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ORGANIC WALLED MICROFOSSILS IN THE CLAY OF IEPER IN THE OVERIJSE BOREHOLE

by Jan De Coninck (*)

SAMENVATTING. - De associaties van microfossielen met organische wand maken het mogelijk de Ieperse Klei in de boring te Overijse, aangetroffen tussen -52 m en -71 m, te korreleren met een pak sedimenten in het onderste derde van de Ieperse Klei in de boring te Kallo. De randpositie van Overijse in het toenmalig sedimentatiebekken heeft wellicht een weerslag gehad op de frekwentie van *Apectodinium*, *Kisselovia* et *Wetzeliella* spp.

RESUME. - Les assemblages de microfossiles à paroi organique permettent une corrélation de l'argile d'Ypres dans le sondage d'Overijse, rencontré entre -52 m et -71 m, avec un paquet de sédiments dans le tiers inférieur de l'Argile d'Ypres dans le sondage de Kallo. La position marginale d'Overijse dans le bassin de sédimentation a probablement eu une répercussion sur la fréquence des *Apectodinium*, *Kisselovia* et *Wetzeliella* spp.

SUMMARY. -The assemblages of organic walled microfossils offer the possibility to correlate the Ieper clay in the Overijse borehole, found between -52 m and -71 m, with a packet of sediments in the lower third of the Ieper clay in the Kallo boring. The marginal position of Overijse in the sedimentary basin at that time has probably had a repercussion on the frequency of *Apectodinium*, *Kisselovia* and *Wetzeliella* spp.

INTRODUCTION.

The overijse borehole n° 103 W - 145 (Geological Survey Belgium) is situated at Overijse-Terlanen (Lambert coord. : x = 163.810 y = 162.230) (fig. 1). In this Overijse borehole the Ypresian is represented by about 19 m of Ieper clay between -52 and -71 m below the surface (which is situated at an altitude of + 97,9 m). The Ieper clay lies upon slightly clayey Landenian sands and is covered by Sands of Brussels (Lutetian).
The purpose of our investigation was to determine which part of the Ypresian is represented by these 19 m of clay. We studied

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TABLE 1: Distribution and frequency of species in the Overijse borehole

