lat. aculeus* — spine.

Diagnosis. — Trilete mark developed in the form of narrow tecta. Curvaturae absent. Entire surface of exine ornamented with acute spines which often have curved tips.

Material. — A few tens of specimens.

Dimensions (in microns):

Diameter of megaspores	174—580
Diameter of central area	100—290
Length of trilete rays	0.2R—0.9R
Height of trilete rays	8—20
Width of trilete rays	4—8
Length of spines	12—45
Width of spines (at base)	3—8

Description. — Megaspores of subtriangular to circular amb. Trilete mark usually weak, developed in form of narrow tecta diminishing rapidly in height towards the spore equator, extending most often to margin of central area, or, not often, beyond margin. Curvaturae absent. In transmitted light exine appears two-layered: intexine smooth, thin, forms a central body; exoexine ornamented with discrete, sharp, thin spines with often hooked tips. Spines better developed at distal spore side.

Remarks. — These megaspores are most similar to *Grandispora velata* (Richardson) McGregor, 1973, but they differ in being larger and in having longer and more crowded appendages.

Grandispora ciliata sp.n.
(pl. 10: 3, 5; pl. 11: 1; pl. 13: 2)

Holotype: IGP/79; pl. 10: 3.
Type horizon: Eifelian?
Type locality: Miastko-1 borehole, depth 2.675.8 m, Poland.
Derivation of name: Lat. cilium — lash, due to the appearance of the distal appendages.

Diagnosis. — Trilete mark well developed. Curvaturae absent. Spore equator and distal surface ornamented with crowded, thin and long, hairlike appendages.
Material. — A few tens of specimens.
Dimensions (in microns):

Diameter of megaspores	340—600
Diameter of central area	232—255
Length of trilete rays	0.8R—R
Height of trilete rays	23—35
Width of trilete rays	20—35
Length of appendages	up to 30 (most commonly 16—25)
Width of appendages (at base)	2—4

Description. — Megaspores with subtriangular or, rarely, subcircular amb. Trilete mark well developed, tecta rodlike, often slightly sinuous at apex. Curvaturae absent. Contact areas most commonly concave, distal side hemispherical (pl. 10: 5). Megaspores cavate; intexine smooth, subcircular, often folded; diameter of intexine equal 1/2 of that of the spore. Proximal spore surface finely granulate; distal surface covered with densely set, almost parallel-sided, hairlike appendages.
Remarks. — *G. ciliata* sp.n. differs from *G. aculeata* sp.n. (of similar size) in having a better developed trilete mark, lacking proximal ornamentation and having hairlike appendages on distal surface.

?*Grandispora irregularis* sp.n.
(pl. 9: 5; pl. 10: 7; pl. 14: 1)

Holotype: IGP/87; pl. 9: 5.
Type horizon: Eifelian.
Type locality: Miastko-1 borehole, depth 2,549.2 m, Poland.
Derivation of name: *Lat. irregularis* — owing to irregular amb of spores.

Diagnosis. — Spores of irregularly subcircular amb. Trilete mark distinct. Curvaturae absent. Exine wrinkled; wrinkles form an irregular network; on distal surface there occur single, flat spines.
Material. — Fourteen specimens.
Dimensions (in microns):

Diameter of megaspores	290—580
Diameter of central area	197—290
Length of trilete rays	R of central area
Height of trilete rays	12—25
Width of trilete rays	8—14
Width of zona	up to 120
Length of distal spines	up to 80
Width of spines (at base)	14—20

Description. — Megaspores of irregularly subcircular amb. Trilete mark developed as sinuous tecta diminishing rapidly in height towards the equator. Curvaturae absent. Exine cavate. Intexine circular; exoexine detached from intexine in equatorial region, forming a wide zona. In transmitted light trilete mark hardly visible, obscured by wrinkled exine. Contact faces covered with wrinkles forming an irregular network. Distal surface ornamented similarly but at periphery of central area (and, seldom, in central region), there occur single, flat spines. Zona wide, slightly serrated.

Remarks. — The inclusion of this species in *Grandispora* Hoffmeister Staplin and Malloy emend. McGregor is tentative because the wrinkled exine is not typical of this genus.

Genus *Pomeranisporites* gen.nov.

Type species: *Pomeranisporites subtriangularis* sp.n.

Derivation of name: After the geographical name, Pomerania.

Stratigraphical and geographical range: Eifelian-Givetian, Western Pomerania.

Diagnosis. — Megaspores mostly of subtriangular amb. Trilete mark well developed. Curvaturae absent. Contact faces usually smooth or granulate. Distal surface often covered with hairlike processes (pl. 9: 4, 6).

Remarks. — The described species is similar to *Ancyrospora* Richardson emend. Richardson, 1961, but differs in lacking ornament of grapnel-shaped appendages. It differs from *Ocksisporites* Chaloner emend. Hills, Chi and Sweet, 1975 in having unornamented proximal side.

Pomeranisporites subtriangularis sp.n.

(pl. 9: 4, 6, 7, 8; pl. 14: 2)

Holotype: IGP/81; pl. 9: 4.

Type horizon: Givetian.

Type locality: Miastko-1 borehole, depth 2,202.5 m, Poland.

Derivation of name: Lat. subtriangularis — because of subtriangular amb.

Diagnosis. — Megaspores most commonly of subtriangular amb. Trilete mark well developed. Contact faces smooth or scabrate, occasionally wrinkled. Distal surface uneven, rugged, often covered with numerous, fine spines.

Material. — A few hundred specimens.

Dimensions (in microns):

Diameter of megaspores	290—464
Diameter of central area	174—232
Length of trilete rays	R
Height of trilete rays	15—23
Width of trilete rays	10—20
Length of spines	up to 16

Description. — Megaspores usually of subtriangular amb. Trilete mark well developed in form of raised, straight or sinuous tecta. Exine two-layered. Intexine smooth, forming central area encircled by exoexine forming an equatorial pseudozona. Curvaturae absent. Contact faces smooth or scabrate. Distal surface uneven, sometimes rugged, often ornamented with numerous, fine, thin spines.

