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DISTRIBUTION OF MEGASPORE ASSEMBLAGES IN MIDDLE BUNDSANDSTEIN OF POLAND

Abstract. — The paper presents characteristics of two megaspore assemblages of the Middle Bundsandstein of Poland. First assemblage, characterized by mass occurrence of *Talchirella daciae* Antonescu & Taugourdeau — Lantz, was derived from top parts of the Middle Bundsandstein of the Fore-Sudetic Monocline and margins of the Świętokrzyskie Mts (Holy Cross Mts), whereas the second, characterized by a marked contribution of *Trileites polonicus* Fuglewicz, was recorded from basal parts of the Middle Bundsandstein of the north-eastern Poland.

INTRODUCTION

Up to the present little is known about the megaspores of the lower parts of the Triassic. Therefore, attention should be paid to the paper by Fuglewicz (1973), presenting an attempt to correlate Bundsandstein deposits of Poland on the basis of megaspore. The present paper gives some new data and observations concerning distribution of megaspores in deposits assigned to the Middle Bundsandstein by Gajewska (1973), and Szyperko-Śliwczyńska (1973).

The samples analysed represent core material from boreholes (text — fig. 1) from the area of the Fore-Sudetic Monocline (Otyń IG 1, depth 476.40—515.80 m; Sulechów IG 1, depth 1160—1184.4 m; Wschowa geo 8, depth 428.8 m, 450.5 m; Środa IG 2, depth 2378.2 m; Chlewo 1, depth 1141.5 m; 1144.5 m; Marcinki IG 1, depth 1087.0 m; Dymek IG 1, depth 1730.0 m; Rzeki IG 1, depth 1183.5, 1184.5 m), the margins of the Holy Cross Mts (Ruda Strawczyńska 1, depth 359.3 m, 368.10 m) and north-eastern Poland (Gołdap IG 1, depth 793.0—804.0 m; Olsztyn IG 1, depth 1718.3 m, 1720.5 m, 1770.0 m, 1778.6 m; Olszyny IG 1, depth 1403.0—1411.5 m; Bartoszyce IG 1, depth 974.6—979.2 m).

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of the Bundsandstein. K. Pawłowska, M. Sc., kindly supplied photos illustrating megaspore concentrations on rock surface as well as some samples. The photos of megaspores were taken by Mrs. D. Oleksiak (Photographic

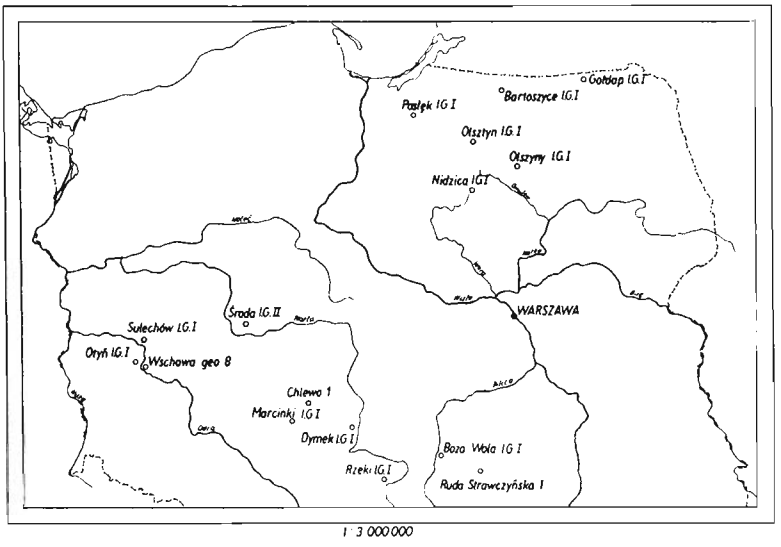

Fig. 1. Map of megaspore localities of Middle Bundsandstein deposits in Poland
Note: Nidzica IG I, Olszyny IG I, Pasłęk IG I and Boża Wola IG I — Bundsandstein profiles studied by Fuglewicz (1973).

Laboratory of the Geological Institute, Warsaw) and Miss M. Czarnocka (Paleozoological Institute, Polish Academy of Sciences, Warsaw).

The megaspores here described are housed at the Laboratory of Paleobotany, Geological Institute, Warsaw (IG. 508/1-21/75M).

CHARACTERISTICS OF MEGASPORE ASSEMBLAGES

The analysis of megaspores of the Middle Bundsandstein deposits has shown the occurrence of two entirely different megaspore assemblages. One assemblage was recorded from several Bundsandstein profiles of the Fore-Sudetic Monocline and margins of the Świętokrzyskie Mts, and another — in the north-eastern Poland.

The Talchirella daciae megaspore assemblage was found in the area of the Fore-Sudetic Monocline. It was found in top parts of the Middle Bundsandstein, represented by dark-gray siltstones intercalated by light-gray fine-grained sandstones with some clay layers (Gajewska, 1973, Deczkowski & Gajewska, 1974).

This assemblage comprises the following megaspore species: *Talchirella daciae* Antonescu & Taugourdeau-Lantz, *Echitriletes echinatus* Fuglewicz,

Trileites vulgaris Fuglewicz, *Hughesisporites tumulosus* n.sp. and *H.* cf. *variabilis* Dettmann.