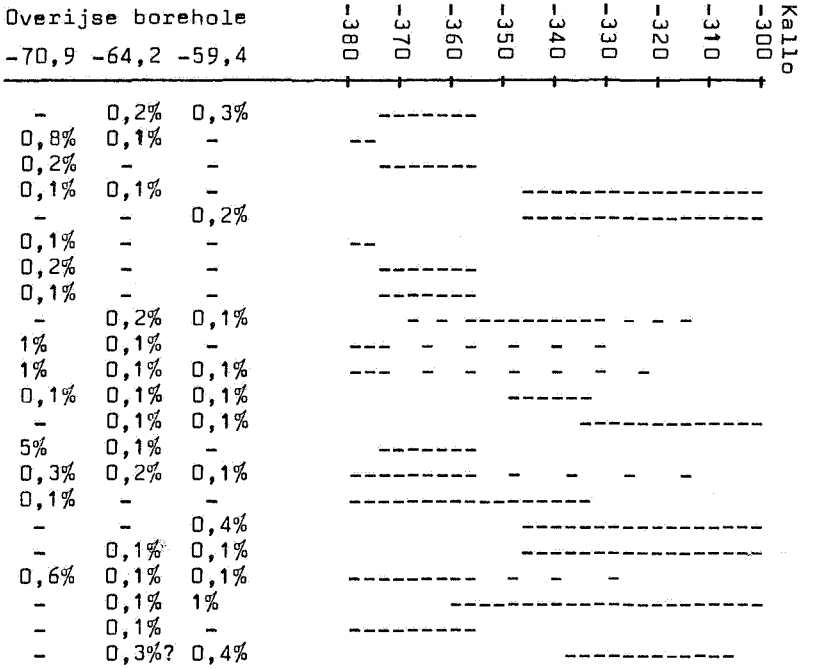
Depth in metres below the surface	-70,9	-64,2	-59,4
Frequencies in percentages			
Chlorophyceae			
Paralecaniella indentata (DEFLANDRE & COOKSON 1955)	1	3	<0,1
Pediastrum sp.	-	0,1	<0,1
Dinophyceae			
Achomosphaera alcicornu (EISENACK 1954)	0,6	<0,1	-
A. sp. indet.	2	<0,1	-
Adnatosphaeridium ? capilatum DE CONINCK 1969	2	4	1,5
A. caulleryi (DEFLANDRE 1938)	-	-	0,2
A. reticulense (PASTIELS 1948)	-	0,3	-
A. robustum (MORGENROTH 1966)	-	0,2	0,3
cf. A. vittatum WILLIAMS & DOWNIE 1966	-	3	2
Alisocysta margarita (HARLAND 1979)	1	<0,1	-
Apectodinium homomorphum (DEFLANDRE & COOKSON 1955)	5	6	5
A. aff. hyperacanthum (COOKSON & EISENACK 1965)	-	<0,1	-
A. parvum (ALBERTI 1961)	-	<0,1	<0,1
? Apteodinium emslandense (GERLACH 1961)	-	-	<0,1
? Areoligera coronata (O. WETZEL 1933)	-	<0,1	-
Areoligeraceae sp. C. in DE CONINCK 1976	0,2	-	-
Cannosphaeropsis utinensis O. WETZEL 1933	-	<0,1	-
Cordosphaeridium ? callosum MORGENROTH 1966	-	0,3	0,4
"C." divergens (EISENACK 1954)	0,1	0,1	-
C. fibrospinosum DAVEY & WILLIAMS 1966	0,1	-	-
C. gracile (EISENACK 1954)	0,4	<0,1	<0,1
C. inodes (KLUMPP 1953)	0,1	<0,1	3
"C." microtriaina (KLUMPP 1953)	4	6	7
"C." microtriaina centrocarpum (DEFLANDRE & COOKSON 1955)	2	3	2
C. minimum (MORGENROTH 1966)	2	0,3	-
"C." uncinispinosum DE CONINCK 1967	-	-	0,2
Cyclonephelium distinctum DEFLANDRE & COOKSON 1955	?	-	-
Deflandrea denticulata ALBERTI 1959	<0,1	-	<0,1
D. denticulata minor DE CONINCK 1969	0,6	-	<0,1
D. depressa MORGENROTH 1966	-	0,1	-
D. oebisfeldensis ALBERTI 1959	<0,1	-	-
D. phosphoritica EISENACK 1938	0,3	0,1	<0,1
D. aff. tenera KRUTZSCH 1962	-	<0,1	-
Diacrocanthidium echinulatum (DEFLANDRE 1937)	0,5	-	1
Dinogymnium sp. indet.	-	-	<0,1
Dinopterygium cladoides DEFLANDRE 1935	0,3	<0,1	-
Diphyes colligerum (DEFLANDRE & COOKSON 1955)	0,1	2	2
Eocladopyxis aff. peniculata MORGENROTH 1966	-	0,2	-
Exosphaeridium phragmites DAVEY, DOWNIE, SARJEANT, WILLIAMS 1966	0,2	-	-
Fibrocysta axialis (EISENACK 1965)	-	<0,1	0,1
F. bipolaris (COOKSON & EISENACK 1965)	-	0,2	<0,1
Glaphyrocysta aff. divaricata (WILLIAMS & DOWNIE 1966)	<0,1	<0,1	-
G. ordinata (WILLIAMS & DOWNIE 1966)	-	<0,1	-
G. reticulosa (GERLACH 1961)	3	<0,1	0,3
Glyphanodinium facetum DRUGG 1964	-	-	0,1
Gonyaulacysta jurassica (DEFLANDRE 1938)	<0,1	-	-
G. tenuiceras (EISENACK 1958)	0,1	-	-
Hemicystodinium zoharyi (ROSSIGNOL 1962)	-	?	-
Hystrichogonyaulax cladophora (DEFLANDRE 1938)	<0,1	-	-
Hystrichokolpoma cinctum KLUMPP 1953	-	<0,1	-
H. unispinum WILLIAMS & DOWNIE 1966	-	0,1	?
? "Hystrichosphaeridium" langi WALL 1965	1	<0,1	-
H. latirictum DAVEY & WILLIAMS 1966	2	0,1	?
H. salpingophorum DEFLANDRE 1935	-	<0,1	<0,1
H. tubiferum (EHRENBERG 1838)	1	<0,1	<0,1
Impagidinium sp. indet.	0,1	0,1	0,1
Kallosphaeridium brevibarbatum DE CONINCK 1969	-	<0,1	<0,1
Kenleyia lophophora COOKSON & EISENACK 1965	-	-	?
Kisselovia tenuivirgula crassoramosa WILLIAMS & DOWNIE 1966	5	<0,1	-
Lejeunia hyalina GERLACH 1961	<0,1	-	<0,1
Lingulodinium machaerophorum (DEFLANDRE & COOKSON 1955)	4	<0,1	1
Litosphaeridium ? inversibuccinum DAVEY & WILLIAMS 1966	2	<0,1	-
Membranilarnacia tenera DE CONINCK 1976	-	-	<0,1
Millioudodinium tenuitabulatum (GERLACH 1961)	2	?	?
Nematosphaeropsis philippotii (DEFLANDRE 1947)	-	0,1	<0,1
Odontochitinopsis ? sp. A in DE CONINCK 1976	0,3	0,2	<0,1
Oligosphaeridium complex (WHITE 1842)	-	<0,1	<0,1
O. pulcherrimum (DEFLANDRE & COOKSON 1955)	0,1	<0,1	-
Operculodinium pseudorecurvatum (MORGENROTH 1966)	0,3	0,6	<0,1
O. sp. indet.	<0,1	<0,1	1,5

three samples (-70,9 m -64,2 m and -59,4 m) in which we recognized 109 species of organic walled microfossils (Table 1) (*).

