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DINOFLAGELLATE CYSTS FROM GRODZISZCZE BEDS
(HAUTERIVIAN — LOWER BARREMIAN?) OF LIPNIK NEAR BIELSKO,
WESTERN CARPATHIANS

Cysty bruzdnic z warstw grodziskich (hoteryw — dolny barrem?)
z Lipnika koło Bielska w zachodnich Karpatach

ABSTRACT. In the present paper are described six species of four genera of dinoflagellate cysts from the Grodziszczce beds of Lipnik near Bielsko. They indicate a Lower Cretaceous age of the beds. Earlier investigations of lithology and microfauna (Geroch & Nowak 1963) determine their age as Hauterivian — Lower Barremian? Fragments of plant megafossils from Lipnik also suggest a Lower Cretaceous age of the Grodziszczce beds (Reymanówna 1965; Reymanówna & Watson 1976).

INTRODUCTION

The idea to investigate the microflora of the Grodziszczce beds from the locality Lipnik near Bielsko arose in connection with the X Conference of Palaeontologists dedicated to the memory of Professor Marian Książkiewicz which was held in Cieszyn in 1986. Before this conference the late Docent Wiesław Nowak invited Assist. Prof. M. Reymanówna to take part, as in 1960 he had shown her a place in Lipnik with Lower Cretaceous megafossils. They were later determined and described (Reymanówna 1965, Reymanówna & Watson 1976, Bielaszka 1981). Interestingly enough, this flora contained fragments of the unusual Lower Cretaceous conifer *Frenelopsis hoheneggeri* Schenk (*Cheirolepidiaceae*), one of the many species of this group which met with great interest of palaeobotanists in the following two decades. It could be expected that the sediment at Lipnik contained also pollen of *Frenelopsis* (*Classopollis*) and spores of the fern *Weichselia*.

Therefore palynological investigations were started by J. Ziaja. Soon it was clear that the samples contained no determinable sporomorphs, but some dinoflagellate cysts were present. Although they were scarce it seemed that they should be described in order to complement the picture of the beds, of which the microfauna and megaflora had been investigated.

Numerous acritarchs and dinoflagellate cysts from Palaeozoic and Mesozoic sediments of Poland were described by Prof. H. Górká. Two species found in Lipnik occur according to Górká (1963) in Upper Cretaceous sediments of North Western and Eastern Poland.

MATERIAL AND METHODS

The investigated material consists of seven samples collected by Doc. W. Nowak in Lipnik from the Grodziszczce beds in part 2 of the outcrop illustrated in Fig. 4 (Geroch & Nowak 1963). Two more samples containing plant megafossils were collected by Assist. Prof. M. Reymanówna and Doc. W. Nowak in the stream valley in Lipnik, one from the outcrop and another from the stream bed.

The material was macerated and prepared according to the method used for Mesozoic palynological samples (Guy 1971). The material was kept in glycerine and investigated and photographed in glycerine-jelly preparations.

INDEX OF SPECIES

1. *Cleistosphaeridium aciculare* Davey 1969
2. *Cleistosphaeridium ehrenbergi* (Deflandre 1937) Davey, Downie, Sarjeant & Williams 1966
3. *Exochosphaeridium pseudohystrichodinium* (Deflandre 1937) Davey, Downie, Sarjeant & Williams 1966
4. *Oligosphaeridium asterigerum* (Gocht 1959) Davey & Williams 1966
5. *Oligosphaeridium reniforme* (Tasch 1964) Davey & Williams 1966
6. *Xenascus australense* Cookson & Eisenack 1969

SYSTEMATIC DESCRIPTIONS

Division: *Pyrrophyta* Pascher 1914

Class: *Dinophyceae* Fritsch 1929

Order: *Peridiniales* Haeckel 1896

Family: *Lingulodiniaceae* Sarjeant & Downie 1974

Genus: *Exochosphaeridium* Davey, Downie, Sarjeant & Williams 1966

Exochosphaeridium pseudohystrichodinium (Deflandre 1937)

Davey, Downie, Sarjeant & Williams 1966

Pl. I, fig. 1

1937 *Exochosphaeridium pseudohystrichodinium* Deflandre in: Eisenack 1971, pp. 415—416, 1 fig.

1963 *Hystrichosphaeridium pseudohystrichodinium* Deflandre; Górká, pp. 61—62, pl. VIII, figs. 4—6, text-pl. 7, figs. 1—3.

1966 ?*Exochosphaeridium pseudohystrichodinium* Deflandre; Davey et al., p. 166.

1967 *Baltisphaeridium pseudohystrichodinium* (Deflandre) Downie & Sarjeant; Baltes, pp. 332, pl. 4, fig. 22.

1967 *Baltisphaeridium pseudohystrichodinium* (Deflandre) Downie & Sarjeant; Drugg, pp. 32—33, pl. 5, fig. 19.

