

DINOFLAGELLATE CYSTS FROM 'NON-MARINE' SEDIMENTS OF JABALPUR GROUP AT MORGHAT, MADHYA PRADESH

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ABSTRACT

The Jabalpur Group sediments are so far believed to be of non-marine origin. These sediments have yielded a rich flora comprising both mega- and microfossils. Recently, while working out the palynostratigraphy of the group, some dinoflagellate cysts were found in one of the samples from Morghat, Hoshangabad District, Madhya Pradesh. The dinoflagellate cysts are referable to three genera, viz., *Kalyptea*, *Sentusidinium* and *Canningia*. One species, i.e. *Kalyptea indica*, is new.

Key-words — Dinoflagellate cysts, ?Upper Jurassic, Jabalpur Group (India).

सारांश

मोरघाट (मध्य प्रदेश) से जबलपुर के 'असमुद्री' अवसादों से घूर्णीकशाभ पुटीयाँ — कृष्ण प्रसाद जैन, प्रमोद कुमार एवं हरिकृष्ण माहेश्वरी

जबलपुर समूह के अवसादों की उत्पत्ति अभी तक असमुद्री मानी जाती है। इन अवसादों से गुरु एवं सूक्ष्म-पादपाश्र्मों वाला प्रचुर वनस्पतिजात प्राप्त हुआ है। हाल ही में इस समूह का परागानुस्तरिकीय अध्ययन करते समय मध्य प्रदेश के होशंगाबाद जनपद में मोरघाट से एकत्रित नमूनों में एक नमूने से कुछ घूर्णीकशाभ पुटीयाँ उपलब्ध हुईं। ये घूर्णीकशाभ पुटीयाँ तीन प्रजातियों, कैलिप्टिआ, सेन्टूसीडोनियम एवं कैनिन्जिआ से निरूपणीय हैं। एक जाति, कैलिप्टिआ इन्डिका, नई है।

INTRODUCTION

THE Jabalpur Group typically comprises massive sandstones alternating with white clays. At places earthy hematite, red clay, carbonaceous shale and coal are also found. The soft white clay is very characteristic of the Jabalpur Group as a similar lithology is not found in any other Gondwana formation in India. The coaly and carbonaceous facies are especially well-developed near Sehora, Marhiparia, Hathnapur, Parsapani, Kotri, Ranidhar (Dongarkhoh), Ranikamar and Morghat.

On the basis of plant fossil distribution, Crookshank (1936, p. 250) proposed division of the Jabalpur of Satpura Gondwana Basin into two 'stages', viz., Chaugan and Jabalpur. However, the rocks of both the stages are lithologically very similar.

The age of the Jabalpur Group is believed to be Upper Jurassic.

While the megafloora of the Jabalpur Group has rather been extensively studied, it is only during the last decade or so that detailed studies on the mioflora of the group have been undertaken (Bharadwaj, Kumar & Singh, 1972; Maheshwari, 1973, 1974). Recently Maheshwari and Kumar (1979) while working out the Jabalpur mioflora of the Lokhartalai area noted the presence of microplankton-like bodies in one of the samples from Morghat.

As the sample and the section from which it was obtained are apparently of non-marine origin, the presence of dinoflagellates therein is of great interest, and these form the subject of this paper.

Fossil dinoflagellates are not entirely unknown from non-marine deposits. Traverse (1955) recorded *Peridinium* (*Saep-*