Palaeocystodinium golzowense ALBERTI 1961	<0,1	-	-
? Perisseiasphaeridium sp. indet.	<0,1	-	-
Phthanoperidinium crenulatum (DE CONINCK 1976)	-	-	0,4
P. echinatum EATON 1976	-	<0,1	<0,1
Rottnestia borussica (EISENACK 1954)	0,1	-	-
Selenopemphix nephroides BENEDEK 1972	-	-	0,1
Senegalinium dilwynense ? (COOKSON & EISENACK 1965)	-	0,1	0,2
S. obscurum ? (DRUGG 1967)	-	0,1	-
Silicisphaera ferox (DEFLANDRE 1937)	-	<0,1	<0,1
Spiniferites cornutus (GERLACH 1961)	1	-	-
S. pseudofurcatus (KLUMPP 1953)	-	<0,1	-
S. cf. tertiara A in DE CONINCK 1969	1	-	-
S. spp. indet.	41	58	50
Surculosphaeridium oceaniae (DE CONINCK 1969)	7	4	6
cf. Systematophora placacantha (DEFLANDRE & COOKSON 1955)	-	1,5	2
Thalassiphora delicata WILLIAMS & DOWNIE 1966	0,6	<0,1	0,1
T. pelagica (EISENACK 1954)	-	<0,1	1
Trigonopyxidia ginella (COOKSON & EISENACK 1960)	-	0,1	-
Turbiosphaera filosa (WILSON 1967)	0,1	<0,1	-
Wetzeliella similis EISENACK 1954	-	?0,3	0,4
W. lunaris GOCHT 1969	-	0,1	-
Xiphophoridium alatum (COOKSON & EISENACK 1962)	-	-	0,1
Prasinophyceae			
Cymatiosphaera eupeplos (VALENSI 1948)	-	0,3	0,4
Pterospermella aff. aureolata (COOKSON & EISENACK 1958)	0,1	-	-
P. heliantoides (DE CONINCK 1969)	0,1	-	-
P. microptera (DEFLANDRE & COOKSON 1955)	-	-	<0,1
P. pastielsi (DURAND 1958)	0,2	-	-
P. aff. pastielsi (DURAND 1958)	-	-	<0,1
Pollen of the mangrove palm tree Nypa			
Spinozonocolpites echinatus MUELLER 1968	-	<0,1	-
Acritarcha			
Baltisphaeridium ligospinosum DE CONINCK 1969	3	0,6	4
B. lumectum SARJEANT 1960	<0,1	<0,1	-
Comasphaeridium cometes (VALENSI 1948)	4	1,5	4
C. multispinosum (PASTIELS 1948)	-	<0,1	0,7
C. whiteii (DEFLANDRE & COURTEVILLE 1939)	-	<0,1	<0,1
? Micrhystridium deflandrei VALENSI 1948	0,5	<0,1	-
M. inconspicuum (DEFLANDRE 1935)	0,5	-	-
M. lymense glisca WALL 1965	-	-	<0,1
M. piliferum ? DEFLANDRE 1937	-	0,3	0,4
M. recurvatum VALENSI 1953	0,1	<0,1	-
100% =	212 (2000)	322 (3100)	259 (2500)
number of species	59	75	62

(*) Frequencies of less than 15 % have been calculated as a fraction of the estimated total of microfossils (given in parentheses under the effectively counted number) in the complete series of slides made from a sample.

Table 2: Significant species and their regional stratigraphic distribution projected in the reference profile of the Kallo borehole.



BIOSTRATIGRAPHIC SIGNIFICANCE OF THE ASSEMBLAGES.

From the similarities between the assemblages of organic walled microfossils in the clay in the Overijse borehole and in the Ypresian deposits at Orchies (Northern France), in the Tielt borehole and in the Kallo borehole appears that the deposits at Overijse between -52 m and -71 m below the surface correspond with a packet of sediments situated in the lower third of the Ieper clay in the Kallo reference profile.
Among the 109 species encountered in the samples, twenty three have local biostratigraphic significance. They are listed in table 2. From their stratigraphic distribution in the Lower Ypresian deposits of the Belgian basin (DE CONINCK, J. 1976a, fig. 3) the following can be concluded :

- The assemblage of Overijse -70,9 m, resembling very well the one found in Orchies (DE CONINCK, J. 1976a, p. 17), can be situated between -357,5 m and -374,5 m in the reference profile of Kallo.