1969 *Exochosphaeridium pseudohystrichodinium* (Deflandre); Davey, pp. 163—164, pl. 11, figs. 4—5.

1969 ?*Exochosphaeridium pseudohystrichodinium* (Deflandre) Davey, Downie, Sarjeant & Williams; Davey et al., p. 16.

?1981 *Exochosphaeridium muelleri*; Yun, pp. 25—26, pl. 4, figs. 12, 14, 15; pl. 5, figs. 9, 11.

Description. Central body subspherical, surface pitted, archaeopyle pre-cingular. Processes numerous, slender, straight or sinuous, widening at base, their ends semicircular, occasionally bifurcating.

Dimensions: diameter of central body 35.7—39.1 μm , length of processes 6.8—11.9 μm . Number of specimens measured 3.

Occurrence: Albian (Rumania), Cenomanian — Turonian (England), Senonian (France), Campanian, Maastrichtian (Poland), Danian (U.S.A.).

Remarks. *Exochosphaeridium pseudohystrichodinium* and species regarded as its synonyms possess a wide range of variability. In almost all papers known to me the morphology of this species and particularly of the processes and their terminations is somewhat different. It appears that the specimens from Lipnik are most similar to *Hystrichosphaeridium pseudohystrichodinium* described by Górká (1963) from Poland.

Family: *Hystrichosphaeridiaceae* (Evitt 1963) Norris 1978

Genus: *Oligosphaeridium* Davey & Williams 1966

Oligosphaeridium asterigerum (Gocht 1959) Davey & Williams 1966

Pl. I, figs. 2—3

1959 *Hystrichosphaeridium asterigerum* Gocht in: Eisenack 1971, p. 839, 1 fig.

1963 *Hystrichosphaeridium asterigerum* Gocht; Górká, pp. 60—61, pl. VIII, fig. 7, text-pl. 7, fig. 5.

1966 ?*Oligosphaeridium asterigerum* Gocht; Davey et al., p. 77.

1969 ?*Oligosphaeridium asterigerum* Gocht; Davey et al., p. 5.

1977 *Oligosphaeridium asterigerum* Gocht; Duxbury, p. 45, pl. 6, figs. 1—4.

1981 *Oligosphaeridium asterigerum* (Gocht) Davey & Williams; Yun, pp. 34—35, pl. 2, figs. 7, 10; pl. 12, fig. 8.

1982 *Oligosphaeridium asterigerum* (Gocht) Davey & Williams; Below, p. 20, pl. 1, fig. 5, text-fig. 5m.

Description. Central body sphaerical or subsphaerical, tubiform processes 10—15. Processes narrow, open on end, ending with 4—6 pointing outwards spines, frequently placed at right angle to axis of processes. Rarely end of spines splitting into two parts.

Dimensions: diameter of central body 42.5—81.5 μm , length of processes 10.5—34.0 μm , width of processes about 1.8—5.4 μm , length of spines about 10 μm . Number of specimens measured 9.

Occurrence: Hauterivian (Germany), Hauterivian — Albian (Morocco), Cenomanian (Poland), Santonian (Germany), (together with *O. vasiformum*) Valanginian — Barremian (England).

Remarks. Certain authors e.g. Brideaux (1971) regard *O. asterigerum* as a synonym of *O. complex*, others e.g. Duxbury (1977) as a synonym *O. vasiformum*. Others treat the three mentioned species as separate species. *O. complex* differs from *O. asterigerum* in the form of distal terminations of processes (Yun 1981). *O. vasiformum* differs from *O. asterigerum* in possessing a pitted periphragm on the surface of the central body (Davey et al. 1966). In the present paper *O. asterigerum* is treated as a separate species.

Oligosphaeridium reniforme (Tasch 1964) Davey & Williams 1966

Pl. I, fig. 4

1964 *Hystrichosphaeridium reniforme* Tasch, p. 193, pl. 2, fig. 6.

1966 *Oligosphaeridium reniforme* Tasch; Davey et al., p. 77.

1969 *Oligosphaeridium reniforme* Tasch; Davey, p. 148, pl. 6, fig. 1.

1977 *Oligosphaeridium reniforme* (Tasch) Davey & Williams; Jain, pp. 173, 182, pl. 1, fig. 9.

Description. Central body subsphaerical with apical archaeopyle and about 8—12 thick tubiform processes widening distally into a funnel, margin of funnel provided with 4—5 irregularly shaped spines.

Dimensions: diameter of central body 52.7—73.1 μm , length of processes 17—34 μm , width of processes about 1.0—10.8 μm , length of spines about 4—12 μm . Number of specimens measured 2.

Occurrence: Lower Albian (India), Albian (U.S.A.), Albian—Cenomanian (Canada).

