

Some Middle Jurassic dinocysts from the Brent Group of the northern North Sea

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ABSTRACT - Selected dinocyst taxa from the Brent Group equivalent (Bathonian-Aalenian) of the northern North Sea are described. The diagnosis of *Dissiliodinium* (Drugg 1978) is emended. Two new species: *Dissiliodinium willei* and *Durotrigia aspera* are introduced. In addition, several new taxa are informally described and illustrated.

INTRODUCTION

This paper describes some initial results of palynological analysis of conventional core samples from the Brent Group (Aalenian-Bathonian) and lower Humber Group (Bathonian-Early Callovian). All material is from wells in blocks 9/8a and 9/9b in the UK Sector of the northern North Sea (Fig. 1). Several hundred samples have been analysed and many previously undescribed marine species were recorded. Selected dinocyst taxa are described in the following systematic section. All of these forms have stratigraphic potential.

All type and illustrated material are housed in the collection of BP Exploration Ltd, 301 St. Vincent Street, Glasgow, Scotland.

SYSTEMATIC PALYNOLOGY

Division Pyrrophyta Pascher 1914

Class Dinophyceae Fritsch 1935

Order Peridiniales Haeckel 1894

Genus *Crussolia* Wolfard & Van Erve 1981,
emend. Smelror & Aarhus 1989.

Type species. *Crussolia deflandrei* Wolfard and Van Erve 1981.

Remarks. Smelror and Aarhus (1989) emended the diagnosis of *Crussolia* to incorporate the morphological features of their new species *C. dalei*, which is a tabulate variety. This is slightly contentious, because many genera are currently separated on the basis of the presence or absence of tabulation (e.g.) *Spiniferites* vs. *Achomosphaera*, *Lagenadinium* vs. *Stephenelytron*, *Pareodinia* vs. *Paragonyaulacysta* and *Dissiliodinium* vs. *Durotrigia*). If this precedent were to be followed, then a new genus, incorporating cavate pareodinioid dinocysts with reflected tabulation, would have to be erected.

We agree with Smelror and Aarhus (*op. cit.*) that *Crussolia* never has a 5I archaeopyle as indicated in the original diagnosis of Wolfard and Van Erve (1981). We would, however, interpret the true archaeopyle structure as variable intercalary (type I-3I) rather than type 3I.

Crussolia perireticulata Aarhus *et al.*, 1989

(Pl.3, Figs. 4, 5, 7 & 8)

1989 *Crussolia* sp. Smelror and Aarhus,
p.44, Figs.5C, D.

1989 *Crussolia perireticulata* Aarhus *et al.*,
p.46, Figs 5a-i.

Description. Proximate pareodinioid dinocyst with a pyriform outline and of intermediate to large size (60-100 micrometers). Cysts circumcavate with thicker, scabrate endophragm and thinner, smoother periphragm. The periphragm is modified into an imperfect reticulum that may be perforate or vacuolate. There are generally no indications of tabulation other than the

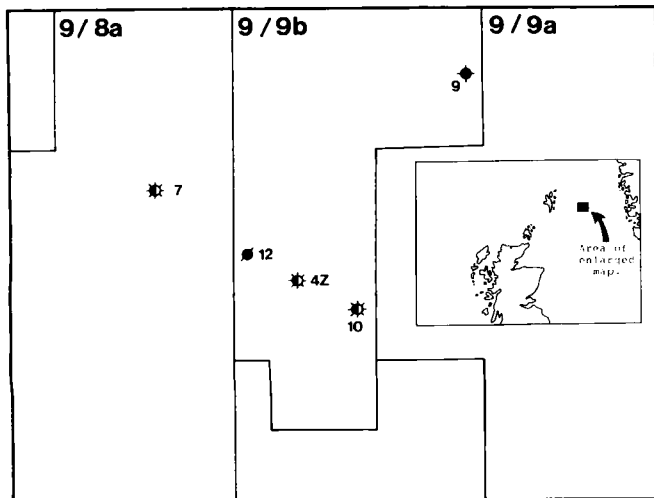


Fig. 1 Location map of study wells

archaeopyle. Some specimens have a larger, more regular reticulate ornament along the cingulum.

Occurrence. This species has been observed in sediments of Bathonian to Middle Oxfordian age. There is some doubt as to whether the younger records are *in situ* or reworked, because it is rare and inconsistent in the Oxfordian and Callovian. *C. perireticulata* has also been recorded from Callovian sediments of the Norwegian Sector of the North Sea (Aarhus *et al.* 1989) and from Late Bathonian to Callovian aged sediments of Kong Karls Land and Franz Josef Land (Smelror and Aarhus, 1989). There are no published records of this species from onshore UK.