- The assemblage of Overijse -64,2 m, intermediary between the assemblages of Orchies and Kallo -341,5 m, can be situated near -350 m in the kallo profile.

- The assemblage of Overijse -59,4 m, intermediary between the assemblages of Kallo -329,5 m and -341,5 m, can be situated in this interval of the Kallo profile.

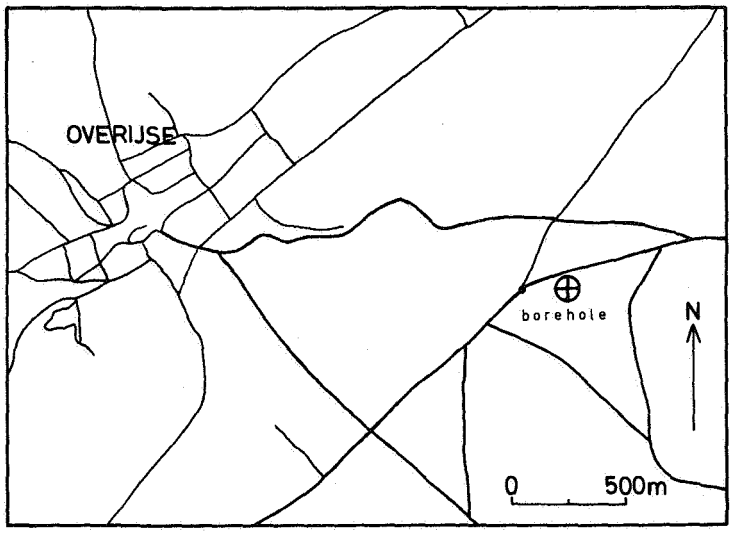


Fig. 1 - Localisation of the Overijse borehole.

PALEOGEOGRAPHIC CONSIDERATIONS.

The Ieper clay at Overijse is correlated with a packet of sediments situated in the lower third of the Ieper clay in the Kallo borehole. The correlations of the base of the clay deposits at Overijse, Orchies and Tielt with the reference profile of Kallo demonstrate that the marine transgression advanced rapidly from the north west

towards the south east over the depositional area (of which the limits are given in KAASSCHIETER 1961, map 8) and attained Overijse at about the same time as Orchies, also situated near the margin of the basin (fig. 2).

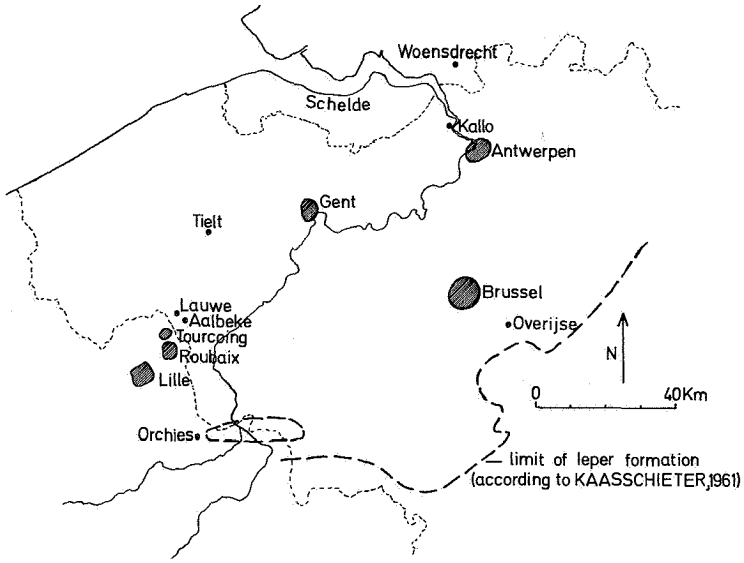


Fig. 2 - Position of Overijse in the basin of sedimentation of the Ieper Formation.

