REMARKS ON DINOFLAGELLATE CYST ASSEMBLAGE FROM RATARIA, SOUTHERN KUTCH, INDIA

K. P. JAIN & RAHUL GARG

Birbal Sahni Institute of Palaeobotany, 53, University Road, Lucknow 226 007, India

Abstract

The dinoflagellate cyst assemblage reported from Rataria, southern Kutch, India by Kar and Saxena (1981) is reassessed and some taxonomic reallocations are proposed with comments on its age.

Introduction

A diverse palynological assemblage consisting of spores, pollen and dinoflagellate cysts has been recorded by Kar and Saxena (1981) from a 45 m deep bore core (No. 27) drilled near Rataria in southern Kutch. Ten out of eleven shale samples collected between 26.0 to 36.8 m depth proved productive. Dinoflagellate cysts were mainly recovered from one sample (no. 3) at a depth of 35.0 m. The assemblage has been redescribed by Kar (1985).

The dinoflagellate cysts referred in their palynological account are as follows:

1. *Hystrichosphaeridium tubiferum* (Ehrenberg) Davey & Williams 1966: *In* Kar & Saxena 1981, p. 115, pl. 4, fig. 78; *In* Kar 1985, pp. 197-198, pl. 45, fig. 1.
2. *Oligosphaeridium complex* (White) Davey & Williams 1966: *In* Kar & Saxena 1981, p. 115, pl. 4, fig. 79; *In* Kar 1985, p. 198, pl. 45, figs. 9-10.
3. cf. *Perisseiasphaeridium pannosum* Davey & Williams 1966: *In* Kar & Saxena 1981, p. 115, pl. 4, fig. 80; *In* Kar 1985, p. 198, pl. 45, fig. 2.
4. *Cordosphaeridium gracilis* Eisenack emend. Davey & Williams 1966: *In* Kar & Saxena 1981, p. 115, pl. 4, fig. 82; *In* Kar 1985, p. 198, pl. 48, fig. 12.
5. *Cleistosphaeridium heteracanthum* (Deflandre & Cookson) Davey *et al.* 1966; *In* Kar & Saxena 1981, p. 116, pl. 4, fig. 83; *In* Kar 1985, p. 198; pl. 45, figs. 3-4.
6. *Hystrichokolpoma eisenacki* Williams & Downie 1966: *In* Kar & Saxena 1981, p. 116, pl. 4, fig. 84; *In* Kar 1985, p. 199, pl. 45, fig. 8.

Kar (1985, pp. 197-199) reproduced the descriptions of only two taxa, viz., cf. *Perisseiasphaeridium pannosum* and *Cleistosphaeridium heteracanthum* from Kar and Saxena (1981) whereas for all other species, he preferred to copyout the original diagnoses given by Williams and Downie (1966) and Davey and Williams (1966), though these diagnoses do not relate to the actual morphology of the documented Kutch specimens.

Taxonomic comments

A critical re-examination of the figured specimens, listed above, under the differential interference contrast and light microscopy, revealed the following :

1. The two specimens assigned by Kar and Saxena (1981) to *Oligosphaeridium complex* and *Cordosphaeridium gracilis* are hypocysts only bearing 16 intratabular, tubular processes and distinctive epicystal archaeopyle. The cysts are subsphaerical, skolochorate, thin-walled with smooth to faintly granular periphragm. These features clearly indicate their placement under *Homotryblium* Davey and Williams 1966. The processes are typically striate, distally open and expanded with secate or denticulate margins, often branched terminating into 2 or more slender tubular lobes. Paratabulation on the hypocyst is expressed by 6c, 6‴, 1p, 1⁗, 1as, 1ps. The anterior parasulcal process is typically slender and simple.

The posterior intercalary, posterior parasulcal and antapical processes are characteristically arranged to form a triangle (Evitt 1985, p. 255).

In view of these observations, both the above specimens (documented here, figs. 1-3) are assigned to *Homotryblium plectilum* Drugg & Loeblich 1967.

2. The specimen described and illustrated as *Hystrichosphaeridium tubiferum* by Kar and Saxena (1981) is a subspherical skolochorate cyst having smooth to faintly granular periphragm bearing 26 intratabular cylindrical to tubular processes which are variable in width but individually relatively constant in width. Processes are distally slightly expanded and open with secate or denticulate margins. A few processes show typical lobed and tubular distal margins. Archaeopyle is epicystal indicated by faint sutures and opercular pieces. These features suggest its placement under the genus *Homotryblium*. In process characteristic it shows closest affinity with *H. oceanicum* Eaton 1976, but differs in having shorter and norrower processes besides having additional sulcal processes. Eaton (1976, p. 268) noted the absence of sulcal processes in *H. oceanicum*.