Remarks. The investigated specimens possess a somewhat larger central body than *O. reniforme* described by other authors, e.g. 52 μm (Tasch 1964), 49 μm (Davey 1969), 66 μm (Jain 1977). Also, they do not show distal subcircular perforations described by Davey (1969). In other characters, however, they are very similar to typical *O. reniforme*.

Family: *Cleistosphaeridiaceae* Sarjeant & Downie 1974

Genus: *Cleistosphaeridium* Davey, Downie, Sarjeant & Williams 1966

Cleistosphaeridium aciculare Davey 1969

Pl. I, figs. 5—6

1969 ?*Cleistosphaeridium aciculare*; Davey, p. 158, pl. 6, figs. 11—12.

1971 *Cleistosphaeridium* (al. *Baltisphaeridium*) *multispinosum* (Singh) comb. nov.; Brideaux, pp. 93—94, pl. 27, figs. 77—79.

Description. Central body subsphaerical covered with numerous processes. Processes approximately of equal length, very thin, acuminate, distributed regularly on entire surface of central body.

Dimensions: diameter of central body 27.2 (\times 20.4) μm , length of processes about 7 μm . Number of specimens measured 1.

Occurrence: Albian and Cenomanian (Canada), (together with *Baltisphaeridium multispinosum*) Albian (U.S.A.), Albian and Cenomanian (Canada).

Remarks. The specimen from Lipnik is more similar to *C. aciculare* than to *C. multispinosum*. The material is too scanty for detailed comparison.

Cleistosphaeridium ehrenbergi (Deflandre 1937)

Davey, Downie, Sarjeant & Williams 1966

Pl. I, figs. 7—8

1966 *Cleistosphaeridium ehrenbergi* Deflandre; Davey et al., p. 170.

1969 *Cleistosphaeridium ehrenbergi* (Deflandre) Davey, Downie, Sarjeant & Williams; Davey et al., p. 16.

1976 *Cleistosphaeridium ehrenbergi* (Deflandre) Davey, Downie, Sarjeant & Williams; Ioannides, Stavrinos & Downie, pp. 447, 450, pl. 1, fig. 9.

1986 *Cleistosphaeridium polyacanthum*; Nøhr-Hansen, p. 32, pl. 1, fig. 9.

Description. Central body sphaerical to subsphaerical, processes numerous (about 30—40), straight or sinuous, thin, closed distally, with simple or rarely bifurcating end.

Dimensions: diameter of central body 23.8—35.7 μm , length of processes about 7—13.6 μm . Number of specimens measured 4.

Occurrence: Middle Jurassic (France), Kimmeridgian (England), Upper Jurassic (France).

Remarks. In the present paper *C. ehrenbergi* is treated separately from *C. polyacanthum* and *C. polytrichum*. According to Nöhr — Hansen (1986) these three species form a complex "*C. polyacanthum*".

Family: *Odontochitiniaceae* Norris 1978

Genus: *Xenascus* Cookson & Eisenack 1969

Xenascus australense Cookson & Eisenack 1969

Pl. I, fig. 9

1969 *Xenascus australense* Cookson & Eisenack in: Eisenack 1971, p. 1109, 1 fig.

Description. Central body subsphaerical, with granular surface. About 14 processes of varying length and width, their distal parts simple or bifurcating, of equal width or widening distally, some ends provided with 3—4 spines in various inclinations.

Dimensions: diameter of central body 51.0—66.3 μm , length of processes: about 10.0—20.5 μm , width of processes about 1.0—19.8 μm , length of spines about 2.7—7.2 μm . Number of specimens measured 1.

Occurrence: Albian — Cenomanian (Western Australia).

Remarks. The investigated specimen is somewhat smaller than *X. australense* (Cookson & Eisenack 1969).

AGE OF THE GRODZISZCZE BEDS IN LIPNIK

The Grodziszczce beds are regarded by geologists on the basis of lithology as Hauterivian. These beds in Lipnik are now dated with a various amount of precision by different other methods. Geroch & Nowak (1963) determined their age as Hauterivian — Lower Barremian? by means of microfauna. Plant megafossils from Lipnik allow only a less precise determination as they indicate a Lower Cretaceous age. In particular the fern *Weichselia reticulata* Stokes & Webb occurs in Western Europe, Asia and N. Africa almost exclusively in the Lower Cretaceous (Reymanówka 1965). The conifer *Frenelopsis hoheneggeri* Schenk occurs mainly in the Lower Cretaceous of Central Europe and *Pseudofrenelopsis* (= *Manica*) *parceramosa* (Fontaine) Watson is found in the Lower Cretaceous of Europe, N. America and Sudan (Reymanówka & Watson 1976, Bielaszka 1981).