Quantitatively, there is a marked predominance of *T. daciae* Antonescu & Taugourdeau-Lantz which may be considered as a stratigraphic index in identifying and correlating top parts of the Middle Bundsandstein in Poland as well as in Roumania (Antonescu & Taugourdeau-Lantz, 1973) and G.D.R. (Kozur, 1972).

The Trileites polonicus megaspore assemblage. In the north-eastern Poland the megaspores are mostly found in the lowermost Middle Bundsandstein deposits represented by clay rocks with oolite limestone intercalations. The deposits are characterized by mass occurrence of *Trileites polonicus* Fuglewicz, the main element of the I-st assemblage from Nidzica IG 1 and Olszyny IG 1 profiles of Fuglewicz (1973). This species presumably appears for the first time in the Lower Bundsandstein (Olsztyn IG 1 borehole), being the most common in the Middle Bundsandstein. It is a characteristic and sometimes even the only element of the latter.

This megaspore assemblage does not have any species in common with the above discussed *T. daciae* assemblage recorded from gray clastic beds of the Fore-Sudetic Monocline. Therefore it may be concluded that they are different assemblages supposedly occurring one after another (Table 1) and not time equivalent assemblages as it was suggested by Fuglewicz (1973) on the basis of megaspore analysis made for Boża Wola IG 1, Nidzica IG 1, Olszyny IG 1 and other profiles.

SOME COMMENTS ON PREVIOUS ATTEMPT TO CORRELATE MEGASPORE ASSEMBLAGES OF THE BUNDSANDSTEIN OF POLAND

In connection with an earlier attempt to correlate Bundsandstein deposits of Poland on the basis of megaspores, given in the paper by Fuglewicz (1973), a more detailed analysis of this paper seems appropriate. However, this analysis will be limited to the megaspore assemblage I of Fuglewicz (1973). The assemblage I served Fuglewicz (1973) as a basis for correlating "Upper Oolitic Beds" originally interpreted as upper series of the Lower Bundsandstein, (Szyperko-Śliwczyńska, 1964), and at present as a lowermost part of the Middle Bundsandstein (Szyperko-Śliwczyńska, 1973), with some series of the Middle Bundsandstein of the Boża Wola IG 1 profile.

In his discussion of the assemblage from the north-eastern Poland (Nidzica IG 1, Olszyny IG 1) Fuglewicz (1973, p. 406) reported the mass occurrence of three megaspore species: *Trileites polonicus* Fuglewicz, *T. vulgaris* Fuglewicz and *Pusulosporites marginatus* Fuglewicz, accompanied by much scarcer representatives of the following species: *Trileites sinuosus* (Dettmann) Fuglewicz, *Pusulosporites crassus* Fuglewicz, *Bacutriletes*

globosus Fuglewicz, *Horstisporites heteroreticulatus* Fuglewicz, *H. spinosus* Fuglewicz, *H. elegans* Fuglewicz, *Erlansonisporites* sp. and *Triletes* sp. This list did not comprise *P. inflatus* Fuglewicz, in spite of that this species mentioned elsewhere by the author, along with two others, enables a correlation of the I-st assemblage from the north-eastern Poland with the I-st assemblage of the Central Poland.

It should be noted that the megaspore assemblage reported from Boża Wola IG 1 profile (Fuglewicz, 1973, Table 2) comprises: *P. marginatus* Fuglewicz, *P. inflatus* Fuglewicz, *T. vulgaris* Fuglewicz, *H. inflatus* Fuglewicz [1], as well as some new species markedly predominating in the megaspore assemblage. They are: *Pusulosporites populosus* Fuglewicz, *Echitriletes echinatus* Fuglewicz and *Hughesisporites variabilis* Dettmann.

Despite of the obvious differences, suggesting separatness of the discussed assemblages, Fuglewicz (1973, p. 406) entirely identifies megaspore assemblages from Nidzica IG-1 profile (depth 2012—2052m) and Olszyny IG-1 profile (depth 1410—1436m) with that from Boża Wola IG-1 (depth 2000—2096m) basing on the presence of 3 species: *Trileites vulgaris* Fuglewicz, *Pusulosporites inflatus* Fuglewicz, and *P. marginatus* Fuglewicz common to all these assemblages. However, mentioned species are much less aboundant in the samples examined than are *Trileites polonicus* Fuglewicz and *P. populosus* Fuglewicz; thus, there is no sufficient ground for considering these assemblages as contemporaneous. Moreover, it seems that records of these common species may result from misidentification resulting from the assumption of dependance of the size of megaspore, thickness of exine and development of appendages on the lithological character of deposits, made by this author (Fuglewicz, 1973, p. 427). This assumption caused that each of the following species: *T. vulgaris, P. inflatus* and *P. marginatus*, comprise specimens representing several different species.