Considering the above characters within the range of variation, this specimen (illustrated here, figs. 7 & 8) is assigned to *Homotryblium oceanicum* Eaton.

Several other well-preserved hypocysts of *Homotryblium oceanicum* with epicystal archaeopyle and simple cylindrical processes are also observed in the figured slides; one of these specimens is documented here (fig. 9).

3. The specimen referred to cf. *Perisseiasphaeridium pannosum* is badly preserved. It is actually lying over a piece of cuticle obstructing morphological features of the cyst. The cyst is incomplete and shows only a few short processes with faint striations. The archaeopyle is indiscernible. On the basis of process features alone, it can be placed doubtfully in *Homotryblium* which is the major constituent of Rataria dinocyst assemblage (figs. 4,5).

4. The description of *Cleistosphaeridium heteracanthum* provided by Kar and Saxena (1981, p. 116) does not conform with our observations. The specimen is characterised by subspherical cyst having precingular archaeopyle, with densely placed short, nontabular, uniform, spinose processes which are up to 10 μm in length and are characterised by distally closed tips bearing hooklets and minute striations at the proximal ends. The periphragm is microgranular (fig. 6). These features suggest that it is assignable to *Operculodinium centrocarpum* (Deflandre & Cookson) Wall 1967. The presence of one large process mentioned by Kar and Saxena (1981) is actually a piece of foreign organic matter. Kar (1985, pl. 45, fig. 4) though referring to this particular specimen in the reproduced account of the assemblage, wrongly illustrated some other specimen which could not be located in the figured slide.

5. The specimen identified as *Hystrichokolpoma eisenacki* by Kar and Saxena (1981) is badly preserved and torn, showing no diagnostic morphological features to identify it as a dinoflagellate cyst. It is some unidentifiable organic body.

Age of Rataria dinocyst assemblage

On the evidence of the parkeriaceous spore genus *Striatriletes*, Kar and Saxena (1981, p. 120) opined that the Rataria palynological assemblage may be put anywhere between Upper Eocene to Miocene. They further considered the presence of *Cheilanthoidspora enigmata* and *C. monolita* to indicate Early Eocene aspect as these species characterise the Palana Lignite (Rajasthan) palynofloral assemblage. However, Kar and Saxena (1981) preferred to conclude Middle Eocene-Late Eocene age for the Rataria assemblage. The Directorate of Geology & Mining, Gujarat which provided the bore core samples, suggested an Early Eocene age (In Kar and Saxena, 1981, p. 104). It seems that this conclusion is based on stratigraphic grounds as the sequence overlies the Deccan Traps.

Kar (1985) republished the earlier dinocyst data on the Rataria bore core and concluded without further evidence that the sequence, "should be of Middle Eocene age" (Kar 1985, p. 17). He (Kar 1985, pp. 128-130) even proposed two palynozones in the Middle Eocene of Kutch, viz., *Cheilanthoidspora enigmata* Cenozone (between 34-36 m depth in Rataria bore hole) and *Proxapertites microreticulatus* Cenozone for a part of Harudi Formation). The distribution and percentage of palynofossils including dinoflagellate cysts, together with the stratigraphic relationship of cenozones is so vaguely indicated (Kar, 1985, text-fig. 19)

that no worthwhile conclusion could be drawn from the data presented therein.

Our observations on the type material reveal that the Rataria dinocyst assemblage has an extremely low diversity and is masked by the abundance of terrestrial plant debris.

The main constituents of the assemblage are *Homotryblium plectilum* and *H. oceanicum* with very rare occurrence of *Operculodinium centrocarpum*. Of these, *H. plectilum* and *O. centrocarpum* are long ranging species. *H. oceanicum* is known only from the Middle Eocene of England. In fact, Eaton (1976) recorded *H. oceanicum* from Bracklesham and Barton Beds mentioning its occurrence in Middle and Upper Eocene. Based on Eaton's data, Bujak *et al.* (1980) subsequently documented its stratigraphic range within Bracklesham and Barton Beds from *Areosphaeridium arcuatum* Zone (B-4) to *Heteraulacacysta porosa* (BAR-1) Zone which has been equated with Standard Planktonic Foraminiferal zones P 11 (upper part) to P 13 (lower part) within the Middle Eocene (Williams & Bujak, 1985, p. 887, fig. 15). In their range charts, Williams and Bujak (1985, p. 902) documented the range of *H. oceanicum* from P10 to P13 zones which is equivalent to the Lutetian Stage. Although the value of *H. oceanicum* as a Middle Eocene marker is yet to be established on a global scale, the Rataria dinocyst assemblage can be tentatively dated as Middle Eocene (Lutetian). *Homotryblium* species are also recorded from Middle Eocene of south western Kutch and Meghalaya (Dutta & Jain, 1980; Jain & Tandon, 1981).