Remarks. — In the populations of *P. subtriangularis* there occur specimens forming a continuous transition from those with weak ornamentation on distal surface to those ornamented with densely set thin spines.

? *Pomeranisporites variabilis* sp.n.
(pl. 10: 2, 4; pl. 14: 4)

Holotype: IGP/82; pl. 10: 4.
Type horizon: Eifelian.
Type locality: Miastko-1 borehole, depth 2,549.2 m, Poland.
Derivation of name: Lat. variabilis owing to variable ornamentation on distal surface.

Diagnosis. — Trilete mark well developed. Proximal surface almost smooth. Distal surface uneven, covered with flattened appendages with strongly dissected tips.
Material. — A few hundred of specimens.
Dimensions (in microns):

Diameter of megaspores	340—700
Length of trilete rays	R
Height of trilete rays	18—23
Width of trilete rays	12—25

Description. — Megaspores mostly of subtriangular amb. Trilete mark well developed, tecta raised, sinuous, diminishing gradually in height towards spore equator. Contact faces almost smooth. Curvaturae absent. Exine two-layered, intexine smooth, forming central area which in transmitted light is often not distinctly delimited, due to strong distal ornamentation. Exine detached from intexine in equatorial region forming a zona which is deeply serrated at margin. Distal surface not even, ornamented with irregularly flattened appendages which are parallel-sided and forked at tip. Appendages often fused to form larger elements of irregular outline.
Remarks. — These megaspores are most similar to *P. subtriangularis* sp.n., from which they differ in having more prominent ornamentation on distal side and deeply serrated equatorial margin.

Genus *Heliotriletes* gen.n.

Type species: *Heliotriletes longispinosus* sp.n.
Derivation of name: *Gr. helios* — sun.
Stratigraphical and geographical range: Givetian, Western Pomerania.

Diagnosis. — Megaspores of circular amb. Trilete mark well developed. Curvaturae absent. Contact faces smooth or ornamented. Distal surface ornamented with long, acuminate spines.
Remarks. — The described genus is similar to *Ancyrospora* Richardson emend. Richardson, 1962, from which it differs in larger size, lack of pseudozona and lack of furcate spines. From *Nikitinsporites* Chaloner, 1956 it differs in having sharp-tipped, gradually thinning spines.

Heliotriletes longispinosus sp.n.
(pl. 10: 6; pl. 11: 6; pl. 14: 3)

Holotype: IGP/84; pl. 11: 6.
Type horizon: Givetian.
Type locality: Miastko-1 borehole, depth 2,048.8 m, Poland.
Derivation of name: *Lat. longispinosus* because of long spines ornamenting the distal surface.

Diagnosis. — Megaspores of circular amb. Trilete mark strongly developed. Curvaturae absent. Proximal surface smooth. Distal surface and equatorial region ornamented with long spines.

Material. — Seventeen specimens.

Dimensions (in microns):

Diameter of megaspores	348—580 (ornament excluded)
Length of trilete rays	R
Height of trilete rays	20—50 (104)
Width of trilete rays	10—18
Length of spines	up to 209
Width of spines (at base)	10—23

Description. — Megaspores of circular amb. Trilete mark well developed in form of straight or slightly sinuous, raised tecta diminishing gradually in height towards the equator. Curvaturae absent. Contact faces smooth. Distal surface and equatorial region ornamented with not very numerous, long spines.

Heliotriletes acutispinosus sp.n.

(pl. 11: 2, 5, 7; pl. 12: 4)

Holotype: IGP/83; pl. 11: 5.

Type horizon: Givetian?

Type locality: Miastko-1, depth 2,259.3 m, Poland.

Derivation of name: *Lat. acutispinosus* — having sharp spines, due to ornament distal spore side.

Diagnosis. — Trilete mark well developed. Curvaturae absent. Proximal surface granulate. Distal surface ornamented with numerous spines with sharp tops.

Material. — A few hundred of specimens.

Dimensions (in microns):

Diameter of megaspores	120—330 (ornament excluded)
Length of trilete rays	R
Height of trilete rays	12—30
Width of trilete rays	8—18
Length of spines	up to 209
Width of spines (at base)	8—23

Description. — Megaspores of almost circular amb. Trilete mark vell developed in the form of narrowing upwards, sinuous tecta diminishing gradually in height towards the equator. Curvaturae absent. Proximal surface granulate; the remaining portion of exine densely covered with prominent, discrete, acuminate spines; these are wide at base and taper gradually to a sharp, often hooked tip. At equator spine bases are fused.

Remarks. — These megaspores are most similar to *Heliotriletes longispinosus* sp.n., but they are smaller, have narrower tecta and more crowded spines on the distal surface.

Genus *Ancyrospora* Richardson emend. Richardson, 1962

?Ancyrospora acetabulatiformis sp.n.

(pl. 11: 3, 4)

Holotype: IGP/85; pl. 11: 4.

Type horizon: Eifelian.

Type locality: Miastko-1, depth 2,549.2 m, Poland.

Derivation of name: Lat. *acetabulum* — sucker, due to appendages having suckerlike terminations.

Diagnosis. — Trilete mark well developed. Curvaturae absent. Distal surface covered with irregular, wavy thickenings and wide appendages tapering gradually toward tip, with suckerlike terminations. Exine relatively thick.

Material. — Twenty specimens.

Dimensions (in microns):

Diameter of megaspores	300—450
Length of trilete rays	R
Height of trilete rays	18—25
Width of trilete rays	12—20
Length of spines	up to 70
Width of spines (at base)	18—60
Width of suckerlike appendages	25—45

Description. — Megaspores of subtriangular to circular amb. Trilete mark strongly developed in the form of wide, sinuous tecta diminishing in height towards the equator. Curvaturae absent. Proximal surface strongly, more or less radially folded. Distal side covered by thick, irregular folds passing into massive appendages. These are wide at base and taper gradually toward tip; at tip there occur suckerlike widenings. The longest and best developed appendages occur at equator. Exine relatively thick.