According to the present author the sedimentary environment does not influence morphological structure of megaspores but rather their preservation only. If, for example, good preservation and a marked concentration of spores in deposit are taken into account, it may be concluded that the spores were deposited in the proximity of the area of maternal plant vegetation. In turn, destruction or breaking of specimens, occurrence of numerous fragments of spore exine or even thinning of the exine may indicate redeposition of the material (Batten, 1969).

In the case of the material studied by Fuglewicz (1973) the latter cannot be taken into account as the spores derived from both north-eastern and central Poland are well-preserved and fairly numerous. It may be sup-

[1] It follows from Table 2 given in the paper by Fuglewicz (1973) as well as from the text (Fuglewicz, *l.c.*, p. 442) that *H. inflatus* Fuglewicz was found only in Boża Wola IG 1 profile at the depth of 2002 m, which is in contradiction with the Table 5 (*ibidem*) stating the occurrence of this species also in Nidzica IG I profile at the depth of 2018 m.

posed that the spores were not transported at any greater distance and that they were deposited under quiet sedimentation conditions in the proximity of the area of maternal plant vegetation.

DESCRIPTION OF MEGASPORES

Genus *Trileites* (Erdtmann 1945, 1947) Potonié 1956
Trileites polonicus Fuglewicz 1973
(Pl. XXIX, figs 1—5)

1973 *Trileites polonicus* Fuglewicz: pl. 20, figs 3, 5, 6.
1973 *Trileites sinuosus* (Dettmann) Fuglewicz: pl. 20, fig. 4.
1973 *Trileites vulgaris* Fuglewicz: pl. 20, figs 1, 2, (non pl. 20, fig. 7, 8).
?1973 *Pusulosporites inflatus* Fuglewicz: pl. 19, figs 3, 6 [2], 7, (non pl. 19, fig. 1; pl. 31, figs 1, 3).

Description. — Megaspores subcircular in outline, 240—510 μm in diameter. Arms of tetrad scars straight, developed in the form of lips 10—15 μm wide and about 15—45 μm high, equalling 0.8—0.9 of spore radius in length.

Arcuate ridges, marked in the form of weakly outline, not always clearly visible ridge-like swellings, 10 μm wide. Exine surface finely granulate, somewhat glittering, yellow-coloured; exine about 10—12 μm thick. Mesospore thin, folded.

Remarks. — The specimens studied are identical with those described as *T. polonicus* by Fuglewicz in morphological structure. Moreover, it seems that some specimens treated by Fuglewicz as separate species (*P. inflatus*, *T. vulgaris* and *T. sinuosus* Dettmann *sensu* Fuglewicz) and characterized by the lack of any distinct arcuate ridges or somewhat convex contact areas should be also placed in *T. polonicus* Fuglewicz.

Occurrence. — Lower Triassic (the base of the Middle Bundsandstein) of the north-eastern Poland.

Trileites vulgaris Fuglewicz 1973
(Pl. XXX, figs 5, 6)

1973 *Trileites vulgaris* Fuglewicz: pl. 20, figs 7, 8, pl. 31, figs 2, 8 (non pl. 20, figs 1, 2).

Description. — Megaspores subcircular-ovate in outline, 370—540 μm in diameter. Tetrad scar with straight arms developed in the form of narrow (about 10 μm wide) lips, equalling 0.9 spore radius in length. Arcuate ridges lacking. Exine surface smooth, glittering; exine about 4 μm thick. Mesospore thin, folded.

Remarks. — From the point of view of morphology the specimens may be identified only with those illustrated in pl. 20, figs 7, 8 in Fuglewicz (1973) and named as *T. vulgaris*. They cannot be compared with those assigned by Fuglewicz (1973) to the same species and shown in figures 1 and 2 in the same plate. The spores, considered as conspecific by that author, served him as a premise for the invalid correlation of megaspore assemblages from the north-eastern Poland and from the margins of the Świętokrzyskie Mts.

Occurrence. — Lower Triassic (top part of the Middle Bundsandstein) of the Fore-Sudetic Monocline and the margins of the Świętokrzyskie Mts.

[2] According to Fuglewicz (1973, p. 426), the figure 6 from plate 19 represents the holotype of *Pusulosporites marginatus*, whereas in explanations to the plates it is stated that this figure (pl. 19, fig. 6) represents the individual of *P. inflatus*.

Genus *Talchirella* Pant & Srivastava 1961 emend. Bharadwaj & Tiwari 1970

Talchirella daciae Antonescu & Taugourdeau-Lantz, 1973

(Pl. XXVIII, figs 1—7, pl. XXXI, figs 1, 2)

1973 *Talchirella daciae* Antonescu & Taugourdeau-Lantz: pl. 1, figs 1—12; pl. 2, figs 13—19; 21—27; pl. 3, figs 28-30, 33; pl. 4, fig. 48.

1973 *Pusulosporites populosus* Fuglewicz: pl. 22, figs 5 a b; 6, 7, pl. 32, fig. 2.

1973 *Pusulosporites* inflatus Fuglewicz: pl. 31, figs 1, 3; pl. 19, fig. 1; (non pl. 19, fig. 3, 6, 7).

?1973 *Hughesisporites inflatus* Fuglewicz: pl. 30, fig. 1 (non pl. 30, fig. 2).