Genus *Dissiliodinium* Drugg 1978 emend.

Type species. *Dissiliodinium globulum* Drugg 1978, p.68, pl.4, figs 4-6.

Emended diagnosis. Proximate subspherical gonyaulacoid dinocyst of intermediate to large size (50-110 micrometers). The autophragm is smooth, or more normally ornamented by non-tabular features of low relief. The archaeopyle is variable precingular (type 1P-5P), opercular pieces normally free. Apical plates and plate 6" remain attached to hypocyst. Epicystal tabulation derived from the outline of archaeopyle indicate formula; 4', 0a, 6". Faint parasutures delineating the cingulum may rarely be observed. Hypocyst lacks any indication of tabulation.

Remarks. *Dissiliodinium* is originally described with a type 4P-5P archaeopyle. The generic diagnosis is emended to include the variable 1P-5P archaeopyle and the absence of dorsal intercalary plates on the epicyst.

Comparison. *Dissiliodinium* differs from *Durotrigia* Bailey (1987) in being non-tabulate and lacking dorsal intercalary plates on the epicyst.

Dissiliodinium willei sp. nov.

(Pl.1, figs 1-4, text-fig.2).

Derivation of name. This species is named after Herr Wolfgang Wille, Research Fellow at the Centre for Palynological Studies, University of Sheffield, England.

Diagnosis. Subspherical to ellipsoidal proximate gonyaulacoid dinocyst. Autophragm variously ornamented with low relief granulate, vermiculate and reticulate sculpture. Tabulation absent, indicated by archaeopyle only (type 1P-5P). Average size 75x60 micrometers (holotype 81x63 micrometers).

Holotype. Slide B.7058.4, England Finder ref. K53/3.

Type locality. UKCS Well 9/9b-10 at 3550.70m (conventional core).

Description. The cyst outline is often modified by one or two strong, sub-parallel folds. The autophragm is ornamented by low relief features which vary in complexity, from isolated low mounds or granules, to more elongate and branching vermiculae, which may develop into an incomplete reticulum. This variation in ornament is often seen on a single specimen. Tabulation

is generally indicated by the archaeopyle only, but in some rare forms with stronger ornament, individual elements may merge to form partial cingular parasutures. The archaeopyle is formed by the loss of up to five precingular plates. Size intermediate, generally around 70 micrometers in length and 50 micrometers width.

Comparison. *Dissiliodinium willei* sp.nov. is distinguished from other species of the genus by the style of ornament. The low undulose vermiculae and reticulate areas are coarser and distributed in a more open pattern than in *D. globulum* (Drugg 1978).

Occurrence. This species has been observed in sediments ranging in age from Early Bajocian to Callovian. It is often seen in flood abundance in early Middle Jurassic semi-marine sediments from the North Sea and adjacent areas. It appears however, to be a rare form in southern England (pers. obs).

Genus *Durotrigia* Bailey 1987

Type species. *Durotrigia daveyi* Bailey 1987, p.89.

Durotrigia aspera sp. nov.

(Pl.2, figs 1-6, 9, text-fig.3).

Derivation of name. Latin *asper*: rough. With reference to the coarse intratabular ornament.

Diagnosis. A species of *Durotrigia* with full gonyaulacoid tabulation reflected by irregular, undulose ridges and low crests, which often develop proximal vacuoles. The autophragm is relatively thick and intratabular areas are coarsely granulate, vermiculate or semi-reticulate. The archaeopyle is variable precingular, type 1P-5P. Average size c.70x55 micrometers (holotype 62x48 micrometers).

Holotype. Slide C.0187.1 England Finder ref. S49/4.