Remarks. — The inclusion of this species in *Ancyrospora* Richardson emend. Richardson, 1962 is tentative as the large size, ornamentation on distal surface and occurrence of appendages with suckerlike tips are not characteristic of this genus. The thick exine of the discussed spores preclude observation in transmitted light.

Genus *Triangulatisporites* (Potonie and Kremp) Karczewska, 1976

Triangulatisporites rugosus sp.n.

(pl. 10: 8, 9)

Holotype: IGP/86; pl. 10: 9.

Type horizon: Eifelian-Givetian?

Type locality: Miastko-1, depth 2,388.5 m, Poland.

Derivation of name: Lat. *rugosus* — covered with wrinkles, because of wrinkled distal surface.

Diagnosis. — Megaspores mostly of subtriangular amb. Trilete mark well developed. Contact areas encircled by continuous zona. Distal surface covered by irregular, rodlike muri (pl. 10: 8).

Material. — A few tens of specimens.

Dimensions (in microns):

Diameter of megaspores	406—700
Length of trilete rays	R
Height of trilete rays	up to 35
Width of trilete rays	14—24
Width of zona	30—116
Width of rodlike muri	10—23

Description. — Megaspores usually of subtriangular amb, occasionally of subcircular amb. Trilete mark well developed in form of relatively high, often sinuous tecta diminishing in height towards the equator. Contact faces encircled by continuous zona. Proximal side usually smooth. Distal side covered by depressions and rodlike muri which occasionally form an irregular reticulum.

Remarks. — These megaspores are most similar to *Triangulatisporites tuberculatus* Fuglewicz, 1977, from which they differ in having weakly ornamented proximal surface and rodlike muri on distal surface.

REFERENCES

BEDNARCZYK, W. 1974. The Ordovician in the Koszalin—Chojnice region (Western Pomerania). — *Acta Geol. Polonica*, **24**, 4, 581—600.

CHI, B. I. and HILLS, L. V. 1976. Biostratigraphy and taxonomy of Devonian megaspores, Arctic Canada. — *Bull. Canad. Petrol. Geol.*, **24**, 4, 641—818.

DADLEZ, R. 1978. Podpermskie kompleksy skalne w strefie Koszalin—Chojnice. — *Kwart. Geol.*, **22**, 2, 269—301.

FUGLEWICZ, R. 1977. New species of megaspores from the Trias of Poland. — *Acta Palaeont. Polonica*, **22**, 4, 405—431.

ŁOBANOWSKI, H. 1966. Stratygrafia i litologia utworów dewońskich z otworu wiertniczego Miastko 1 (głęb. 1932,0—2737,0 m). — *MS*, Archiwum, Zakład Opracowań Geologicznych Górnictwa Naftowego "Geonafta", Warszawa.

— 1968. Wstępne dane o dewonie w strefie strukturalnej Chojnic (północno-zachodnia Polska). — *Acta Geol. Polonica*, **18**, 4, 765—786.

POKORSKI, J. 1976. *In*: R. Dadlez (ed.), Perm i mezozoik niecki pomorskiej. — *Prace Inst. Geol.*, **79**, 10—18.

RICHARDSON, J. B. 1960. Spores from the Middle Old Red Sandstone of Cromarty, Scotland. — *Palaeontology*, **3**, 45—63.

— 1965. Middle Old Red Sandstone spore assemblages from the Orcadian basin, north-east Scotland. — *Ibidem*, **7**, 559—605.

STASIŃSKA, A. 1969. Koralowce dewońskie Tabulata z otworu Miastko-1 w północno-zachodniej Polsce. — *Acta Geol. Polonica*, **19**, 4, 765—778.

TURNAU, E. 1977. Stratygrafia sporowa utworów dewonu z otworu Miastko 1 (Pomorze Zachodnie). — *MS*, Archiwum, Zakład Nauk Geologicznych PAN, Warszawa.

RYSZARD FUGLEWICZ I ANDRZEJ PREJBISZ

MEGASPORY DEWONU Z WIERCENIA MIASTKO 1 (POLSKA NW)

Streszczenie

Przedmiotem pracy są megaspory dewonu środkowego i górnego z wiercenia Miastko 1 usytuowanego w strefie Koszalin—Chojnice, na styku platformy prekambryjskiej i paleozoicznej. W otworze tym przewiercono 805,0 m osadów dewonu spoczywających z niezgodnością kątową na utworach ordowiku (landeil lub karadok), a przykrytych przez niezgodnie zalegające brekcje (? dolnego) permu. Utwory de-

wonu wykazują dużą zmienność w profilu pionowym zarówno pod względem wykształcenia litologicznego jak i występowania szczątków organicznych (fig. 1). Osady te najprawdopodobniej reprezentują przybrzeżną, paraliczną strefę morza dewońskiego. Charakter sedymentacji tych skał oraz występujących w nich skamieniałości wskazuje na powiązanie basenu dewońskiego strefy Koszalin—Chojnice z obszarem Centralnego Pola Dewonu Platformy Rosyjskiej.

Stratygrafia utworów dewonu w profilu wiercenia Miastko 1 była przedmiotem 3-ch opracowań, w których schematy stratygraficzne oparto na różnych grupach skamieniałości (fig. 1). Utwory te zawierają ponadto bardzo liczne i doskonale zachowane megaspory, które stały się podstawą wykonania pierwszego w Polsce opracowania tych skamieniałości. Opisane spory (pl. 9—14) charakteryzują się dużymi na ogół rozmiarami oraz specyficznymi cechami morfologicznymi, które pozwoliły na wyróżnienie nowych taksonów. Zbadano 15 gatunków megaspor należących do 11 rodzajów, w tym 3 rodzaje (*Heliotriletes*, *Oncodisporites* i *Pomeranisporites*) i 11 gatunków opisano jako nowe.