Description. — Megaspores characterized by relatively high variability in size, shape and ornamentation. The diameter ranging from 290 μm to 780 μm, 595 μm at the average (40 measurements). There are some large, typically developed megaspores (plate XXVIII, figs 1, 3), characterized by subcircular outline and flattened surface of contact areas, as well as smaller-sized megaspores (plate XXVIII, fig. 2, 4), subcircular-triangular to subcircular in outline, and characterized by convex contact areas separated from basic part by a groove.

Exine surface granulose, covered with densely spaced, fine (4 μm in height), needle-shaped or rounded-ended, glossy reddish appendages. However, the surface of the majority of specimens available is smoothened and the appendages are hardly visible.

Tetrad scar with strongly outline, straight to somewhat wavy arms in the form of ridges uniform in width and equalling 0.7 of spore radius in length. Arcuate ridges not developed; sometimes some swellings of exine are visible.

Exine brownish to almost black in colour, about 15—22 μm in thickness. When the external layer of exine is dissolved in KOH, mesospore with circular or ovate cushions arranged along the arms of tetrad scar may be noted.

Remarks. — The genus *Pusulosporites* proposed by Fuglewicz (1973) is presumably a synonym of the genus *Talchirella* introduced by Pant and Srivastava in 1961. Therefore the generic name *Talchirella* is accepted and the specimens assigned to the species *Talchirella daciae* proposed by Antonescu and Taugourdeau-Lantz (1973) for megaspores from the Werfenian of Roumania. At the same time this specific name is treated as a synonym of the name *Pusulosporites populosus*, also introduced in 1973. The paper of Antonescu and Taugourdeau-Lantz and that of Fuglewicz were published at the same time and the specific name *T. daciae* is here selected because of a more accurate description and electron microscope micrographs displaying much better details of morphology of the spores.

It seems that some specimens named by Fuglewicz (1973) as *P. inflatus* or his *H. inflatus* figured in pl. 30, fig. 1 (*l.c.*) should be also put in the synonymy of *T. daciae*. According to the present author these specimens assigned by Fuglewicz (*op.c.*) to separate species display features typical of *T. daciae*. They differ from the large specimens of *T. daciae* (= *P. populosus*) in smaller size and convex contact areas only.

Taking into consideration the results of Bocheński's (1939, pl. 7, fig. 45, pp. 20, 22) investigations concerning the megaspores from cones of *Sigillariostrobus czarnockii* Bocheński and *S. ciliatus* Kidston it is probable that the smaller specimens of *T. daciae*, characterized by convex contact areas and differing from normal, well-developed (mature) megaspores of this species in markedly smaller size and in shape, may represent immature megaspores.

It is highly probable that the specimens tentatively identified as *Trileites* sp. and compared with the spores *Pleuromeia sternbergi* by Kozur (1972) represent

T. daciae. However, these specimens were neither illustrated nor described by Kozur (1972) and this assumption is solely based on the mass occurrence of *Trileites* sp. in the Hardegsen series, i.e. in the stratigraphic position identical as that of *T. daciae* from Poland.

Occurrence. — Lower Triassic (the top part of the Middle Bundsandstein) of the Fore-Sudetic Monocline and the margins of the Świętokrzyskie Mts.

Genus *Echitriletes* (van der Hammen, 1954) Potonié, 1956
Echitriletes echinatus Fuglewicz 1973
(Pl. XXIX, figs 6a, 6b; pl. XXX, figs 1—4)

1973 *Echitriletes echinatus* Fuglewicz: pl. 24, figs 4, 5ab; 6, pl. 32, fig. 3.

Description. — Megaspores subcircular in outline, 340—800 μm in diameter. Arms of tetrad scars developed in the form of lips 20—55 μm high and lowering towards their ends, equalling 0.8 of spore radius in length. Arcuate ridges lacking. The whole exine surface including the lips of tetrad scar covered with yellow-reddish glossy projections attaining up to about 80 μm in length and 4—15 μm in width at the base. The projections are sharp-pointed, often hooked or multiply branching.

Remarks. — The specimens illustrated by Fuglewicz on pl. 24 figs 3, 4 (1973) are identical and may be considered as representing the same species — *Echitriletes echinatus* Fuglewicz.

Occurrence. — Lower Triassic (the top part of the Middle Bundsandstein) of the Fore-Sudetic Monocline and the margins of the Świętokrzyskie Mts.

Genus *Hughesisporites* Potonié, 1956
Hughesisporites tumulosus n.sp.
(Pl. XXIX, fig. 7)

1973 *Hughesisporites inflatus* Fuglewicz: pl. 30, fig. 2 (non pl. 30, fig. 1).

Holotype: IG. 508/1/75M; pl. XXIX, fig. 7.

Type horizon: Middle Bundsandstein.

Type locality: Rzeki IG 1 borehole, depth 1184.5 m.

Derivation of the name: Lat. *tumulosus* — hummocky.

Description. — Megaspores subcircular-triangular in outline, 300—400 μm in diameter. Tetrad scar with wavy, roll-like arms about 20 μm wide and 30 μm high, almost equal to spore radius in length. Characteristic swellings developed at the extensiones of arms of tetrad scar. Contact areas somewhat convex, covered with irregular folds and swellings. Arcuate ridges lacking. Exine surface smooth and somewhat glittering.