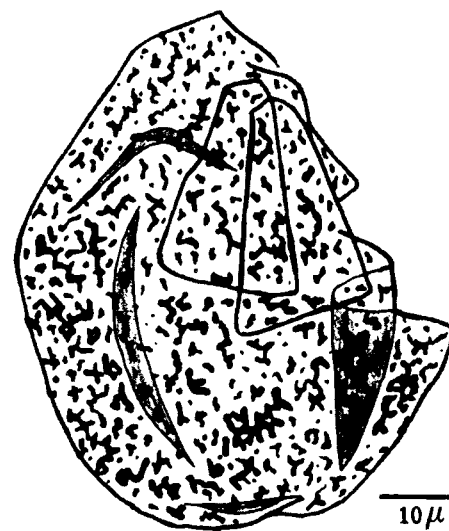
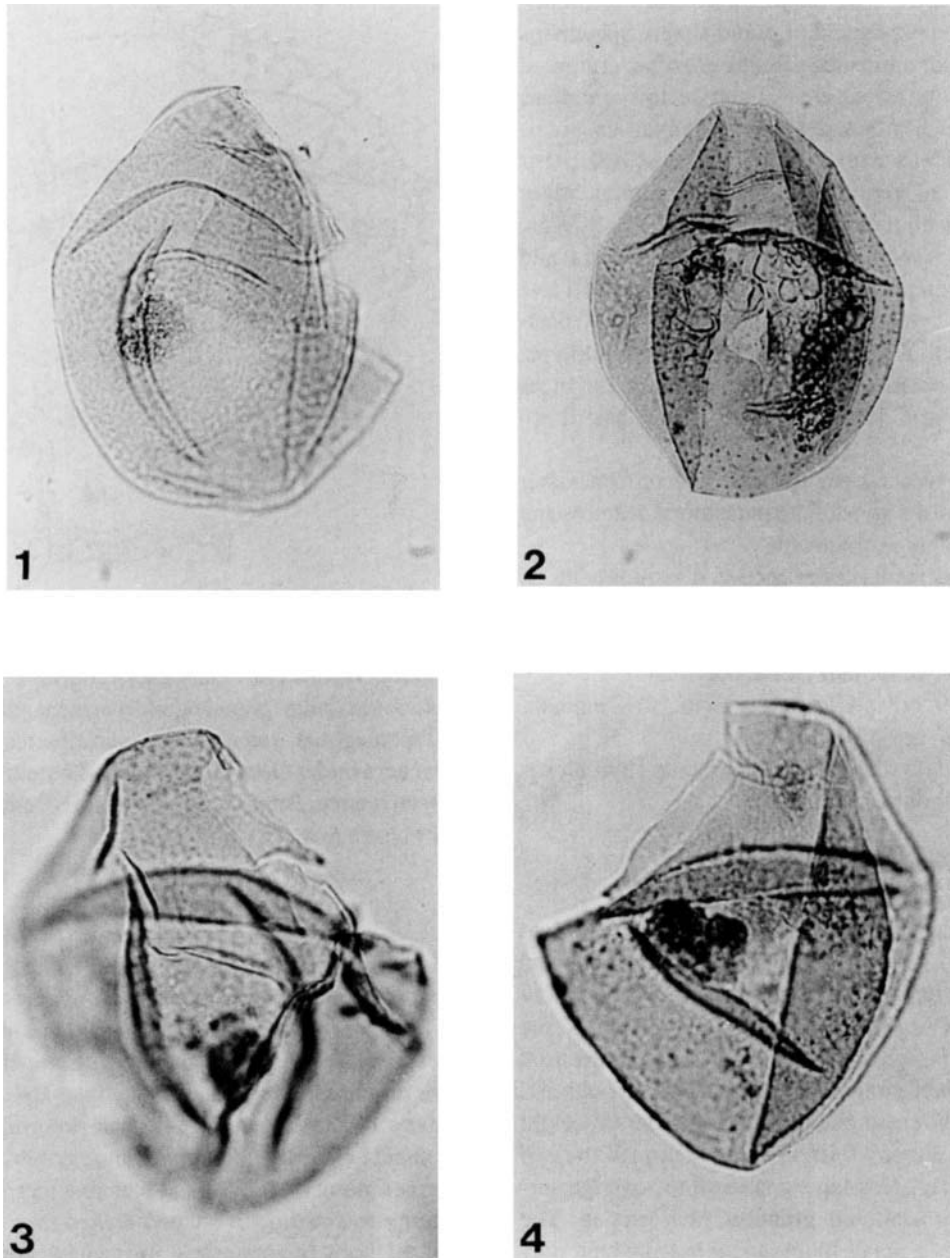


Fig.2 *Dissiliodinium willei* sp. nov. Holotype



Explanation Of Plate 1

Dissiliodinium willei sp. nov., all x800 approx.

- Fig. 1. Holotype. Note the two precingular opercula trapped within the epicyst. UKCS Well 9/9b-10, 3550.7m (slide B.7058.4) EF K53/3.
- Fig. 2. This specimen shows granulate rather than vermiculate ornament. The archaeopyle has not operated, though incipient sutures are visible on the epicyst. Note the characteristic longitudinal folds. UKCS Well 9/9b-10, 3550.7m (slide 4), EF K44/1
- Fig. 3. Lateral view of specimen with 2P archaeopyle and strongly vermiculate ornament. UKCS Well 9/9b-10, 3550.7m (slide 4), EF H44/3.
- Fig. 4. Lateral view of specimen with complete or partial loss of 4 precingular plates. UKCS Well 9/9B-10, 3550.7m (slide 4), EF K51/1.