Drugi z autorów (A. Prejbisz) wykonywał niniejszą pracę w ramach problemu międzyresortowego MR I — 16: Geodynamika obszaru Polski, finansowanego przez Polską Akademię Nauk.

РЫШАРД ФУГЛЕВИЧ и АНДЖЕЙ ПРЭЙБИШ

ДЕВОНСКИЕ МЕГАСПОРЫ ИЗ БУРОВОЙ СКВАЖИНЫ МЯСТКО 1 (СЕВЕРО-ЗАПАДНАЯ ПОЛЬША)

Резюме

В работе излагаются результаты мегаспоровых исследований отложений среднего и верхнего девона вскрытых буровой скважиной Мястко I. Эта скважина расположена в зоне сочленения палеозойской платформы юго-западной части Польши и докембрийской Русской платформы. Отложения девона мощностью 805,0 м лежат несогласно на породах ордовика (лландейло или карадок) и также несогласно перекрыты нижнепермскими брекчиями. Породы девона характеризуются сильной пёстротой как литологического, так и палеонтологического состава (Фиг.1). Отложения эти очевидно образовались в прибрежной паралической зоне девонского моря. Характер осадконакопления отложений девона, а также заключённых в них ископаемых указывает на связь девонского бассейна района Мястко с Центральным (Воронежским) Девонским Полем Русской Платформы.

Стратиграфия отложений девона скважины Мястко I была предметом исследований трёх авторов, которые, опираясь на разных группах ископаемых, пред-

ставили различные варианты стратиграфического расчленения этих отложений. Породы девона содержат кроме того обильные и отлично сохранённые мегаспоры, которые позволили выполнить первую в Польше работу по девонским мегаспорам. Описанные мегаспоры (табл. 9—14) характеризуются обычно большими размерами, а также необычной орнаментацией, позволившей на выделение новых таксонов. Исследовано 15 видов мегаспор принадлежащих к 11 родам, в том числе 3 рода (*Heliotriletes*, *Oncodisporites* и *Pomeranisporites*) и 11 видов новые.

EXPLANATION OF THE PLATES 9—14

Plate 9

Contagisporites optivus (Chibrikova) var. *optivus* Owens 1971

1. Proximal surface, from scanning electron microscope, ×130, depth 2202,5 m Givetian.
10. Proximal surface, from scanning electron microscope, ×170, depth 2202,5 m, Givetian.

Retusotriletes distinctus Richardson, 1965

2. Megaspore in lateral view, from scanning electron microscope, ×170, depth 2202,5 m, Givetian.

Oncodisporites validitectatus sp.n.

3. Megaspore in lateral view, from scanning electron microscope, ×100, depth 2675,8 m, Eifelian?
9. Ornamentation of equatorial area of the megaspore, ×300, depth 2675,8 m, Eifelian?
11. Megaspore in lateral view, from scanning electron microscope, ×100, holotype IGP/77, depth 2675,8 m, Eifelian?

? *Grandispora irregularis* sp.n.

5. Proximal surface, from scanning electron microscope, ×100, holotype IGP/87, depth 2549,2 m, Eifelian.

Pomeranisporites subtriangularis sp.n.

4. Proximal surface, from scanning electron microscope, ×130, holotype IGP/81, depth 2202,5 m, Givetian.
6. Distal surface, from scanning electron microscope, ×130, depth 2202,5 m, Givetian.
7. Proximal surface, from scanning electron microscope, ×130, depth 2202,6 m, Givetian.
8. Megaspore in lateral view, from scanning electron microscope, ×100, depth 2202,5 m, Givetian.

Plate 10

Biharisporites capillatus sp.n.

1. Proximal surface, from scanning electron microscope, ×130, holotype IGP/80, depth 2388,5 m, Eifelian-Givetian?
10. Megaspore in lateral view, from scanning electron microscope, ×130, depth 2388,5 m, Eifelian-Givetian?

? *Pomeranisporites variabilis* sp.n.

2. Megaspore in lateral view, from scanning electron microscope, ×67, depth 2549,2 m, Eifelian.
4. Proximal surface, from scanning electron microscope, ×100, holotype IGP/82, depth 2675,8 m, Eifelian?

Grandispora ciliata sp.n.

3. Proximal surface, from scanning electron microscope, ×67, holotype IGP/79, depth 2675,8 m, Eifelian?
5. Distal surface, from scanning electron microscope, ×100, depth 2675,8 m, Eifelian?

Heliotriletes longispinosus sp.n.

6. Megaspore in oblique compression, from scanning electron microscope, ×107, depth 2241,7 m, Givetian.

? *Grandispora irregularis* sp.n.

7. Distal surface, from scanning electron microscope, ×130, depth 2549,2 m, Eifelian.

Triangulatisporites rugosus sp.n.

8. Distal surface, from scanning electron microscope, ×80, depth 2388,5 m, Eifelian-Givetian?
9. Proximal surface, from scanning electron microscope, ×80, holotype IGP/86, depth 2388,5 m, Eifelian-Givetian?

Plate 11

Grandispora ciliata sp.n.

1. Part of specimen illustrating ornamentation of distal surface of the megaspore, ×670, depth 2675,8 m, Eifelian?

Heliotriletes acutispinosus sp.n.

2. Distal surface, from scanning electron microscope, ×130, depth 2202,5 m, Givetian.
5. Proximal surface, from scanning electron microscope, ×130, holotype IGP/83, depth 2259,3 m, Givetian?
7. Proximal surface, from scanning electron microscope, ×130, depth 2202,5 m, Givetian.

? *Ancyrospora acetabulatiformis* sp.n.

3. Distal surface, from scanning electron microscope, ×100, depth 2549,2 m, Eifelian.
4. Proximal surface, from scanning electron microscope, ×100, holotype IGP/85, depth 2549,2 m, Eifelian.

Heliotriletes longispinosus sp.n.

6. Proximal surface, from scanning electron microscope, ×90, holotype IGP/84, depth 2048,8 m, Givetian.

Plate 12

Oncodisporites validitectatus sp.n.