Remarks. — The specimens do not have any features in common with the specimen selected by Fuglewicz (1973, pl. 30, fig. 1) as the holotype of *H. inflatus*. The photograph of the holotype does not reveal important diagnostic features of this species including the folds in contact areas whereas it displays certain similarity in morphology to smaller specimens of *Talchirella daciae* Antonescu & Taugourdeau-Lantz.

Occurrence. — Lower Triassic (the top part of the Middle Bundsandstein) of the Fore-Sudetic Monocline and the margins of the Świętokrzyskie Mts.

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ROZPRZESTRZENIENIE ZESPOŁÓW MEGASPOROWYCH W ŚRODKOWYM PSTRYM PIASKOWCU POLSKI

Streszczenie

Wyodrębniono w osadach środkowego pstrego piaskowca w Polsce dwa zespoły megasporowe (fig. tekst. 1, tabela 1).

Pierwszy zespół reprezentowany przez *Talchirella daciae* Antonescu & Taugourdeau Lantz, *Trileites vulgaris* Fugl., *Echitriletes echinatus* Fugl., *Hughesisporites*

cf. *variabilis* Dettmann, *H. tumulosus* sp.n. został stwierdzony w stropowym ogniwie środkowego pstrego piaskowca licznych wierceń, usytuowanych na obszarze monokliny przedsudeckiej i obrzeżenia Gór Świętokrzyskich.

Drugi zespół, charakteryzujący się masowym udziałem *Trileites polonicus* Fugl., występuje na obszarze Polski północno-wschodniej w osadach stanowiących najniższe ogniwo środkowego pstrego piaskowca. Omówione zespoły megasporowe ze względu na brak wspólnych gatunków nie mogą być ze sobą korelowane, ponieważ są zespołami następującymi po sobie i charakteryzującymi różne ogniwa litologiczno-stratygraficzne środkowego pstrego piaskowca.

ТЕРЕСА МАРЦИНКЕВИЧ

РАСПРОСТРАНЕНИЕ МЕГАСПОРОВЫХ КОМПЛЕКСОВ В СРЕДНЕМ ПЕСТРОМ ПЕСЧАНИКЕ ПОЛЬШИ

Резюме

На основании проведенных исследований в отложениях среднего пестрого песчаника Польши были определены два комплексы мегаспор (фиг. 1, табл. 1).

Первый комплекс, представленное *Talchirella daciae* Antonescu & Taugourdeau Lantz, *Trileites vulgaris* Fugl., *Echitriletes echinatus* Fugl., *Hughesisporites* cf. *variabilis* Dettmann, *H. tumulosus* sp. n., было выявлено в кровельном интервале среднего пестрого песчаника по разрезам многочисленных скважин, пройденных на площади Предсудетской моноклинали и на обрамлении Свентокшиских гор.

Второй комплекс, характеризующееся обильным содержанием *Trileites polonicus* Fugl., приурочено к самым нижним горизонтам среднего пестрого песчаника на территории северо-восточной Польши. Описанные сообщества не содержат общих видов, не эквивалентны друг друга, а сменяют друг друга и характеризуют разные литолого-стратиграфические интервалы среднего пестрого песчаника.

EXPLANATION OF PLATES

All figures on plates XXVIII—XXXI × 100

Plate XXVIII

Talchirella daciae Antonescu & Taugourdeau-Lantz, 1973

Fig. 1. Typically developed megaspore with ornamented exine; Wschowa geo 8 borehole, depth 428.8 m; IG. 508/2/75M.

Fig. 2. Megaspore subcircular-triangular in shape, with convex contact areas — (?) immature megaspore; Marcinki IG 1 borehole; depth 1087.0 m; IG. 508/8/75M.
Fig. 3. Typically developed megaspore with smooth exine; Wschowa geo 8 borehole, depth 428.8 m; IG. 508/3/75M.
Fig. 4. Megaspore subcircular-triangular in shape, with convex contact areas — (?) immature megaspore; Dymek IG 1 borehole, depth 1730.0 m; IG. 508/10/75M.
Fig. 5. Mesospore. Otyń IG 1 borehole, depth 501.80 m; IG. 508/a-4/75 Mp.
Fig. 6. Wschowa geo 8 borehole, depth 428.8 m; transmitted light; IG. 508/a-1/75Mp.
Fig. 7. Marcinki IG 1 borehole, depth 1087.0 m; transmitted ligth; IG. 508/a-2/74Mp.

Plate XXIX

Trileites polonicus Fuglewicz, 1973

Fig. 1. Gołdap IG 1 borehole, depth 804.0 m; IG. 508/20/75M
Fig. 2. Gołdap IG 1 borehole, depth 799.7 m; IG. 508/18/75M
Fig. 3. Gołdap IG 1 borehole, depth 801.9 m; IG. 508/19/75M
Fig. 4. Olszyny IG 1 borehole, depth 1411.5 m; transmitted light; IG. 508/a-3/75Mp.
Fig. 5. Olszyny IG 1 borehole; depth 1407.6 m; IG. 508/21/75M.