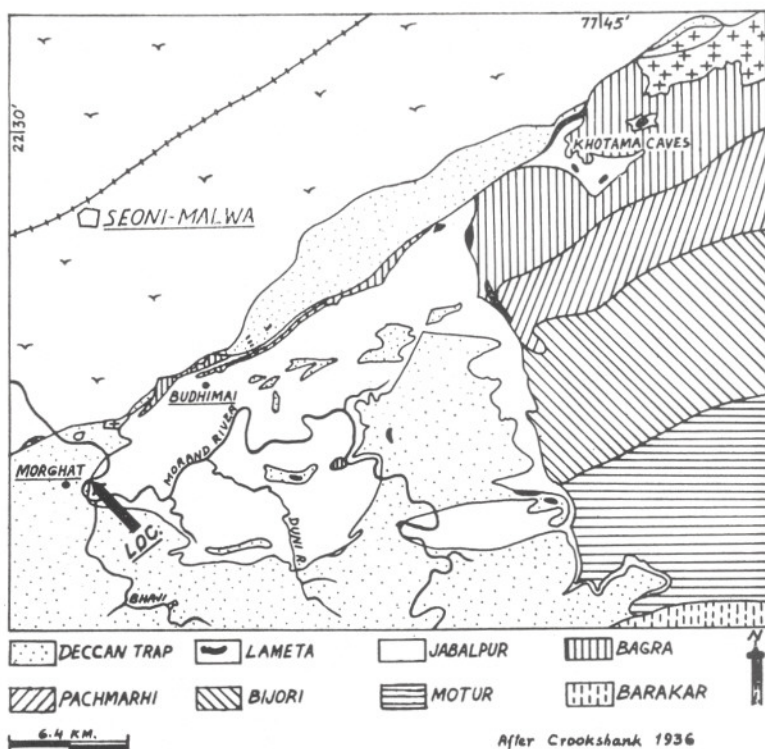
toadinium) *hansonianum* from the Brandon Lignite (Oligocene) of Vermont. Macko (1957) reported a modern species, *Glenodinium smrecyniense* Woloszynska, 1928, from the Miocene of Silesia. Species of *Geiselodinium* are known from the Miocene of Hungary (Nagy, 1965), Miocene of Alaska (Engelhardt, 1976) and Eocene of Germany (Krutzh, 1962). Harris (1973) described an assemblage of non-marine dinoflagellate cysts from the Tertiary sediments of Australia. Non-marine dinoflagellates are also known from the Quaternary deposits (Churchill & Sarjeant, 1963; Sarjeant & Strachan, 1968; Harland & Sarjeant, 1970; Norris & McAndrews, 1970). Morgan (1975) reported a dinoflagellate cyst from the Early Cretaceous fluvial lithofacies of the Great Australian Basin.

The sample from which present dinoflagellate cysts were recovered is very rich in gymnosperm pollen. Only a few pteridophytic spores are present. The dinoflagellates, too, are meagrely represented and form less than 2 per cent of the total

microflora. The diversity of the dinoflagellate cysts is also very low. The cysts possess well-developed horns or archaeopyle, and belong to the non-capsulate peridinioid forms. All the genera represented in the present assemblage are known from the Jurassic and younger marine sediments. To the best of our knowledge the present report happens to be the first record of 'non-marine' dinoflagellates from strata older than the Cretaceous.

MATERIAL AND METHOD

The dinoflagellate yielding sample is a carbonaceous shale collected by one of us (HKM) from the Morand River Section, east-north-east of Morghat, Hoshangabad District, Madhya Pradesh (see Map 1). The details of the palynological samples collected from the area and methodology followed are given in the earlier paper by Maheshwari and Kumar (1979). However, for dinoflagellates, the potassium hydroxide



MAP 1 — Geological map of the area showing the location of sample.

treatment was omitted and the macerate was stained with Safranin.

Photomicrographs were taken on ORWO NP 15 35 mm negative film with a Carl Zeiss Amplival microscope and automatic Camera attachment. Prints were made on AGFA Brovira paper.

The slides containing figured specimens are housed at the Museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

The co-ordinates of the figured specimens are from Carl Zeiss Jena "Amplival" microscope no. 535765 of Birbal Sahni Institute of Palaeobotany.

SYSTEMATIC DESCRIPTION

Class — Dinophyceae Pascher

Order — Peridinales Schutt, 1896

Family — Pareodiniaceae Gocht emend. Sarjeant & Downie, 1974

Genus — *Kalyptea* Cookson & Eisenack emend. Wiggins, 1975

Type Species — *Kalyptea diceras* Cookson & Eisenack, 1960.