1. Proximal surface, in transmitted light, ×160, depth 2675,8 m, Eifelian?

Grandispora aculeata sp.n.

2. Proximal surface in transmitted light, ×160, holotype IGP/78, depth 2675,8 m, Eifelian?
6. Proximal surface, from scanning electron microscope, ×300, depth 2493,3 m, Eifelian.

Rhabdosporites langii (Eisenack) Richardson 1960

3. Megaspore in lateral view, from scanning electron microscope, ×200, depth 2549,2 m, Eifelian.
5. Proximal surface, from scanning electron microscope, ×250, depth 2493,3 m, Eifelian.

Heliotriletes acutispinosus sp.n.

4. Proximal surface in transmitted light, ×160, depth 2,259.3 m, Givetian?

Plate 13

Contagisporites optivus (Chibrikova) var. *optivus* Owens 1971

1. Proximal surface in transmitted light, ×160, depth 2,202.5 m, Givetian.

Grandispora ciliata sp.n.

2. Proximal surface in transmitted light, ×160, depth 2,675.8 m, Eifelian?

Rhabdosporites langii (Eisenack) Richardson 1960

3. Proximal surface in transmitted light, ×160, depth 2,549.2 m, Eifelian.

Biharisporites capillatus sp.n.

4. Proximal surface in transmitted light, ×160, depth 2,388.5 m, Eifelian-Givetian?
5. Proximal surface in transmitted light, ×160, depth 2,148.5 m, Givetian.

Retusotriletes distinctus Richardson, 1965

6. Megaspore in oblique compression in transmitted light, ×160, depth 2,223.6 m, Givetian.

Plate 14

? *Grandispora irregularis* sp.n.

1. Proximal surface in transmitted light, ×160, depth 2,549.2 m, Eifelian.

Pomeranisporites subtriangularis sp.n.

2. Proximal surface in transmitted light, ×160, depth 2,493.3 m, Eifelian.

Heliotriletes longispinosus sp.n.

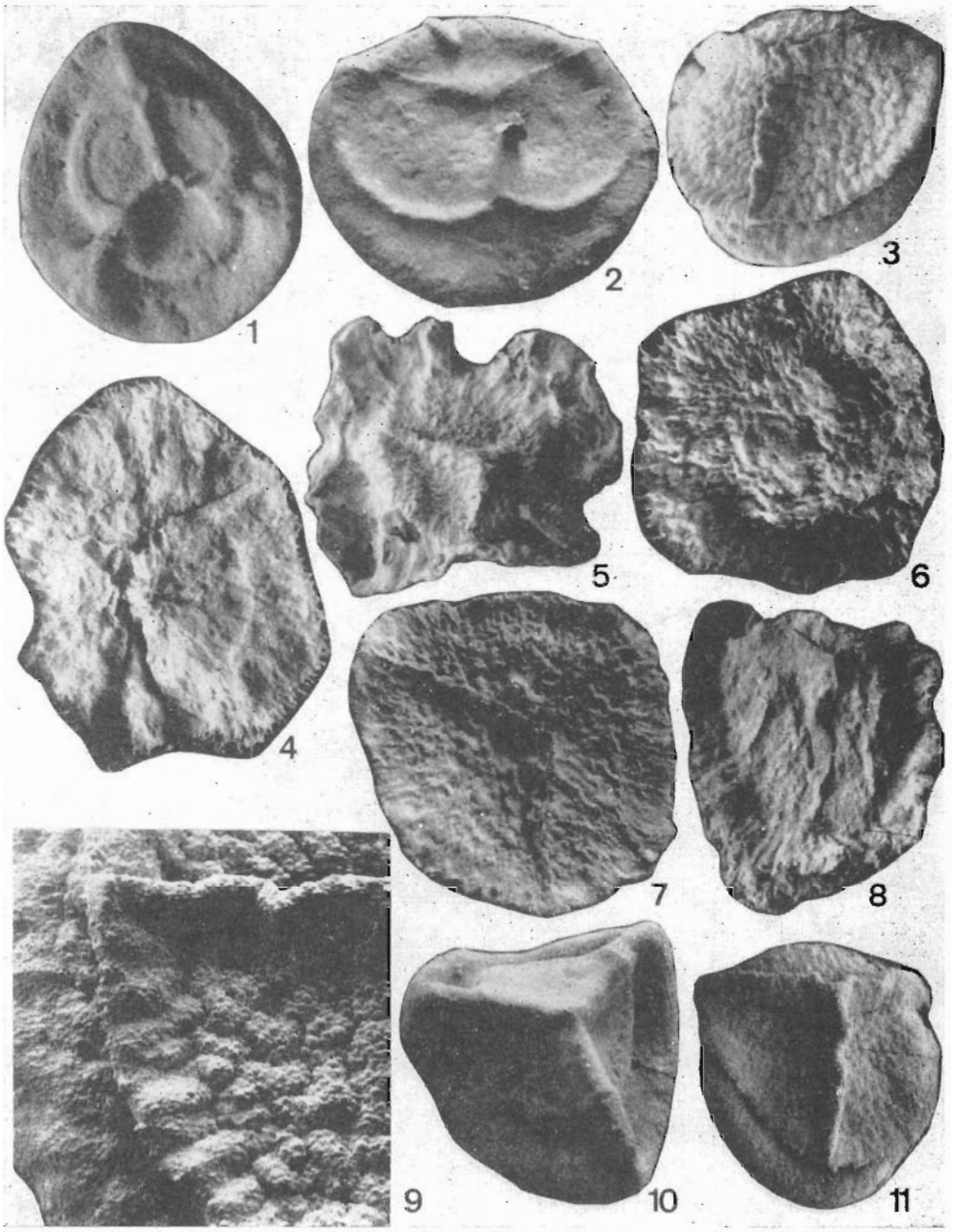
3. Proximal surface in transmitted light, ×160, depth 2,259.3 m, Givetian?