Echitriletes echinatus Fuglewicz, 1973

Fig. 6. *a* proximal side; *b* distal side; Wschowa geo 8 borehole;

Hughesisporites tumulosus sp.n.

Fig. 7. Rzeki IG 1 borehole, depth 1184.5 m; IG. 508/1/75M.

Plate XXX

Echitriletes echinatus Fuglewicz, 1973

Fig. 1. Ruda Strawczyńska 1 borehole, depth 270.5—270.8 m; IG. 508/17/75M.
Fig. 2. Wschowa geo 8 borehole, depth 428.8 m; IG. 508/16/75M.
Fig. 3. Wschowa geo 8 borehole, depth 428.8 m; IG. 508/15/75M.
Fig. 4. Wschowa geo 8 borehole, depth 428.8 m; IG. 508/13/75M.

Trileites vulgaris Fuglewicz, 1973

Fig. 5. Wschowa geo 8 borehole, depth 428.8 m; IG 508/12/75M.
Fig. 6. Otyń IG 1 borehole, depth 514.3 m; IG. 508/11/75M.

Plate XXXI

Talchirella daciae Antonescu & Taugourdeau-Lantz, 1973

Figs 1, 2. Concentrations of megaspores on rock surface; Ruda Strawczyńska 1 borehole, depth 368.1 m; fig. 1 — × 20; fig. 2 — × 30.

Table 1

CORRELATION OF MEGASPORE ASSEMBLAGES OF THE MIDDLE BUNDSANDSTEIN

Stratigraphic subdivision	Megaspore assemblages distinguished in present paper			Megaspore assemblage I in Fuglewicz (1973)	
	NE Poland	Fore-Sudetic Monocline	Margins of Świętokrzyskie Mts	Margins of Świętokrzyskie Mts	NE Poland
Röt					
Middle Bundsandstein	T. polonicus assemblage: *T. polonicus* Fugl. = = *T. polonicus* Fugl. *T. sinuosus* (Dett.) Fugl. = *T. vulgaris* Fugl. (p.p.) = *P. inflatus* Fugl. (p.p.) *Trileites* sp.sp.	T. daciae assemblage: *T. daciae* Ant. & Taug.-Lantz = = *P. populosus* Fugl. = *P. inflatus* Fugl. (p.p.) = *H. inflatus* Fugl. (p.p.) *T. vulgaris* Fugl. = *T. vulgaris* Fugl. (p.p.) *E. echinatus* Fugl. *H.* cf. *variabilis* Dett. *H. tumulosus* sp.n.	T. daciae assemblage: *T. daciae* Ant. & Taug.-Lantz = = *P. populosus* Fugl. = *P. inflatus* Fugl. (p.p.) = *H. inflatus* Fugl. (p.p.)	Assemblage I: *P. populosus* Fugl. *H. inflatus* Fugl. *H. variabilis* Dett. *E. echinatus* Fugl. *P. inflatus* Fugl. *P. marginatus* Fugl. *T. vulgaris* Fugl. ——— ——— ——— ——— ——— ——— ——— ———	Assemblage I: ——— ——— ——— ——— *P. inflatus* Fugl. *P. marginatus* Fugl. *T. vulgaris* Fugl. *T. polonicus* Fugl. *T. sinuosus* (Dett.) Fugl. *P. crassus* Fugl. *H. heteroreticulatus* Fugl. *H. spinosus* Fugl. *H. sulcatus* Fugl. *H. elegans* Fugl. *B. globosus* Fugl.
Lower Bundsandstein					


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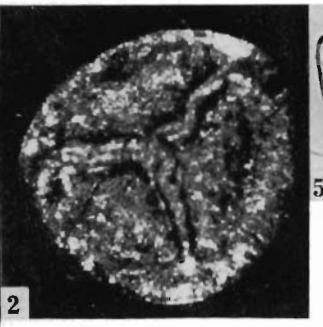
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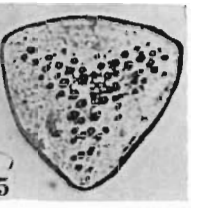
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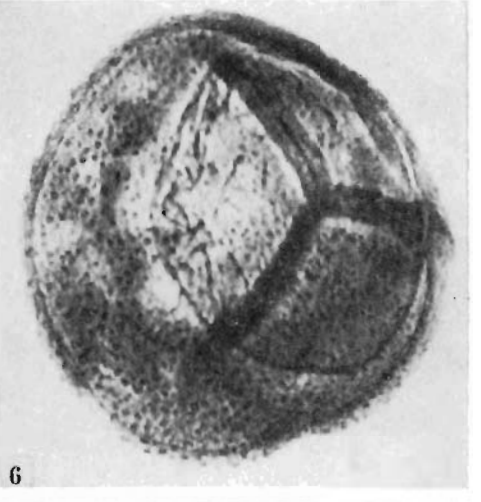
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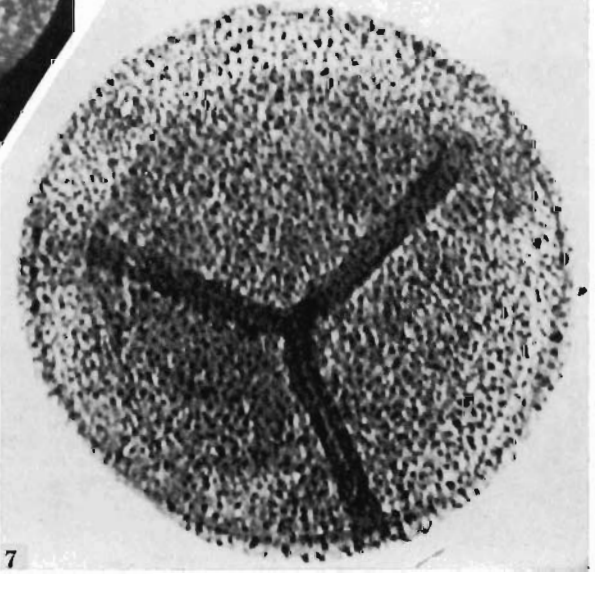
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4