Kalyptea indica Jain & Maheshwari sp. nov.

Pl. 1, figs 7-12; Text-fig. 1A-C

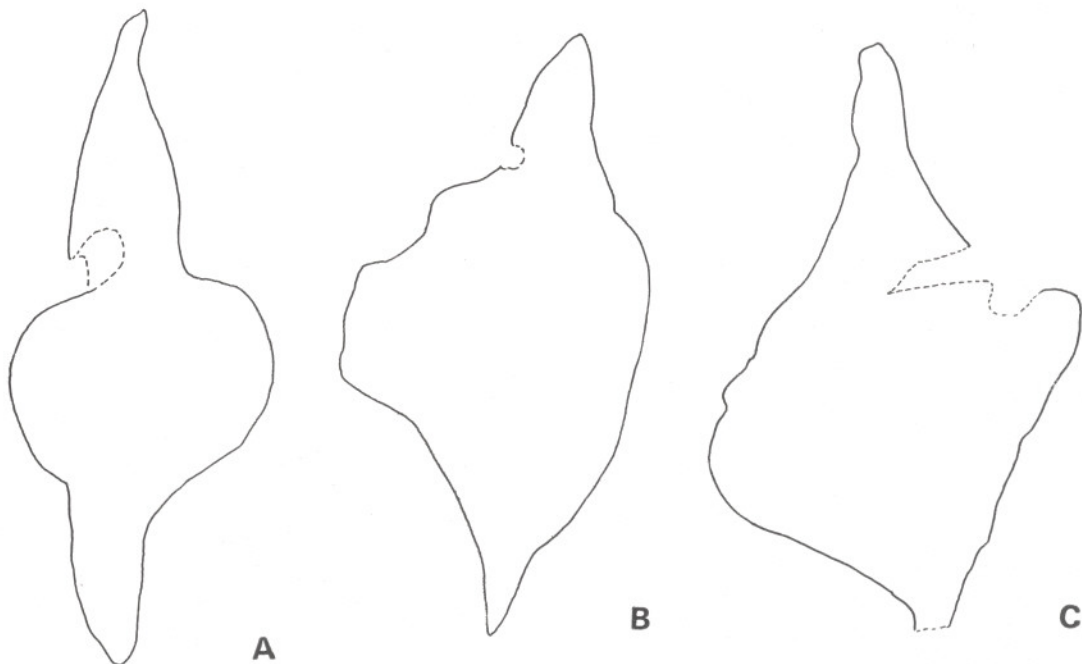
Holotype — Pl. 1, figs 8, 9; slide no. BSIP 5726/101 \times 101 6.0.

Type Locality — Morand River Section, E.N.E. of Morghat, Hoshangabad District, Madhya Pradesh

Age — ?Upper Jurassic (Jabalpur Group).

Diagnosis — Cyst ellipsoidal, thin-walled, single-layered, folds frequent, surface finely granulate, apical and antapical horns well-developed; apical horn longer and broader than antapical horn, gradually tapering, tip rounded; antapical horn usually short, narrow, pointed. Central part of cyst inflated-elongate. Kalyptra and apical structures totally absent. Archaeopyle intercalary, probably made up of types 2I to 3I.

Measurements	Holotype μm	Range μm
Cyst size	125 \times 65	78-125 \times 50-70
Apical horn size	40 \times 16	30-50 \times 13-20
Antapical horn size	20 \times 8	13-20 \times 8-10



TEXT-FIG. 1A-C — *Kalyptea indica* Jain & Maheshwari sp. nov.; cyst outline showing inflated central part with well-developed apical and antapical horns. Archaeopyle margin broken (\times 500).

Comparison — Twenty-five specimens belonging to *Kalypteia indica* Jain & Maheshwari sp. nov. have been studied. The preservation of the forms is not very satisfactory, damaged specimens are frequently recovered. The species compares best with *K. diceras* Cookson & Eisenack, 1960 in having unequal horns and thin and finely granulate cyst wall but differs in having inflated elongate central part and no kalyptra. The rhombic shape of *K. glabra* (Cookson & Eisenack) Wiggins, 1975 easily distinguishes it from *K. indica*.