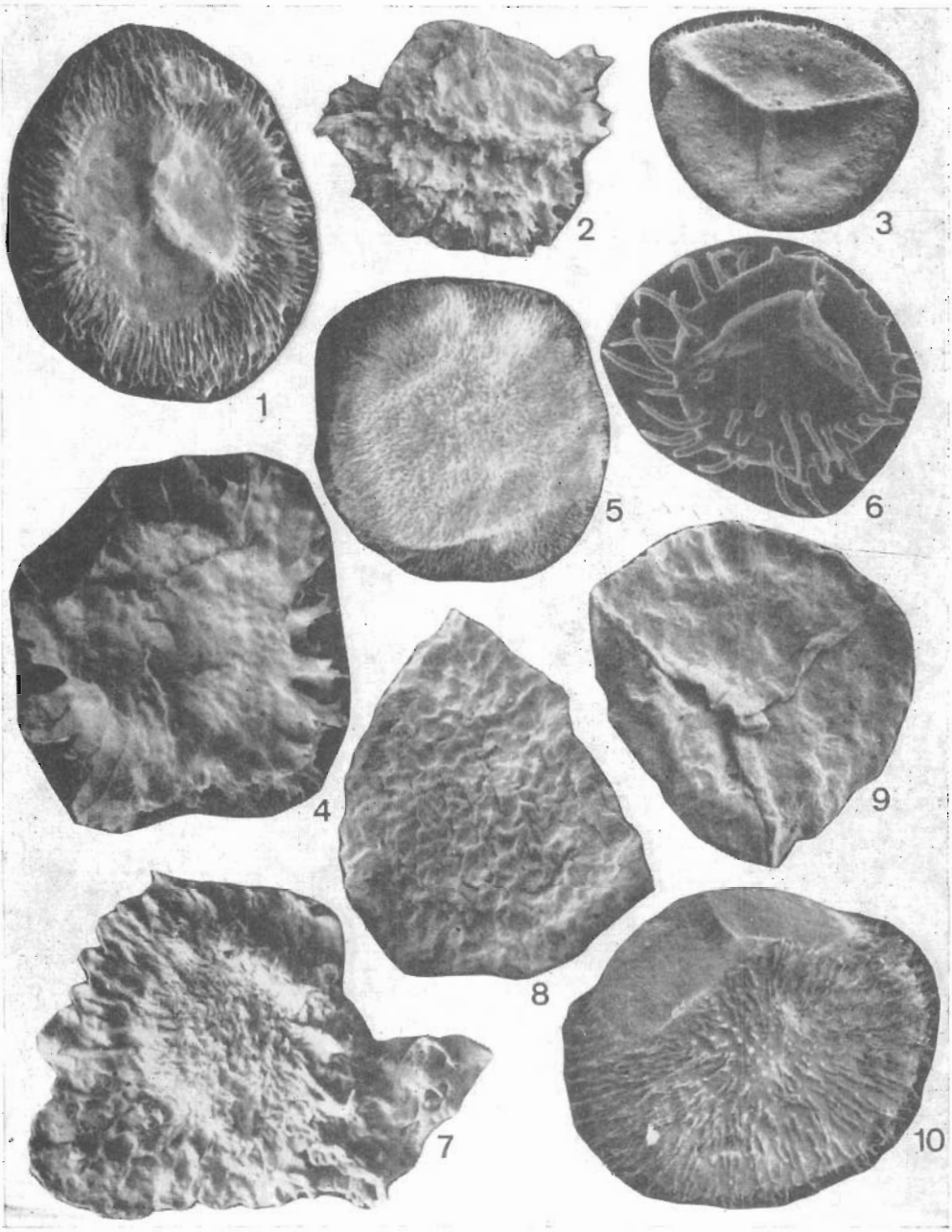
? *Pomeranisporites variabilis* sp.n.

4. Proximal surface in transmitted light, ×160, depth 2,549.2 m, Eifelian.

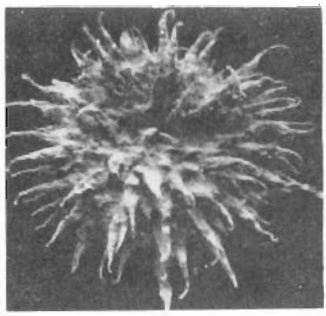
Auroraspora macromanifestus (Hacquebard) Richardson, 1960