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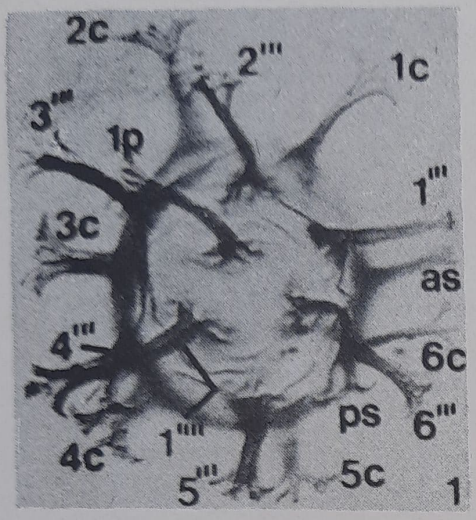
Figures 1—9. 1, 2. *Homotryblium plectilum* Drugg & Loeblich 1967, Slide no. BSIP 6369; coordinates : 158×7.7; hypocyst in apical view; 1. lower focus showing hypocystal paratabulation, ×650; 2. upper focus showing archaeopyle suture; ×500. **3.** *Homotryblium plectilum* Drugg & Loeblich 1967, Slide no. BSIP 6366; coordinates : 125.9×21.2; hypocyst in antapical view; ×500. **4,5.** *Homotryblium* sp. in two different foci; Slide no. BSIP 6351; coordinates : 146.3×7.7; ×500. **6.** *Operculodinium centrocarpum* (Deflandre & Cookson) Wall 1967; Slide no. BSIP 6370, coordinates : 153.6×11.4; ×750. **7, 8.** *Homotryblium oceanicum* Eaton 1976, Slide no. BSIP 6357; coordinates: 127.1×13.8; complete cyst in apical-antapical orientation, in two different foci; ×500. **9.** *Homotryblium oceanicum* Eaton 1976, Slide no. BSIP 6358, coordinates : 163.1×12.2; hypocyst; ×500.

(All illustrations under Differential Interference Contrast; Coordinates refer to Olympus AH2 Vanox microscope).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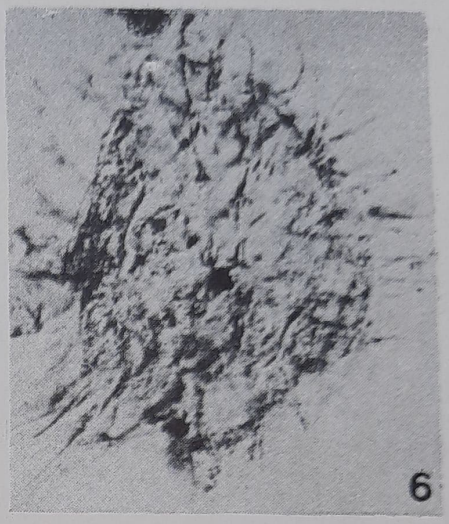
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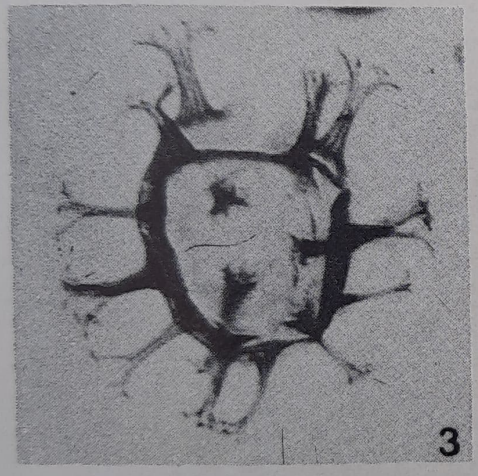
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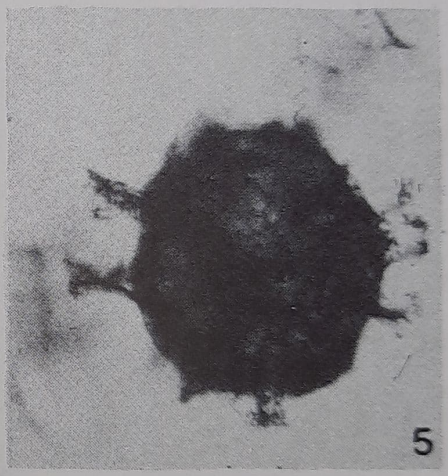
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