That there has been a rapid transgression is also concluded in COSTA, L. & DOWNIE, C. (1976, p. 601, text fig. 4) who have correlated the base deposits of the London clay in the Hampshire and London basins with the base of the Ieper clay in the Belgian basin, using *Apectodinium*, *Kisselovia* and *Wetzeliella* spp. as biostratigraphic indicators. In the Overijse borehole the Ieper clay is overlain by Sands of Brussels (Lutetian); erosion must have removed the rest of the Ypresian deposits that almost certainly covered the relatively thin packet of Ieper Clay left in this area. Furthermore the thickness of the clay packet between samples -70,9 m and -59,4 m is reduced when compared with the corresponding part of the clay in the Kallo borehole where it is at least one and a half times as thick and probably about twice as thick. These facts reflect the marginal position of Overijse in the sedimentary basin at that time.
In the assemblages of the Ieper clay in the Overijse borehole we note relatively high frequencies of *Apectodinium*, *Kisselovia* and *Wetzeliella* spp. (considered together : about 10 % in the lower sample, 6,4 % in the following, and 5,4 % in the upper one). DOWNIE, HUSSAIN and WILLIAMS (1971, p. 34) make the supposition that a predominance of species belonging to these genera might indicate an estuarine environment. In Overijse we can of course not speak of a predominance but it is clear that the frequencies of species belonging to these genera are significantly higher than in the corresponding parts of the Kallo or Tielt sections (where the frequencies oscillate around 1 % and attain only once 4 % in Kallo -357,5 m). The frequencies of *Apectodinium*, *Kisselovia* and *Wetzeliella* spp. together are comparable with those observed in Orchies (about 8 %) (DE CONINCK, J. 1976a, p. 18) and might well be related to the proximity of the shoreline.

CONCLUSION.

Biostratigraphic correlation of the base of the Ypresian clay deposit in the Overijse borehole with a packet of sediments in the lower third of the Ieper clay in the Kallo borehole indicates that the transgression advanced rapidly from north west towards south east. The reduced thickness of the clay deposit together with the more pronounced frequencies of *Apectodinium, Kisselovia* and *Wetzeliella* spp. at Overijse, when compared with the more important thickness and also the lower frequencies of the former taxa in the Kallo or Tielt boreholes, reflect the marginal position of Overijse in the sedimentary basin during the Ypresian.

REMARKS ABOUT SPECIES WHICH WERE NOT PREVIOUSLY ENCOUNTERED IN THIS STRATIGRAPHIC POSITION.

Glyphanodinium facetum DRUGG 1964.

DRUGG, 1964, Proc. Biol. Soc. Wash. 77, p. 238, figs. 1-6

Remarks : The species has been found in Paleocene deposits in California by DRUGG (1964 and 1967), in Upper Ypresian and Lower Lutetian deposits in the Belgian basin by DE CONINCK (1977 and 1976b) and in Lower Miocene deposits in the Norwegian-Greenland Sea borehole 338 by MANUM (1976, described as Problematicum II).

Selenopemphix nephroides BENEDEK 1972.

Pl. 3, fig. 7

BENEDEK, 1972, Palaeontographica 137 B, p. 47, pl. 11, fig. 13, pl. 16, figs. 1-4.

Remarks : The species was found in Oligocene deposits in S W Westfalen (Germany) by BENEDEK (1972), in Upper Eocene deposits in the Hampshire basin by BUJAK (thesis), in Ypresian and Lower Lutetian deposits in the Belgian basin by DE CONINCK (1977 and 1976b).

Senegalinium ? dilwynensis ? (COOKSON & EISENACK 1965) STOVER & EVITT 1978.

Pl. 3, figs. 3, 6, 8.

Deflandrea dylwynensis COOKSON & EISENACK, 1965, p. 141, pl. 18, fig. 6-9.

STOVER & EVITT, 1978, p. 123.

Remarks : The form observed at Overijse -64,2 m differs from the species in having an almost circular endocyst with slightly granulate endophragm and a coarsely reticulated, although thinwalled periphragm. *S. ? dilwynensis* has been recorded by COOKSON & EISENACK in the Australian Pebble Point Formation (Middle Paleocene according to VERDIER, 1970), by STOVER (1973) in Paleocene deposits in the Victorian coastal and off shore basin of Australia, and by BENSON (1976) in Paleocene deposits from Maryland - U. S. A.
Overaal dimensions : between 50 and 63 μm high
between 40 and 48 μm wide.

Spinozonocolpites echinatus MUELLER, 1968.

Pl. 3, fig. 13.

MUELLER 1968, Micropaleontology 14, p. 11, pl. 3, fig. 3.

Remarks : *S. echinatus*, found at Overijse -64,2 m, is the pollen of the mangrove palm tree *Nipadites*. It occurs here lower in the Ypresian than ever observed; its frequency is however very low (only one specimen recovered). In the Tertiary deposits of the Belgian basin it was also found in the Lower Ypresian deposits at Lauwe (DE CONINCK, 1976b) (which can be correlated with Kallo -305 m), and appears regularly in the upper part of the Lower Ypresian and in the Upper Ypresian deposits (ROCHE 1973, DE CONINCK, 1976a and 1977).

