

Some new dinoflagellate cyst taxa from Dalmiapuram Formation, Cauvery Basin, southern India*

Khowaja-Ateequzzaman

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

Khowaja-Ateequzzaman 1993. Some new dinoflagellate cyst taxa from Dalmiapuram Formation, Cauvery Basin, southern India. *Geophytology* **23**(1): 131 — 135.

Three new species of the dinoflagellate cyst genus *Trichodinium* Eisenack & Cookson emend. Clarke & Verdier 1967, viz., *T. brevispinosum*, *T. jainii* and *T. minutum*, are described from the Lower Albian Grey Shale Member of the Dalmiapuram Formation, Cauvery Basin, southern India. A new combination *Acanthaulax magnum* (Jain) has been proposed, transferring *Trichodinium magnum* Jain 1977 to *Acanthaulax* Sarjeant emend. Sarjeant 1982.

Key-words—Dinoflagellate cyst, Early Albian, Cauvery Basin, India.

INTRODUCTION

THE type section of Dalmiapuram Formation in Cauvery Basin is exposed along the northern face of the Kallakudi Quarry II near Kallakudi village on the Trichinopoly - Vriddhachalam road. This Formation has two distinct members, the Grey Shale and the Limestone members. Jain (1969, 1973, 1977) described rich dinoflagellate cyst and spore-pollen assemblages from the Grey Shale Member. The present dinoflagellate cyst account is based on the restudy of type and figured slides of Jain (1977) available in the museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

The genus *Trichodinium* Eisenack & Cookson emend. Clarke & Verdier 1976 is characterised in possessing cysts with circular paracingulum and no definite paratabulation. A critical review of its known species (Table 1) clearly indicates that *Trichodinium magnum* Jain 1977 does not conform to the morphological definition of *Trichodinium* in having indication of paratabulation (Jain, 1977, p.176). The re-examination of its holotype (BSIP slide no. 5049-17) and of several other specimens encountered in the same slide revealed that it possesses definite paratabulation (0a, 5-6, " ?C, 5-6", 1p, 1", 3-4 s) having helicoid paracingulum. These features warrant its transfer to *Acanthaulax* Sarjeant emend. Sarjeant 1982; *Acanthaulax magnum* (Jain) comb. nov. (\equiv *Trichodinium magnum* Jain 1977, p.175-176, pl.4, figs 40-42; Lower Albian, Dalmiapuram Formation, Cauvery Basin, southern India).

All coordinates mentioned in systematics refer to Olympus BH2 microscope.

SYSTEMATICS

Division— Pyrrhophyta Pascher 1914

Class— Dinophyceae Fritsch 1929

Order— Peridiniales Haekel 1894

Sub-order— Gonyaulacystineae Norris 1978

Family— Gonyaulacystaceae Sarjeant & Downie emend. Sarjeant & Downie 1974

Genus—*Trichodinium* Eisenack & Cookson emend. Clarke & Verdier 1967

1960 *Trichodinium* Eisenack & Cookson, p.5.

1967 *Trichodinium* Eisenack & Cookson emend. Clarke & Verdier, p. 18 - 19.

1978 *Trichodinium* Eisenack & Cookson emend. Clarke & Verdier, 1967- in Stover & Evitt, p. 196.

Trichodinium brevispinosum sp. nov.
Pl. 1, figs 1-3

Etymology—From the Latin *brevis* meaning short and *spina* meaning thorn, referring to short processes on the cyst surface.

Holotype—Pl.1, figs 1-3; BSIP museum statement no. 311; slide no. 5071; coordinates : 12.7 x 147.

* Paper presented at the Birbal Sahni Birth Centenary Palaeobotanical Conference, Lucknow, November 20-22, 1991.

Type stratum & locality—Grey Shale Member, Dalmiapuram Formation; Kallakkudi Quarry II, Cauvery Basin, southern India.

Age—Early Albian.

Diagnosis—Cyst subspherical; autophragm thick, fibrous, ornamented with sparsely placed processes; processes short, proximally broad, distally slightly flared, flat topped, solid, distally closed; parasutural features absent; paracingulum circular; transverse furrow outlined by two rows of processes, longitudinal furrow marked by a slight depression and lesser number of processes; archaeopyle precingular, Type P (3" only), broadly triangular, operculum free.

Description

Shape—Subspherical with slight inflection in epicyst outline towards apex; apical horn absent.

Wall relationship—Autophragm only.

Wall features—No parasutural features; autophragm thick, fibrous, ornamented with sparsely placed processes; processes nontabular, short, solid, proximally broad, distally slightly flared, flat topped, distally closed.