Type locality. UKCS Well 9/9b-4Z at 12314'.

Description. This species is of intermediate size (70-90 micrometers) and has a subspherical or ovoid shape. Specimens with several precingular operculae missing are often crumpled and shapeless. Parasutural features comprise low undulose ridges or crests, which often develop proximal vacuoles. Intratabular areas exhibit a coarse ornamentation of isolated or coalescing granules and vermiculae. The para sutural ridges reflect a gonyaulacoid tabulation (4', 2a, 6'', 6c, 6''', 1p, 1''', ?s, fpa). The autophragm is relatively thick (1-2 micrometers) and the archaeopyle is formed by the loss of between one and five precingular plates. Excystment begins dorsally at the 3'' position and progresses ventrally in both directions. In the holotype, only one precingular operculum has fully operated, but cysts with variable dehiscence; 1P, 2P, 3P, 4P and 5P have been recorded.

Comparison: *Durotrigia aspera* sp. nov. differs from other species of the genus by the style of the parasutural features and the very coarse intratabular ornament.

Occurrence. This species has been recorded in sediments of Bathonian age, where it can be common or abundant.

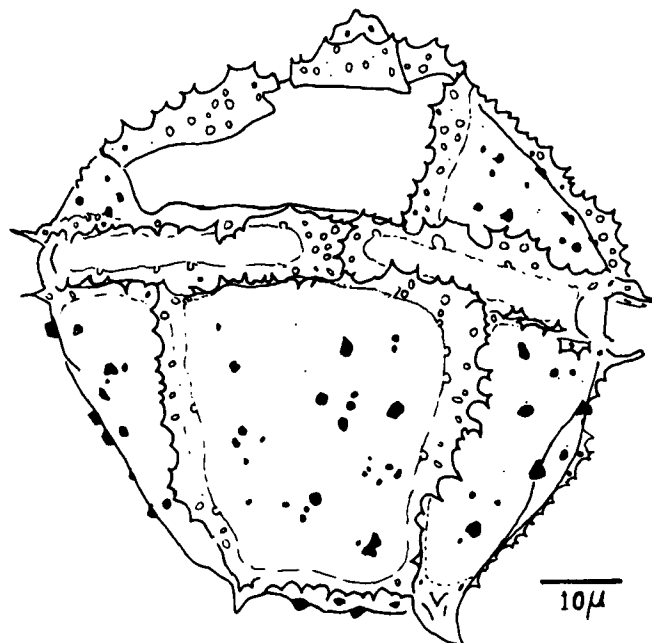


Fig. 3 *Gonyaulacysta* sp. 1.

microperforate crest margins. In addition, *Gonyaulacysta* sp.1 has intratabular granules and verrucae. *G. pectinigera* has a subpentagonal, rather than a subspherical outline. (See also remarks under *Gonyaulacysta* sp.2 herein).

Occurrence. Brent Group (probably Bathonian) of the northern North Sea.

Genus *Gonyaulacysta* Deflandre 1964,

emend. Sarjeant 1969, emend. Stover & Evitt 1978, emend. Sarjeant 1982.

Type species. *Gonyaulacysta jurassica* (Deflandre 1938. Norris & Sarjeant 1965, emend. Sarjeant 1982.

Gonyaulacysta sp. 1.

(Pl.3, figs.3, 6, 9, text-fig.3)

Description. Subspherical proximate dinocyst of small to intermediate size (50-70 microns). Cysts suturocavate and epicornucavate, with thicker endophragm and thinner, more delicate periphragm. Gonyaulacoid tabulation formula (4', 0a, 6'', 6c, 6''', 1p, 1''', ?s, fpa) reflected by distinct parasutural crests (formed by the periphragm only) which are perforate and distally denticulate. The crests average 5 micrometers in height and have a tent-like structure, formed by separation of the two wall layers. Intratabular areas have a smooth to scabrate surface, with irregularly scattered granules or verrucae. The periphragm also forms a small blunt apical horn, which may also be perforate. The archaeopyle is precingular, type P (3'' only).

Remarks. *Gonyaulacysta* sp.1. differs from *G. pectinigera* (Gocht) Fensome 1979 in having perforate, rather than

Gonyaulacysta sp.2

(Pl.3, figs 1, 2, text-fig.4).