Planche I

Magnification : 500 x

Fig. 1	*Alisocysta margarita*	-70,9 m; prep. 4
Figs. 2 - 4	*Alisocysta margarita*	-64,2 m; prep. 4
Fig. 5	*Apectodinium aff. hyperacanthum*	-64,2 m; prep. 5
Fig. 6	*Apectodinium parvum*	-59,4 m; prep. 2
Figs. 7- 8	*Cannosphaeropsis utinensis*	-64,2 m; prep. 3
Figs. 9-10	*Areoligeraceae* sp. C	-70,9 m; prep. 3
Fig. 11	*Exosphaeridium phragmites*	-70,9 m; prep. 4
Fig. 12	*Hystrichosphaeridium latirictum*	-70,9 m; prep. 1
Fig. 13	*Xiphophoridium alatum*	-59,4 m; prep. 1
Fig. 14	*Kallosphaeridium brevibarbatum*	-59,4 m; prep. 3
Figs.15-16	*Impagidinium* sp. indet.	-64,2 m; prep. 4
Figs.17-18	*Impagidinium* sp. indet.	-59,4 m; prep. 2
Fig. 19	*Kallosphaeridium brevibarbatum*	-64,2 m; prep. 5

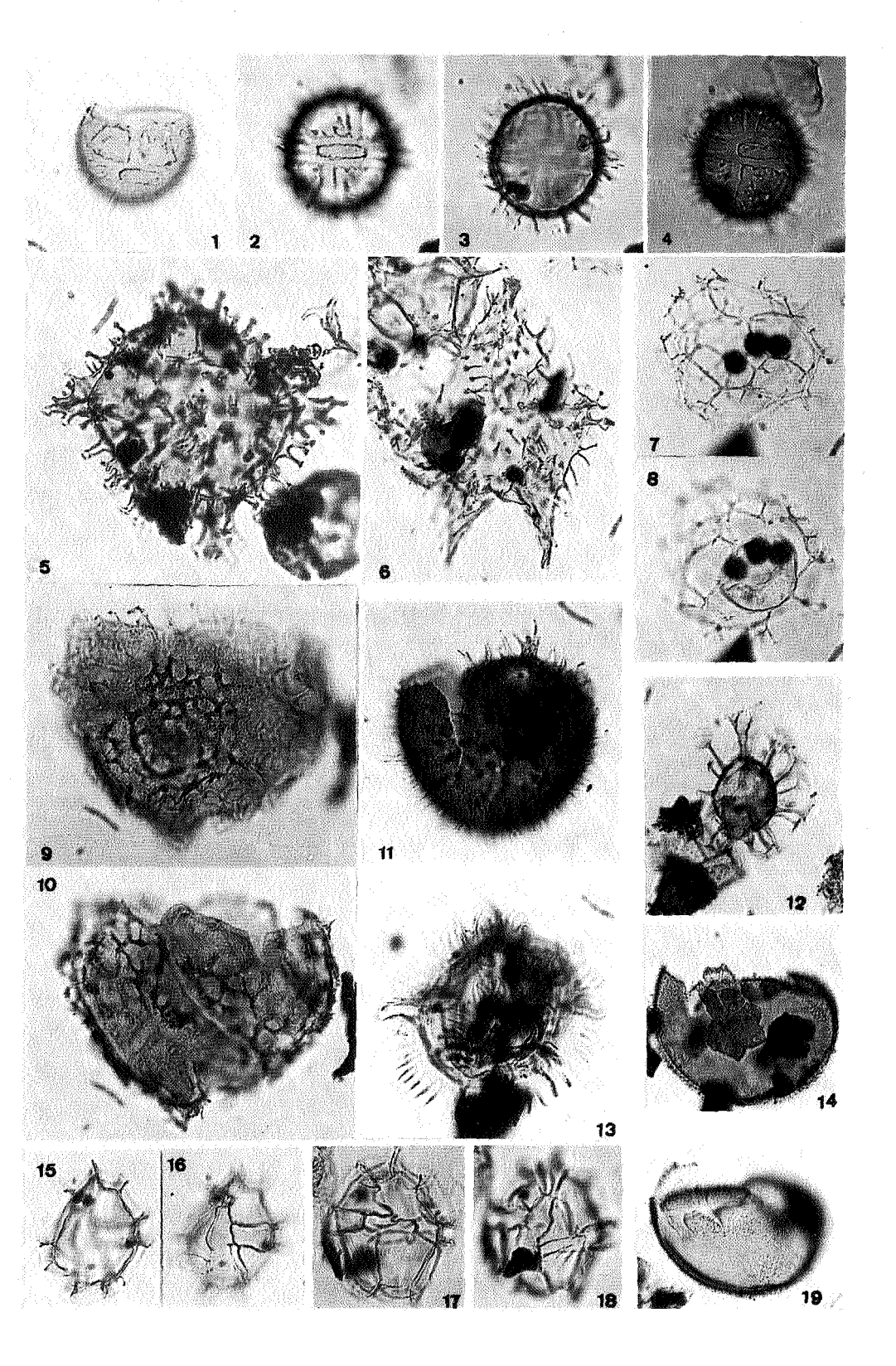