5. Proximal surface in transmitted light, ×160, depth 2,675.8 m, Eifelian?

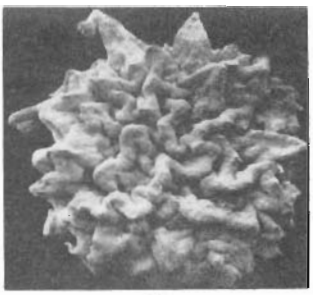

1
2
3
4
5
6
7
8
9
10
11


1
2
3
4
5
6
7
8
9
10

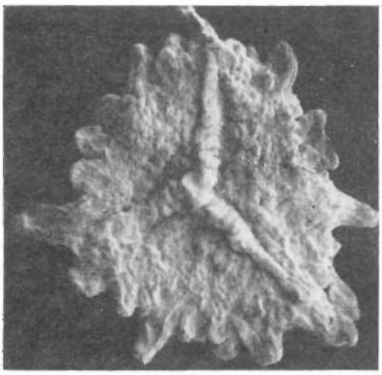
1



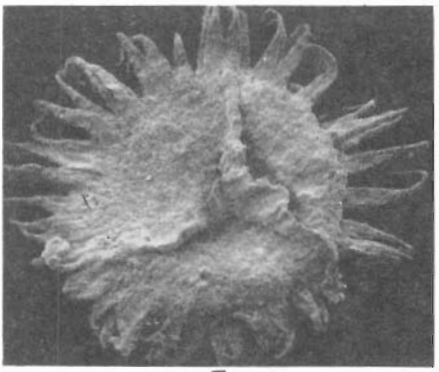
2



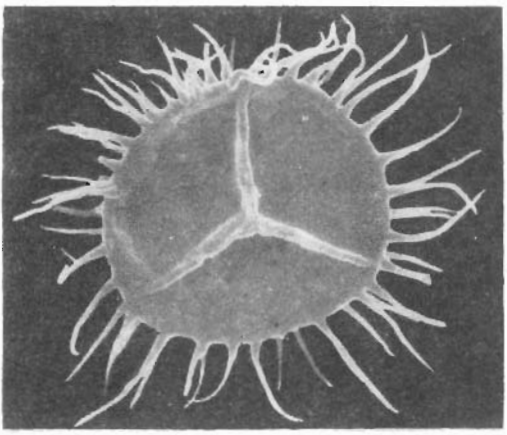
3



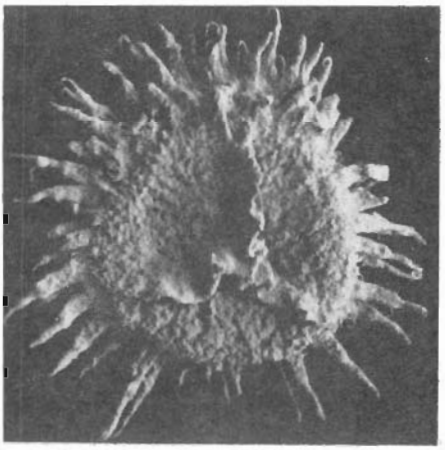