Also the dinoflagellate cysts described in the present paper do not allow a precise age determination because of the small number of specimens (20) and species (6) and because to my knowledge none of the determined forms is an index species or a characteristic species. Nevertheless, five of the six determined species are known from the beginning of the Hauterivian (1) or Albian (4) and one from the Middle Jurassic. As a result an age not older than Lower Cretaceous can be assumed.

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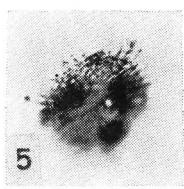
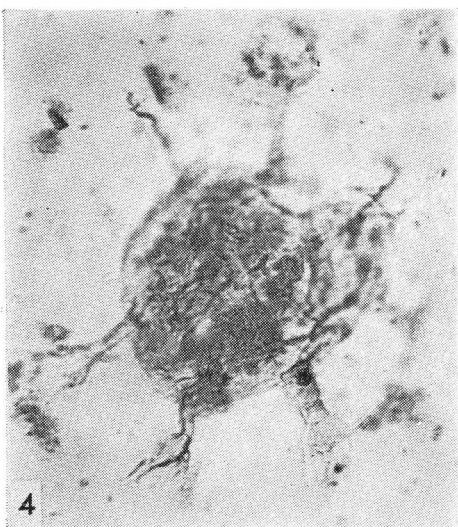
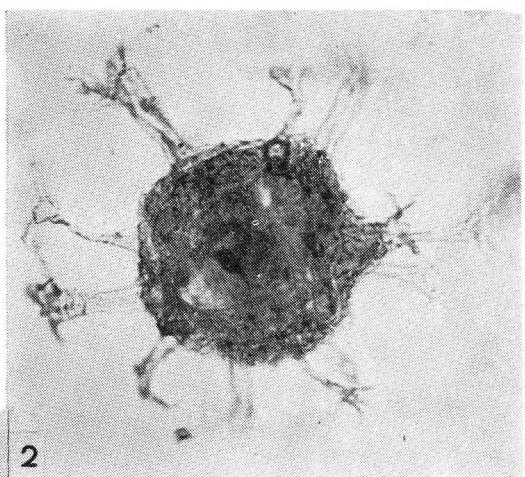
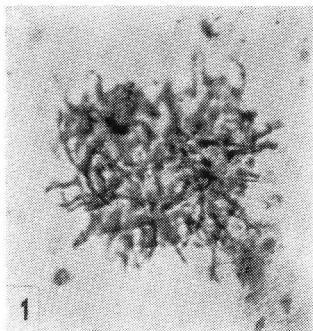
P L A T E

All microphotographs were taken with a Carl Zeiss type Lu microscope (nr 383827) with apochromatic objectives: 90 × n.a. — 1.30, 40 × — 0.95 and eye-piece projective 4.3 : 1 and photomicrographic equipment mf — matic.

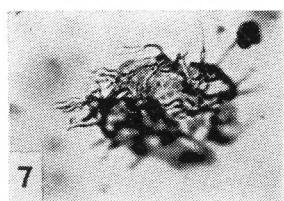
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Plate I

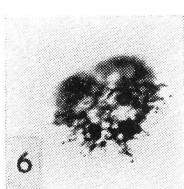
1. *Exochosphaeridium pseudhystrichodinium*, $\times 560$, Lipnik 2/N/59/13; 106/22.5
2. *Oligosphaeridium asterigerum*, $\times 530$, Lipnik 2/N/59/2; 100.5/21.5
3. *Oligosphaeridium asterigerum*, $\times 590$, Lipnik 2/N/59/16; 97/12
4. *Oligosphaeridium reniforme*, $\times 600$, Lipnik 2/N/59/13; 99/13
5. *Cleistosphaeridium aciculare*, $\times 660$, Lipnik 2/N/59/16; 107.5/15.5
6. Same specimen as 5
7. *Cleistosphaeridium ehrenbergi*, $\times 550$, Lipnik 2/N/59/10; 103/4
8. Same specimen as 7
9. *Xenascus australense*, $\times 470$, Lipnik 2/N/59/13; 105/15.5



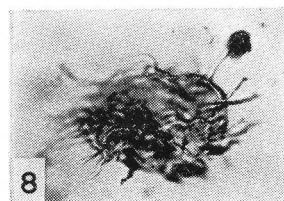
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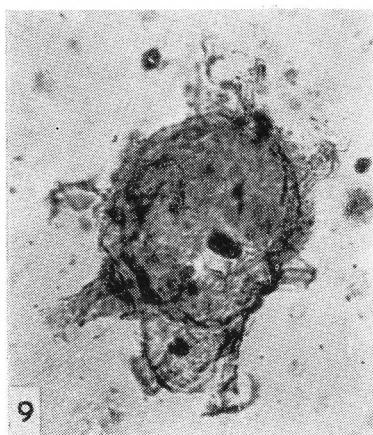
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