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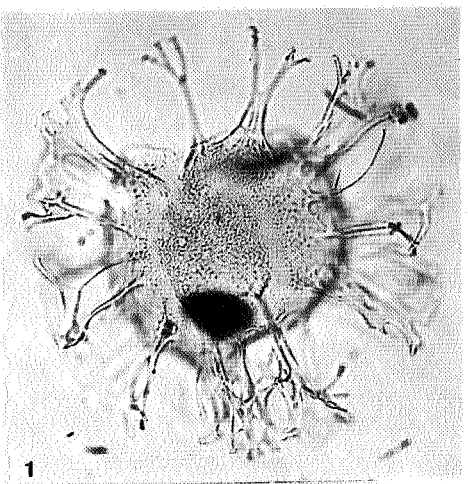
Planche II

Magnification : 500 x

Fig. 1	*Glaphyrocysta ordinata*	-64,2 m; prep. 1
Figs. 2 - 3	*Glaphyrocysta reticulosa*	-59,4 m; prep. 3
Fig. 4	*Glaphyrocysta reticulosa*	-59,4 m; prep. 5
Fig. 5 - 6	*Kisselovia tenuivirgula crassoramosa*	-70,9 m; prep. 4
Fig. 7	*Hystrichokolpoma unispinum*	-64,2 m; prep. 1
Fig. 8	*Nematosphaeropsis philippotii*	-64,2 m; prep. 3



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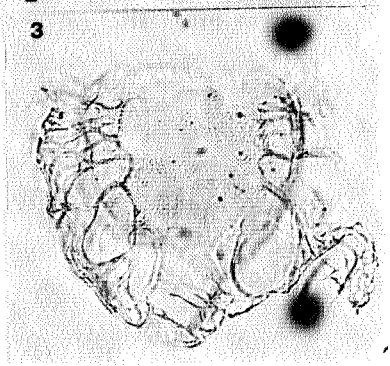

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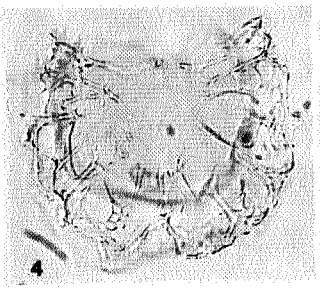

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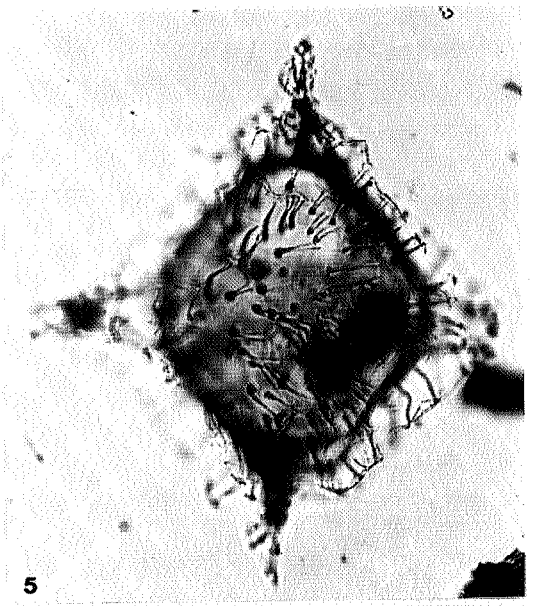

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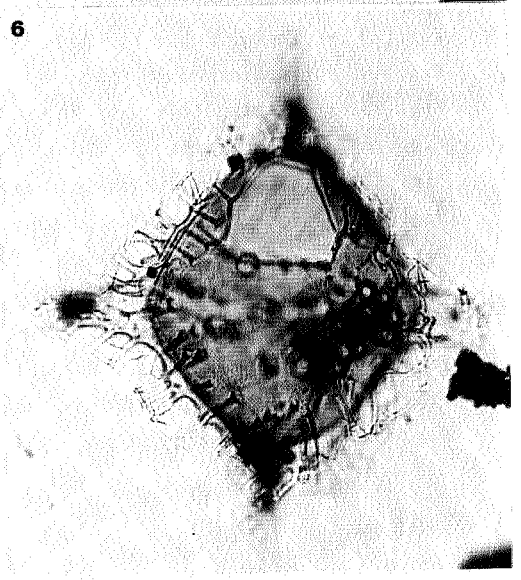