Description. Subpentagonal gonyaulacoid dinocyst of intermediate size (60-80 micrometers). Cysts suturocavate, with wall layers appressed over intratabular areas, separating adjacent to plate boundaries and forming tent-like crests. The crests are proximally perforate to vacuolate and distally denticulate. Many of the larger vacuoles are interrupted by the line of contact between endophragm and periphragm and form broad arches along both flanks of the crest margins. Some vacuoles merge to form heart-shaped arches (see text fig.5). A short apical horn is apparently formed by both wall layers. The tabulation is gonyaulacoid, although the exact formula is uncertain. The archaeopyle is precingular, type P (3'' only).

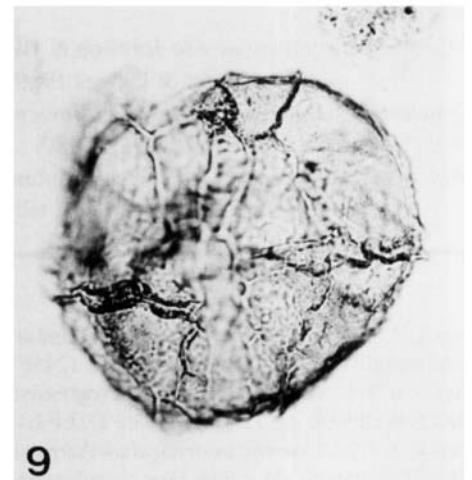
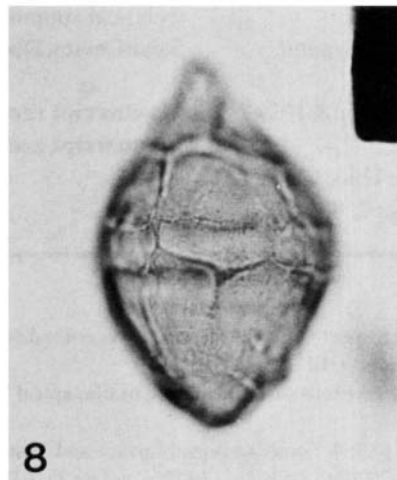
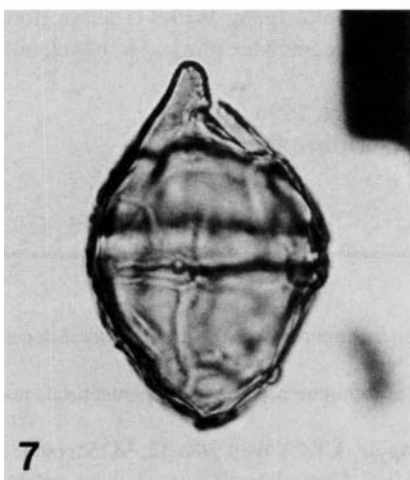
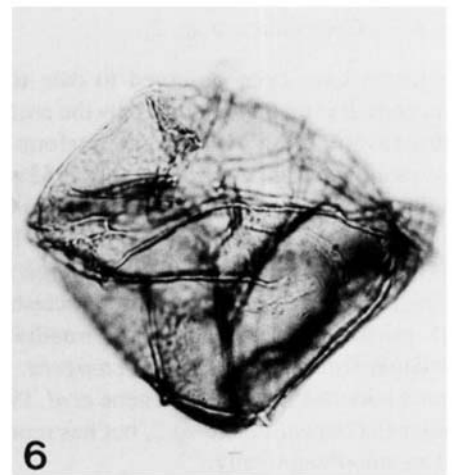
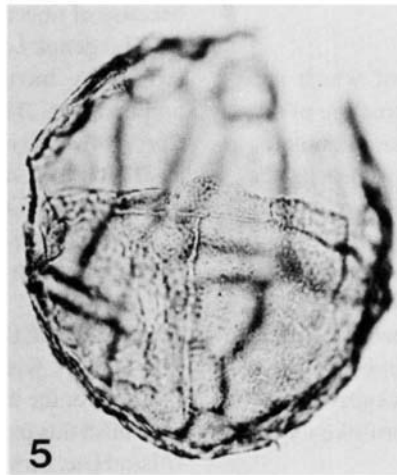
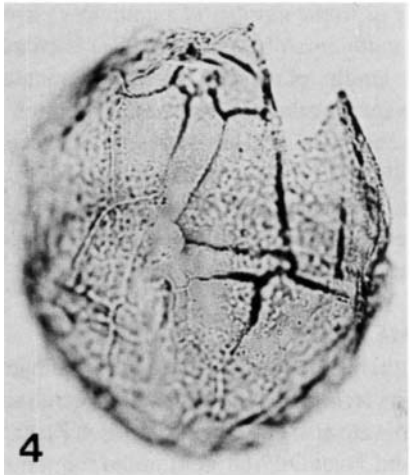
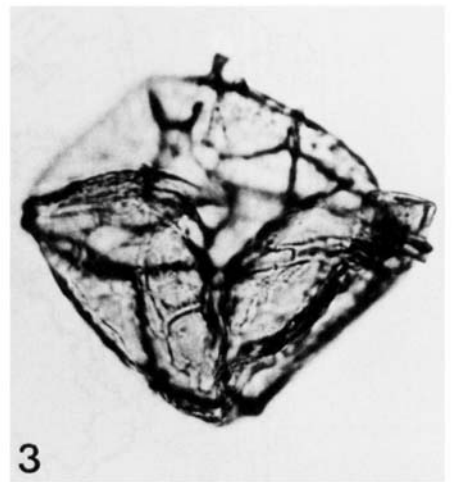
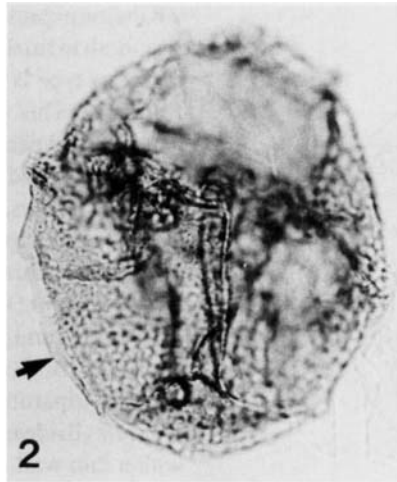
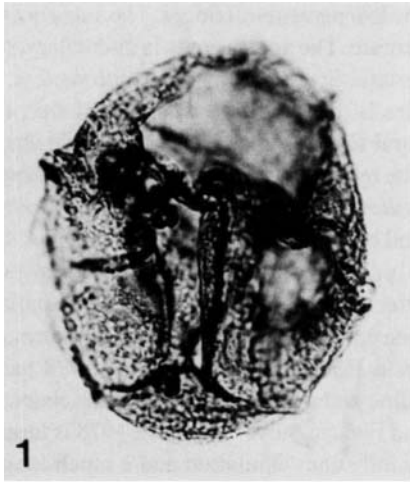
Remarks. This is a very distinctive species, but only two