Phot. D. Olekšiak


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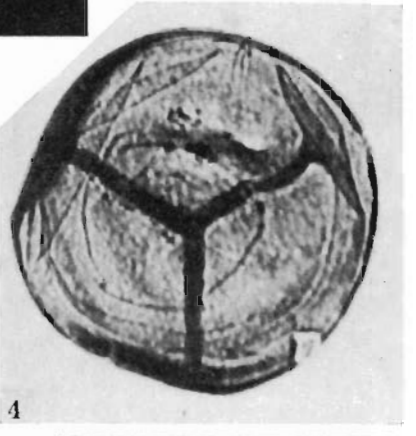
3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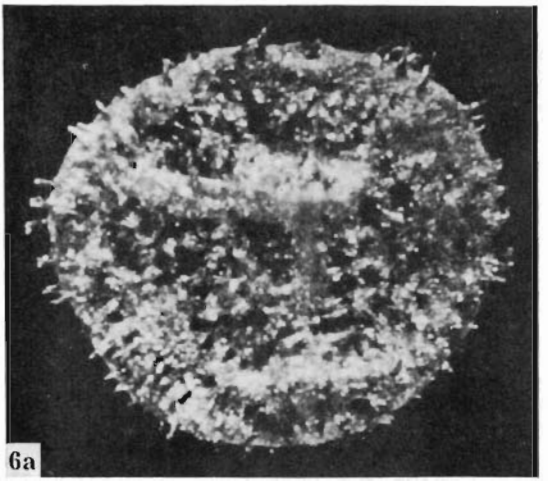
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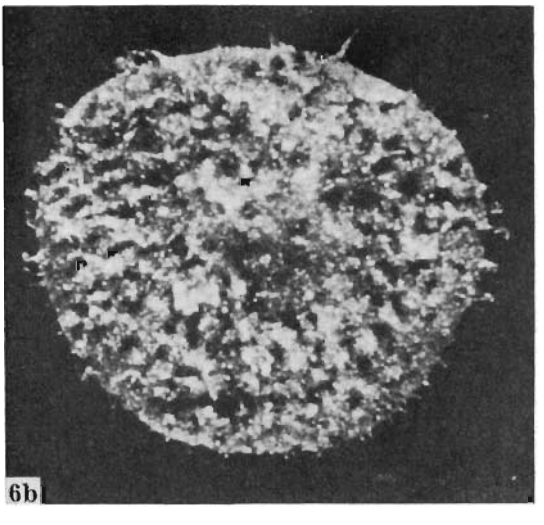
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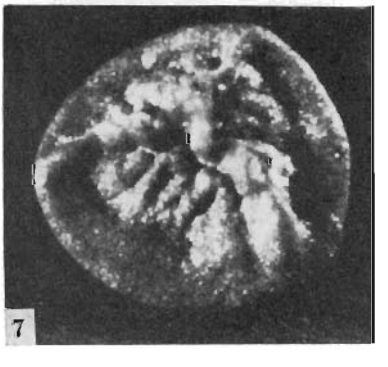
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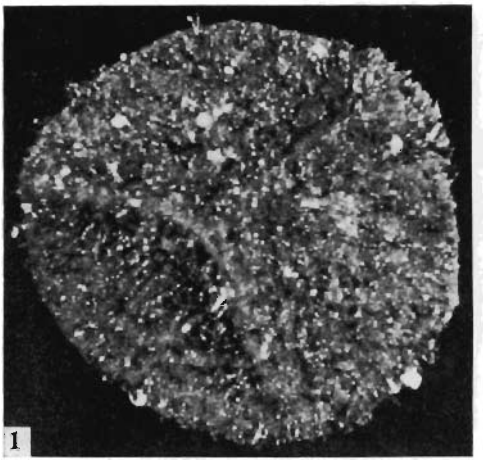
Phot. D. Oleksiak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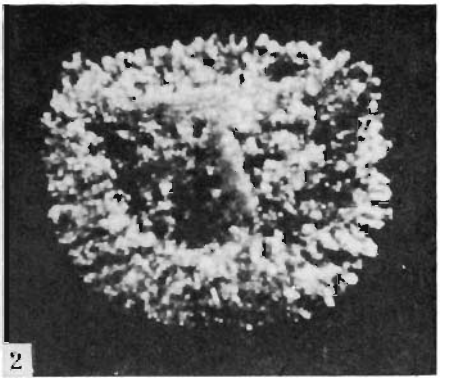