Paracingulum—Circular, transverse furrow outlined by two rows of processes.

Paratabulation—Indicated by archaeopyle, paracingulum and parasulcus only.

Archaeopyle—Precingular, Type P (3" only), broadly triangular, operculum free.

Parasulcus—Indicated as a weak depression having less number of processes.

Dimensions

<i>Holotype</i>	<i>Range</i>
Size of body : 78 x 70 μm	76-85x65-72 μm
Length of processes : 3-5 μm	3-5 μm

Remarks—*Trichodinium brevispinosum* sp. nov. is comparable to *T. castanea*, *T. erinaceoides* and *T. hirsutum* in having inflection in the epicyst but differs

from these and others in possessing sparsely placed short processes on the autophragm (Table 1).

Trichodinium jainii sp. nov.

Pl. 1, figs 8-10

Etymology—After Krishna P. Jain, who has greatly contributed to establish the study of fossil dinoflagellates in India.

Holotype—Pl. 1, figs 8-10; BSIP museum statement no. 311, slide no. 5059; coordinates: 16.98 x 126.5.

Type stratum & locality—Grey Shale Member, Dalmiapuram Formation, Kallakkudi Quarry II, Cauvery Basin, southern India.

Age—Early Albian.

Diagnosis—Cyst subspherical; autophragm thick, covered with mixed type of ornamentation, compactly placed small grana and sparsely placed short, solid, stunted projections; paracingulum circular, marked by two rows of stunted projections delimiting transverse furrow; archaeopyle precingular, Type P (3" only), operculum free.

Description

Shape—Subspherical with slight inflection in epicyst towards apex; apical horn absent.

Wall relationship—Autophragm only.

Wall features—No parasutural features, autophragm thick, bearing two types of ornamentations having compactly placed grana and sparsely placed short stunted solid projections of almost equal height and width; projections delimiting paracingulum are shorter.

Paracingulum—Circular, transverse furrow outlined by two rows of projections.

Paratabulation—Indicated by archaeopyle and paracingulum only.

Parasulcus—Not discernible.

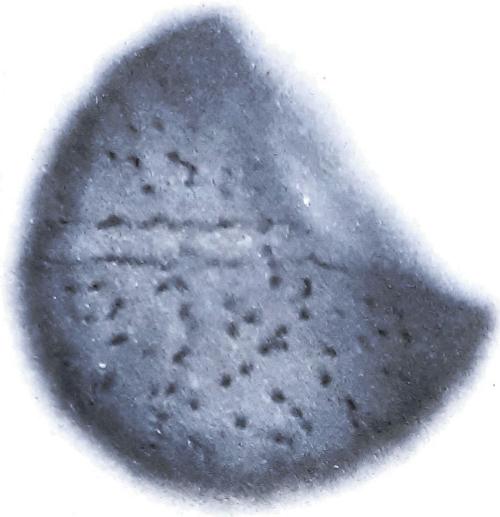
Plate 1

(All photomicrographs in differential interference contrast x 750)

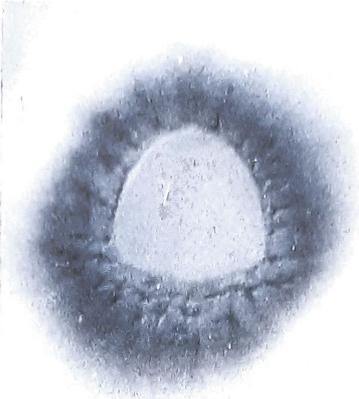
- 1-3. *Trichodinium brevispinosum* sp. nov., same specimen in different foci showing surface ornamentation, paracingulum and precingular archaeopyle.
- 4-7. *Trichodinium minutum* sp. nov., same specimen in different foci; 4. dorsal high view showing broadly triangular precingular (P3) archaeopyle and two parallel rows of spines

delimiting transverse furrow; 5. dorsal low view; 6-7. ventral low and ventral high views respectively showing distribution of processes.

- 8-10. *Trichodinium jainii* sp. nov., same specimen in different foci showing surface ornamentation, paracingulum and precingular (P3) archaeopyle.