Explanation of Plate 2

All x800 approx.

Figs 1-6, 9. *Durotrigia aspera* sp. nov. 1, 2. Holotype. Dorsal view, note the coarse intratabular ornament and the nature of the parasutural features (arrowed). UKCS Well 9/9b-4z, 12314' (slide 1), EF E61/2; 3, 6. Ventral and dorsal foci on specimen with a short apical horn. UKCS Well 9/9b-4z, 12331' (slide 1), EF H60/3; 4, 5. Ventral and dorsal views of specimen with a 2P archaeopyle. UKCS Well 9/8a-7, 12763' (slide 3), EF N60; 9. Ventral view UKCS Well 9/9b-4z, 12314' (slide 1), EF E61/2.

Figs 7, 8. *Paragonyaulacysta* cf. *calloviensis*. 7. Focus on ambitus to show the shortened apical horn and ellipsoidal outline; 8. Lateral focus to show the nature of the parasutural features. UKCS Well 9/8a-7, 12484' (slide 2). EF Q47.



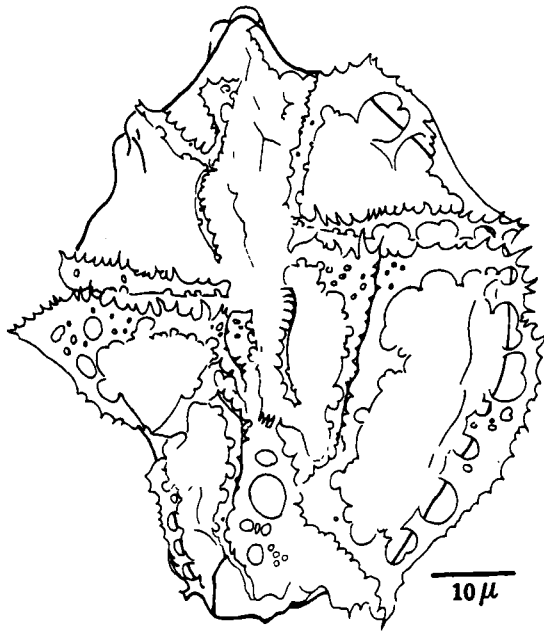


Fig. 4 *Gonyaulacysta* sp. 2.

specimens have been observed to date (both of which are damaged). It is readily identified by the unique structure of the suturocavate crests which are perforate and vacuolate. *Gonyaulacysta centriconnata* Riding 1983 is also suturocavate, but the periphragm is entire. *Gonyaulacysta* sp.2 is related to *Gonyaulacysta pectinigera* (Gocht 1970) Fensome 1979 and *Gonyaulacysta* sp.1 herein. In *G. pectinigera* the crest margins are microperforate, whilst the perforate crests of *Gonyaulacysta* sp.1 probably represent an intermediate form between *Gonyaulacysta* sp.2 and *G. pectinigera*. *Rhynchodiniopsis regalis* (Gocht 1970) Jan du Chene *et al.* 1985 is superficially similar to *Gonyaulacysta* sp.2, but has more thorn-like crests and an autophragm only.