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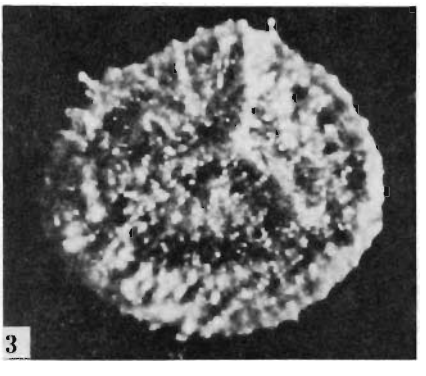
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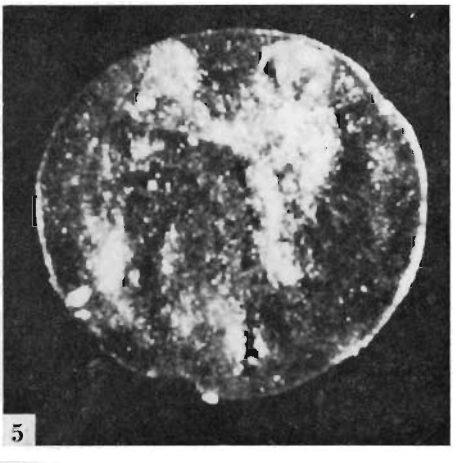
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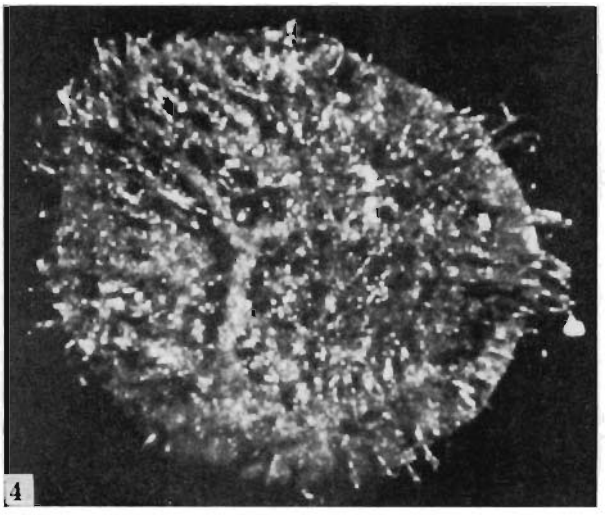
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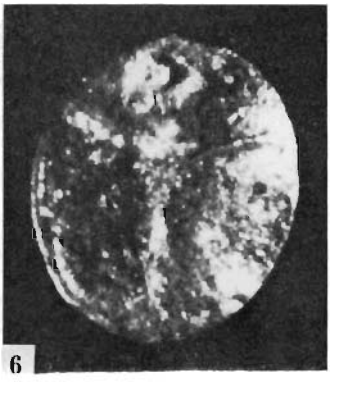
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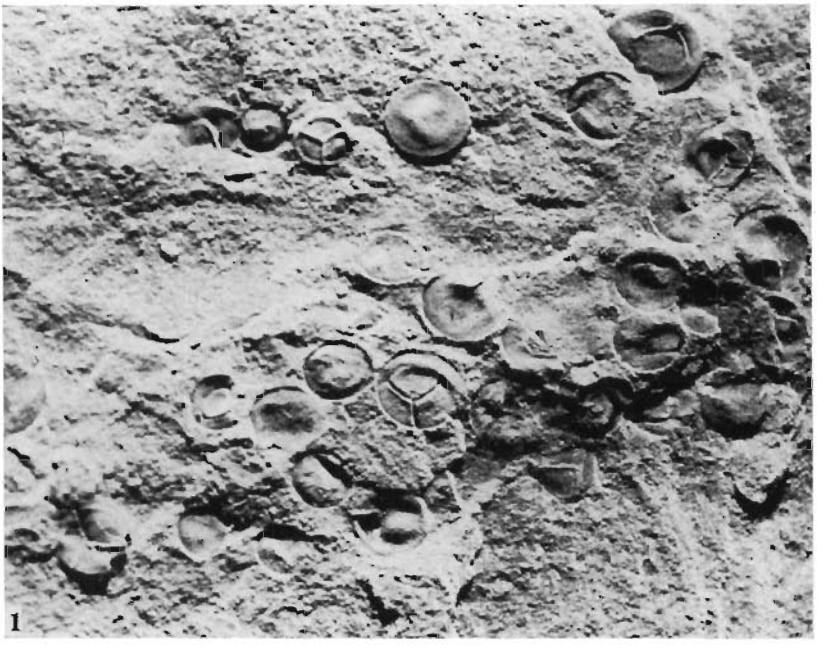
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Phot. M. Czarnocka