4



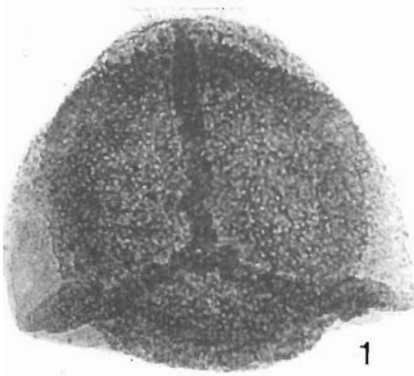
5

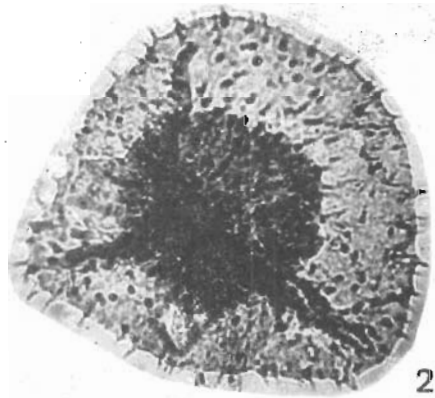


6

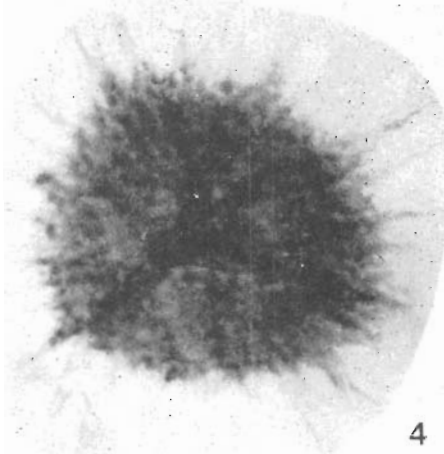


7

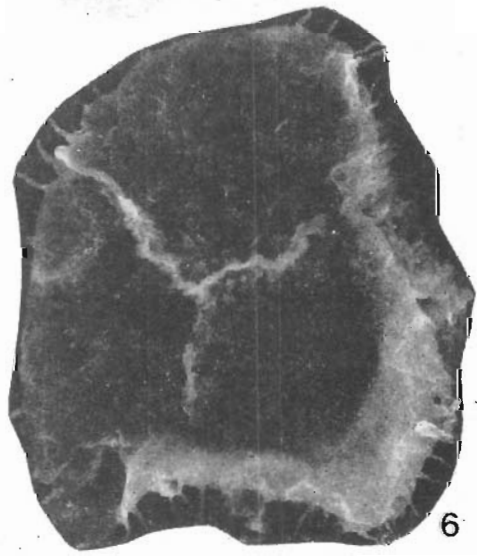

1

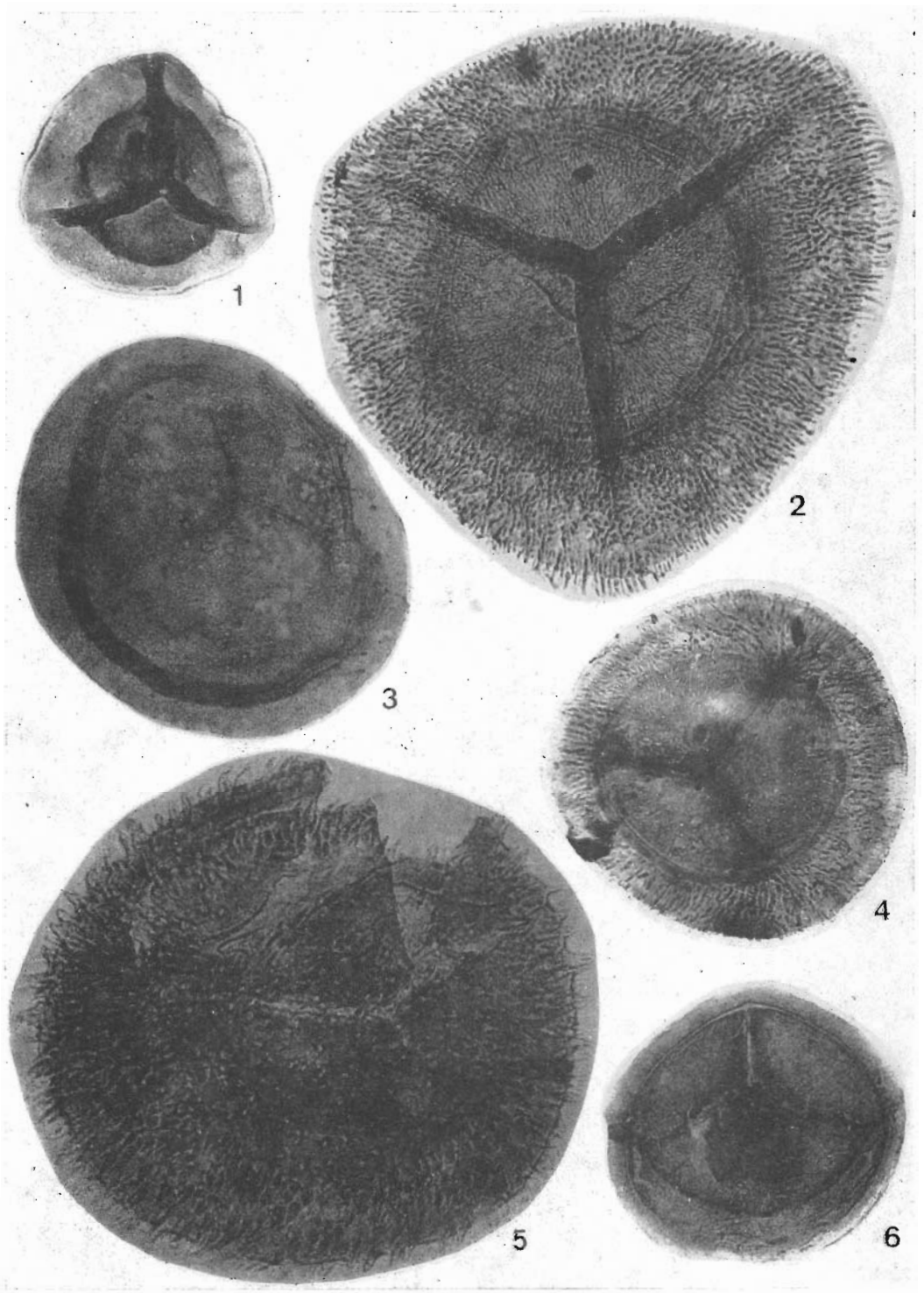

2

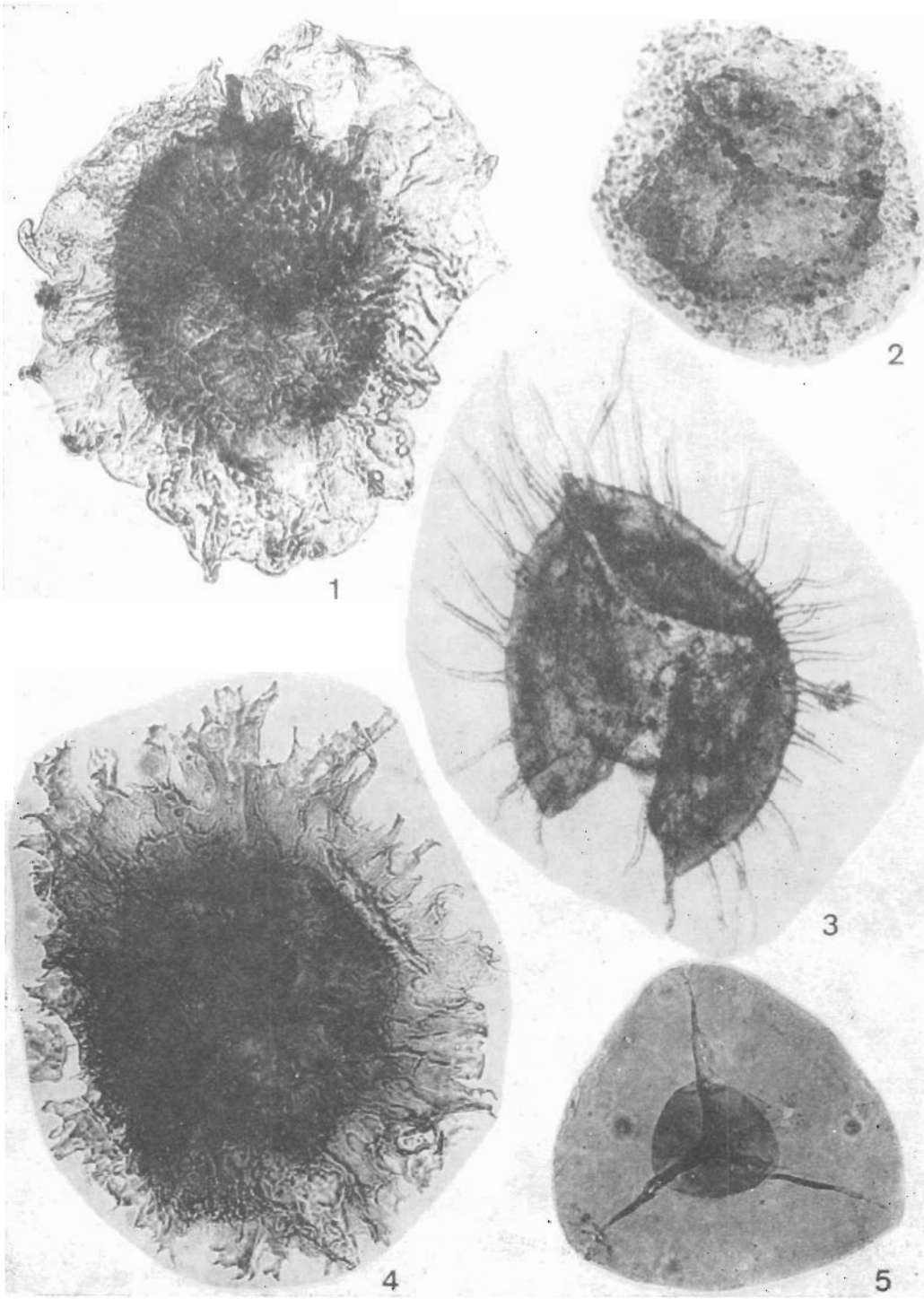

3


4


5


6


1
2
3
4
5
6


1
2
3
4
5