Occurrence. Brent Group (probably Bathonian) of the northern North Sea.

Genus *Paragonyaulacysta* Johnson & Hills 1973, emend.
Dörhöfer & Davies 1980.

Type species. *Paragonyaulacysta calloviensis* Johnson & Hills 1973, emend. Dörhöfer & Davies 1980.

Paragonyaulacysta? cf. *calloviensis* Johnson & Hills 1973,
emend. Dörhöfer & Davies 1980, (Pl.2, figs.7, 8).

Description. Small to intermediate sized proximate dinocyst with a short apical horn and an ellipsoidal outline. Gonyaulacoid tabulation expressed by low parasutural ridges. The autophragm is smooth to finely scabrate. The archaeopyle is intercalary, but the exact type is uncertain. Size range: 45–60 micrometers.

Remarks. This species is distinguished by its small size, the nature of the parasutural features and by the ellipsoidal shape (which is caused by the reduced (or even absent) apical horn). The type species, *P. calloviensis* has a longer horn and stronger sutural crests supported by short gonal spines, which gives this species a more polygonal outline. *Paragonyaulacysta retiphragmata* Dörhöfer and Davies 1980 has a finely reticulate autophragm and punctate parasutural crests. *Paragonyaulacysta capillosa* (Brideaux and Fisher) Stover and Evitt 1978 has a strongly tripartite outline and a covering of fine short hairs. *P. borealis* (Brideaux and Fisher) Stover and Evitt 1978 is larger, with a thin wall, very indistinct tabulation and a much longer apical horn.

This taxon is provisionally placed in *Paragonyaulacysta* because of uncertainty as to the number of intercalary plates.

The genus *Lacrymodinium* Albert *et al.* (1987) is characterised by having a single plate mid-dorsal intercalary archaeopyle. The exact number of intercalary plates in *Paragonyaulacysta* is equivocal, and has been previously cited as 2I (Johnson and Hills 1973, Brideaux and Fisher 1976), 3I (Dörhöfer and Davies, 1980) and I-3I (Eaton 1980).

Occurrence. Upper Brent Group and lower Humber Group (Late Bathonian to Early Callovian) of the North Sea.