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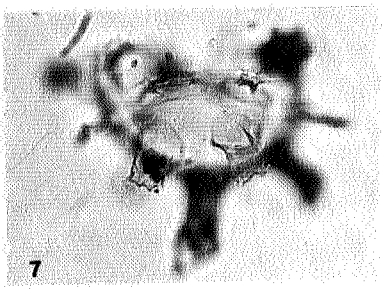

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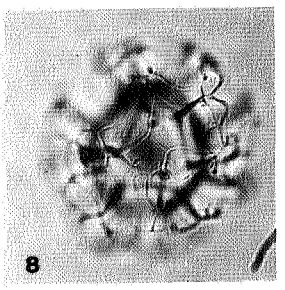

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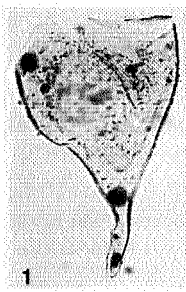
Planche III

Magnification : 500 x

Fig. 1 -	*Odontochitinopsis ?* sp. A	-64,2 m; prep. 2
Fig. 2 -	*Odontochitinopsis ?* sp. A	-59,4 m; prep. 3
Fig. 3 -	*Senegalinium ? dilwynense ?*	-64,2 m; prep. 2
Fig. 4 -	*Turbiosphaera filosa*	-70,9 m; prep. 1
Fig. 5 -	*Odontochitinopsos ?* sp. A	-70,9 m; prep. 5
Fig. 6 -	*Senegalinium ? dilwynense ?*	-64,2 m; prep. 3
Fig. 7 -	*Selenopemphix nephroides*	-59,4 m; prep. 1
Fig. 8 -	*Senegalinium ? dilwynense ?*	-59,4 m; prep. 3
Fig. 9 -	*Wetzeliella similis*	-64,2 m; prep. 2
Fig. 10 -	*Wetzeliella similis*	-59,4 m; prep. 2
Fig. 11 -	*Pterospermella heliantoides*	-70,9 m; prep. 2
Fig. 12 -	*Pterospermella* aff. *pastielsii*	-59,4 m; prep. 2
Fig. 13 -	*Spinozonocolpites echinatus*	-64,2 m; prep. 4
Fig. 14 -	*Wetzeliella lunaris*	-64,2 m; prep. 1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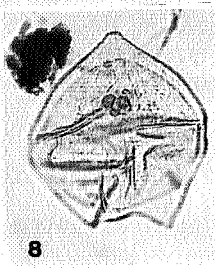
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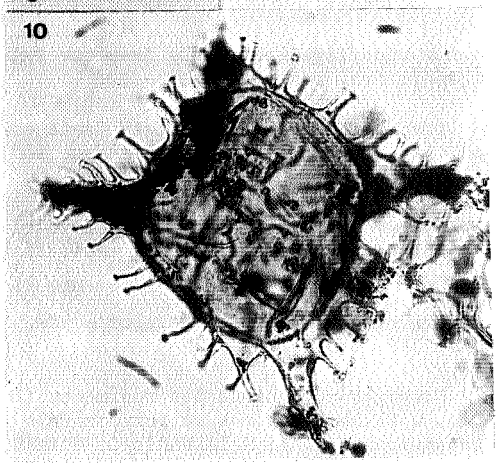
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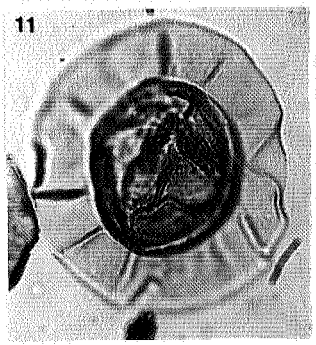
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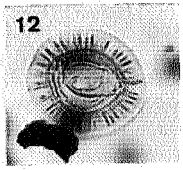
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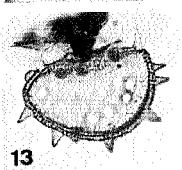
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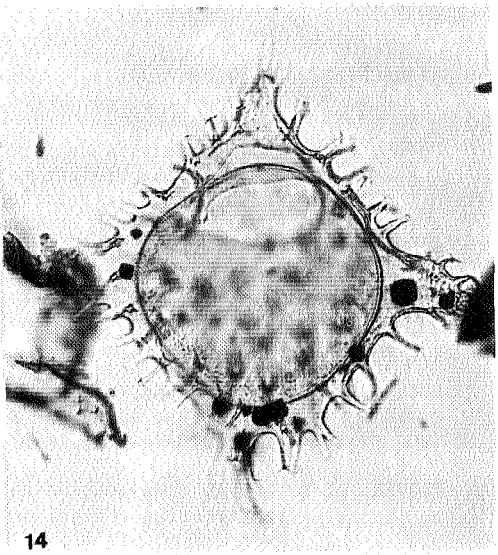
14

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