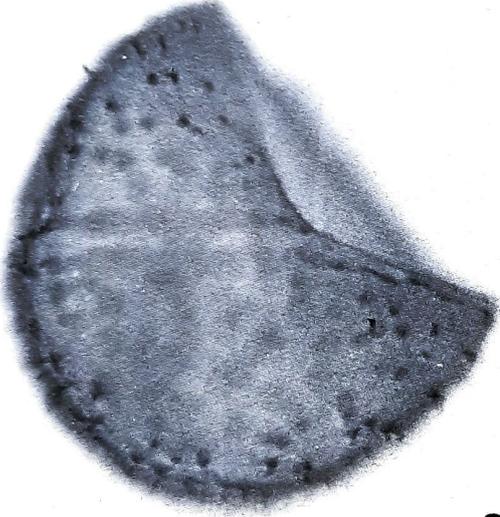
1



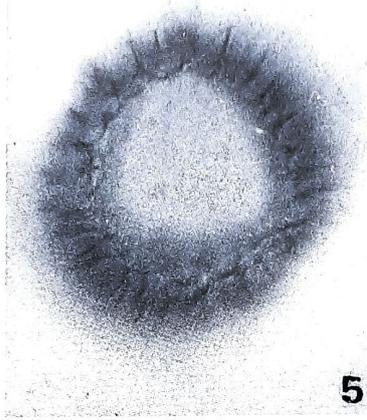
4



8



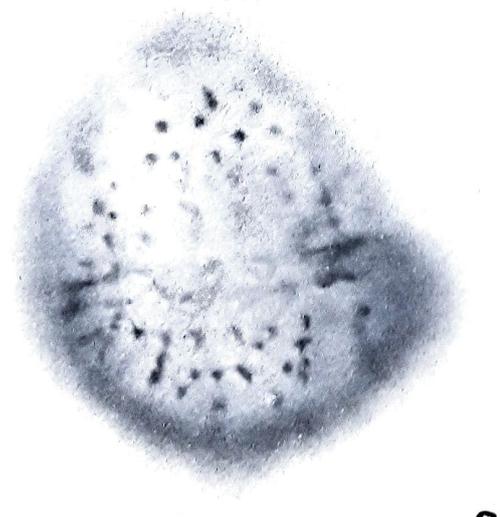
2



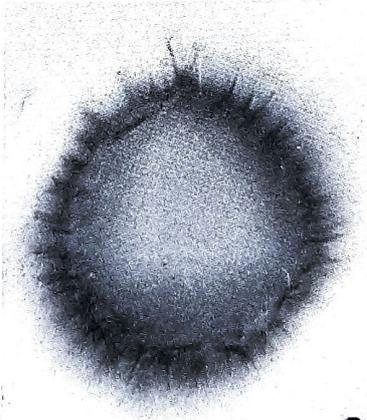
5



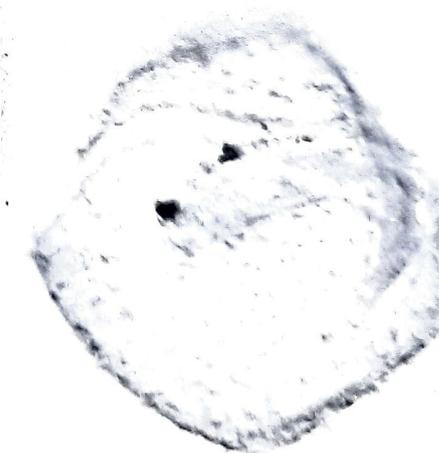
9



3



6



10



7

Plate 1

Table 1. A comparative statement of *Trichodinium* species

Sl. No.	Morphological characters	Shape	Wall relationship	Wall features	Paratabulation (other than archaeopyle and paracingulum)	Archaeopyle
1.	<i>Trichodinium castanea</i> (Deflandre) Clarke & Verdier 1967	Oval	Autophragm only	Ornamented with short spines (1-3/ μ m long)	Absent	Precingular
2.	<i>Trichodinium delicatum</i> Davey 1975	Subspherical	Autophragm only	Ornamented with short hairs (1 μ m long)	Absent	Precingular
3.	<i>Trichodinium eisenackii</i> Burger 1980	Subspherical	Autophragm only	Ornamented with dense short straight spines	Absent	Precingular
4.	<i>Trichodinium erinaceoides</i> Davies 1983	Subspherical	Autophragm only	Ornamented with short hair like spines (5-7 μ m long)	Absent	Precingular
5.	<i>Trichodinium hirsutum</i> Cookson 1965	Almost spherical with a short straight sided, branched apical projection and an antapical projection	Autophragm only	Ornamented with solid, simple or branched, broad based, pointed appendages, variable in size and number according to position	Absent	Precingular
6.	<i>Trichodinium intermedium</i> Eisenack & Cookson 1960	Oval with a small spiny apical horn	Autophragm only	Surface granular, densely covered with short, stiff pointed or slightly capitate spines	Absent	Precingular
7.	<i>Trichodinium magnum</i> Jain 1977 (now <i>Acanthaulax magnum</i> (Jain) comb. nov.	Oval without apical horn	Autophragm only	Ornamented with sparsely placed processes, proximally broader, distally narrower, distal end peltate, closed	Present (oa, 5-6", ?C, 5-6", 1p, 1", 3-4s)	Precingular
8.	<i>Trichodinium pellitum</i> Eisenack & Cookson 1960	Oval with a narrow straight sided apical horn	Autophragm only	Ornamented with dense, long hairs	Absent	Precingular
9.	<i>Trichodinium spectonense</i> Davey 1974	Subspherical with a strong fibrous prolongation	Autophragm only	Autophragm fibro-pitted bearing elongate, conical and thorn-like spines	Absent	Precingular
10.	<i>Trichodinium spinosum</i> Singh 1971	Oval with a short tubular apical horn	Autophragm only	Surface granular, densely covered with stiff, pointed spines of medium length	Absent	Precingular