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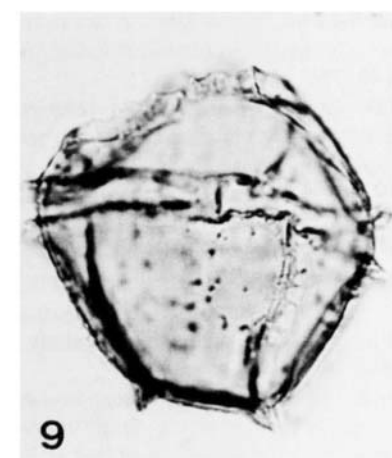
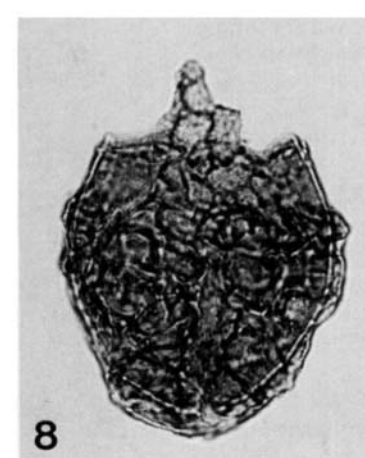
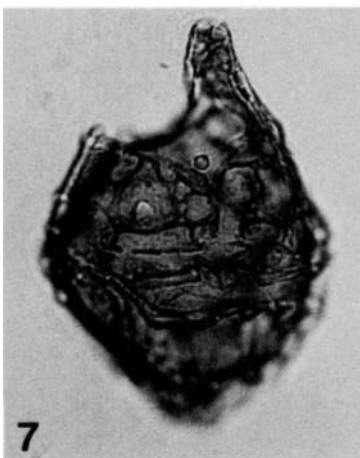
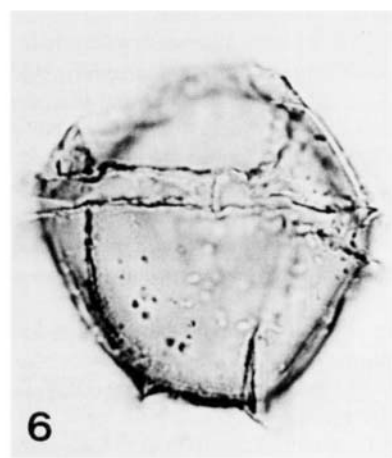
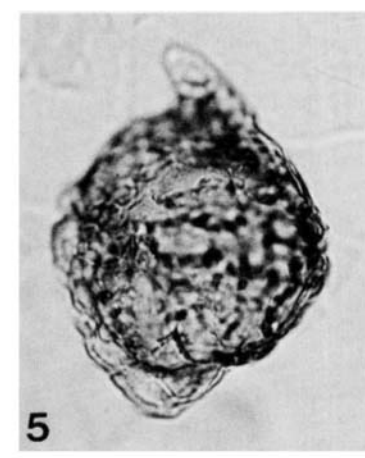
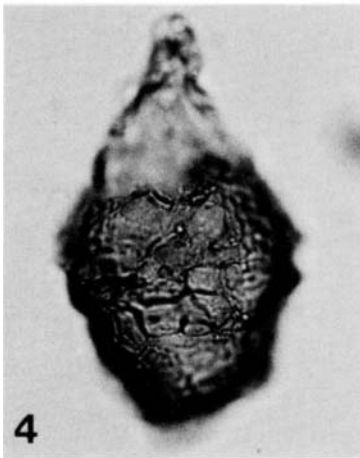
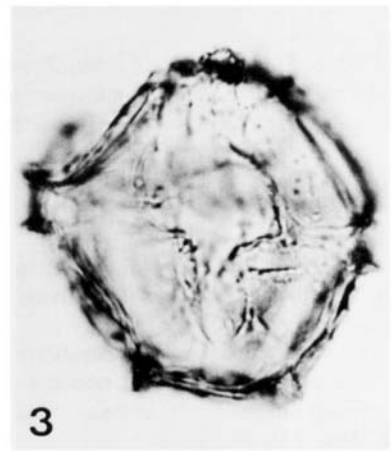
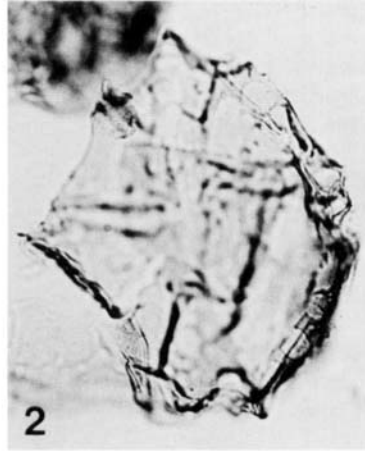
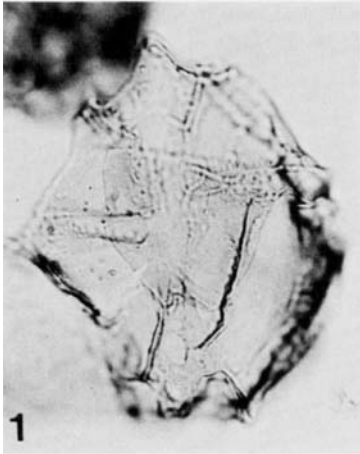
Explanation of Plate 3

All x500 approx.

Figs 1, 2. *Gonyaulacysta* sp.2. Dorsal and ambital foci respectively. Note the large vacuoles developed in the periphragm (bottom centre in 1, right-hand margin in 2.) UKCS Well 9/9b-4z, 12456'4" (slide 1), EF H51/2.

Figs 3, 6, 9 *Gonyaulacysta* sp.1. Progressive focus levels to show the nature of the apical horn, intratabular ornament and parasutural crests. UKCS Well 9/9b-4z, 12307'6" (slide 1), EF F48/2.

Figs 4, 5, 7, 8. *Crusolia perireticulata* Aarhus *et al.* 1989; 4. Focus on dorsal surface and 3I archaeopyle. UKCS Well 9/9b-12. 3825m (slide 2), EF 252; 5. Lateral view, note faint cingular zone. UKCS Well 9/9b-4z, 12479'6" (slide 1), EF W31/1; 7. Dorso-lateral focus, showing nature of the reticulate periphragm. UKCS Well 9/9b-4z, 12418'6" (slide 1), EF J27/1; 8. Focus on ventral surface. UKCS Well 9/9b-4z, 12418'6" (slide 1), EF R47



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