*Dimensions**Holotype*Size of body : 72 x 61 μ m

Length of

projections : 1.5-3 μ m*Range*70-75 x 60-65 μ m1.5-3 μ m

Remarks—*Trichodinium jainii* sp. nov. is characterised in possessing sparsely placed short, stunted, solid, projections together with grana all over the autophragm differentiating it from the other known species (Table 1).

Trichodinium minutum sp. nov.

Pl. 1, fig 4-7

Etymology—From the Latin *minutus* meaning small, referring to the small size of the cyst.

Holotype—Pl. 1, figs 4-7; BSIP museum statement no. 311, slide no. 5071; coordinates: 15.7 x 151.

Type stratum & locality—Grey Shale Member, Dalmiapuram Formation; Kallakkudi Quarry II, Cauvery Basin, southern India.

Age—Early Albian.

Diagnosis—Cyst subspherical, small; autophragm fibrous, ornamented with numerous long spines, spines proximally broad, gradually tapering distally with capitate distal ends; paracingulum circular marked by two rows of spines delimiting transverse furrow; archaeopyle precingular, Type P(3" only), broadly triangular, operculum free.

Description

Shape—Subspherical with slight inflection in the epicyst towards apex, apical horn absent.

Wall relationship—Autophragm only.

Wall features—No parasutural features, surface fibrous, ornamented with numerous closely placed long

spines, spine proximally broad, fibrous, tapering distally, distal end capitate.

Paratabulation—Indicated by archaeopyle and paracingulum only.

Archaeopyle—Precingular, Type P (3" only), broadly triangular, operculum free.

Parasulcus—Not discernible.

Dimensions

<i>Holotype</i>	<i>Range</i>
Size of body : 50 x 48 μm	45-55 x 45-50 μm
Length of spines : 5-7 μm	5-7 μm

Remarks—*Trichodinium minutum* sp. nov. is characterized by its small subspherical cyst without apical horn. *T. castanea* subsp. *bifurcatum* (Jain & Millepied 1975) Schrank 1987, compares best but differs in having an apical protrusion. It resembles well with *T. intermedium* Eisenack & Cookson 1960 and *T. spinosum* Singh 1971, in having spines but differs in that smaller cyst size and non-granular surface (Table 1).

ACKNOWLEDGEMENTS

The author is deeply indebted to Dr K.P. Jain, Deputy Director and Head, Department of Planktonology, BSIP, Lucknow, for critically going through the manuscript and giving invaluable suggestions incorporated herein. Thanks are due to Dr Rahul Garg for helpful discussions.

REFERENCES

- Eisenack, A. & Cookson, I.C. 1960. Microplankton from Australian Lower Cretaceous sediments. *Proc. Roy. Soc. Victoria* **72**: 1-11.
- Cookson, I.C. 1965. Microplankton from the Palaeocene pebble Point Formation, south-western Victoria. *Proc. Roy. Soc. Victoria* **78** (1): 137-141.
- Jain, K.P. 1977. Additional dinoflagellates and acritarchs from Grey Shale Member of Dalmiapuram Formation, south India. *Palaeobotanist* **24** (3): 170-194.
- Jain, K.P. & Subbaraman, J.V. 1969. Plant microfossil evidence on the age of Dalmiapuram Grey Shale, district Trichinopoly. *Curr. Sci.* **38** (22): 549-550.
- Jain, K.P. & Taugourdeau-Lantz, J. 1973. Palynology of Dalmiapuram Grey Shale, Dalmiapuram Formation, District Trichinopoly, south India-1. Taxonomy. *Geophytology* **3** (1): 52-68.