Remarks — Morgan (1975) has reported similar single-layered cysts as *Fusiformacysta* from the Lower Cretaceous of Australia, having precingular archaeopyle. The species *F. salasii* is believed by Morgan (1975, p. 164) to be a non-marine dinoflagellate cyst.

Genus — *Canningia* Cookson & Eisenack, 1960

Type Species — *Canningia reticulata* Cookson & Eisenack, 1960.

Canningia sp.

Pl. 1, figs 5, 6

Description — Cyst spheroidal, $50 \times 40 \mu\text{m}$ in size, wall thin, granular, slight apical projection seen, antapical end broadly rounded, archaeopyle apical, margin deeply notched.

Remarks — It shows close resemblance with *Batiacasphaera macrogranulata* Morgan, 1975 but differs in the surface ornamentation.

Genus — *Sentusidinium* Sarjeant & Stover, 1978

Type Species — *Sentusidinium rioultii* (Sarjeant) Sarjeant & Stover, 1978.

Sentusidinium sp. A

Pl. 1, figs 1, 4

Description — Cyst ovoid, $70 \times 65 \mu\text{m}$ in size, cingulum absent, surface granular, tabulation lacking. Archaeopyle apical, suture zigzag.

Remarks — The preservation of recovered specimens is not satisfactory to give a clear idea of surface ornamentation.

Sentusidinium sp. B

Pl. 1 figs 2, 3

Description — Cysts ovoid, $70 \times 65 \mu\text{m}$ in size, autophragm imperfectly ornamented, appears to be coarsely granulate or tuberculate; sometimes cingulum is indicated by the arrangement of granules or tubercles. Archaeopyle apical.

FORMA A

Pl. 1, fig. 13

Description — Cyst distorted, $110 \times 50 \mu\text{m}$ in size, elongate, single-layered, granulate, an apical and two antapical horns well-developed. Archaeopyle not seen.

Remarks — Only a few specimens have been recovered. The presence of an apical and two antapical horns with autophragm suggests their placement either under the genus *Batioladinium* or *Broomea*. Since the archaeopyle is not discernible, no definite placement is possible.

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EXPLANATION OF PLATE

(All figures, unless mentioned otherwise, are $\times 500$)

- Sentusidinium* sp. A: Slide no. BSIP 5727; coordinates 102.8×0.5 .
- Sentusidinium* sp. B: Slide no. BSIP 5727; coordinates 103.7×11.3 .
- Sentusidinium* sp. B: Slide no. BSIP 5729; coordinates 120.7×12.0 .
- Sentusidinium* sp. A: Slide no. BSIP 5726; coordinates 95.5×0.9 .
- Canningia* sp.: Slide no. BSIP 5726; coordinates 127×13.8 .
- Canningia* sp.: Slide no. BSIP 5725; coordinates 125×20.0 .
- Kalyptea indica* Jain & Maheshwari sp. nov.: Slide no. BSIP 5728; coordinates 100.9×11.1 .
- Kalyptea indica* Jain & Maheshwari sp. nov. magnified apical part showing archaeopyle: Slide no. BSIP 5726; coordinates 101.0×6.0 ($\times 1000$). Holotype.
- Kalyptea indica* Jain & Maheshwari sp. nov.: Slide no. BSIP 5726; coordinates 101.0×6.0 . Holotype. Same specimen as in fig. 8.
- Kalyptea indica* Jain & Maheshwari sp. nov.: Slide no. BSIP 5726; coordinates 108.0×19.8 .
- Kalyptea indica* Jain & Maheshwari sp. nov.: Slide no. BSIP 5728; coordinates 138.4×8.8 .
- Kalyptea indica* Jain & Maheshwari sp. nov.: Slide no. BSIP 5730; coordinates 109.5×14.7 .
- Forma A: Slide no. BSIP 5726; coordinates 117.6×12.5 .

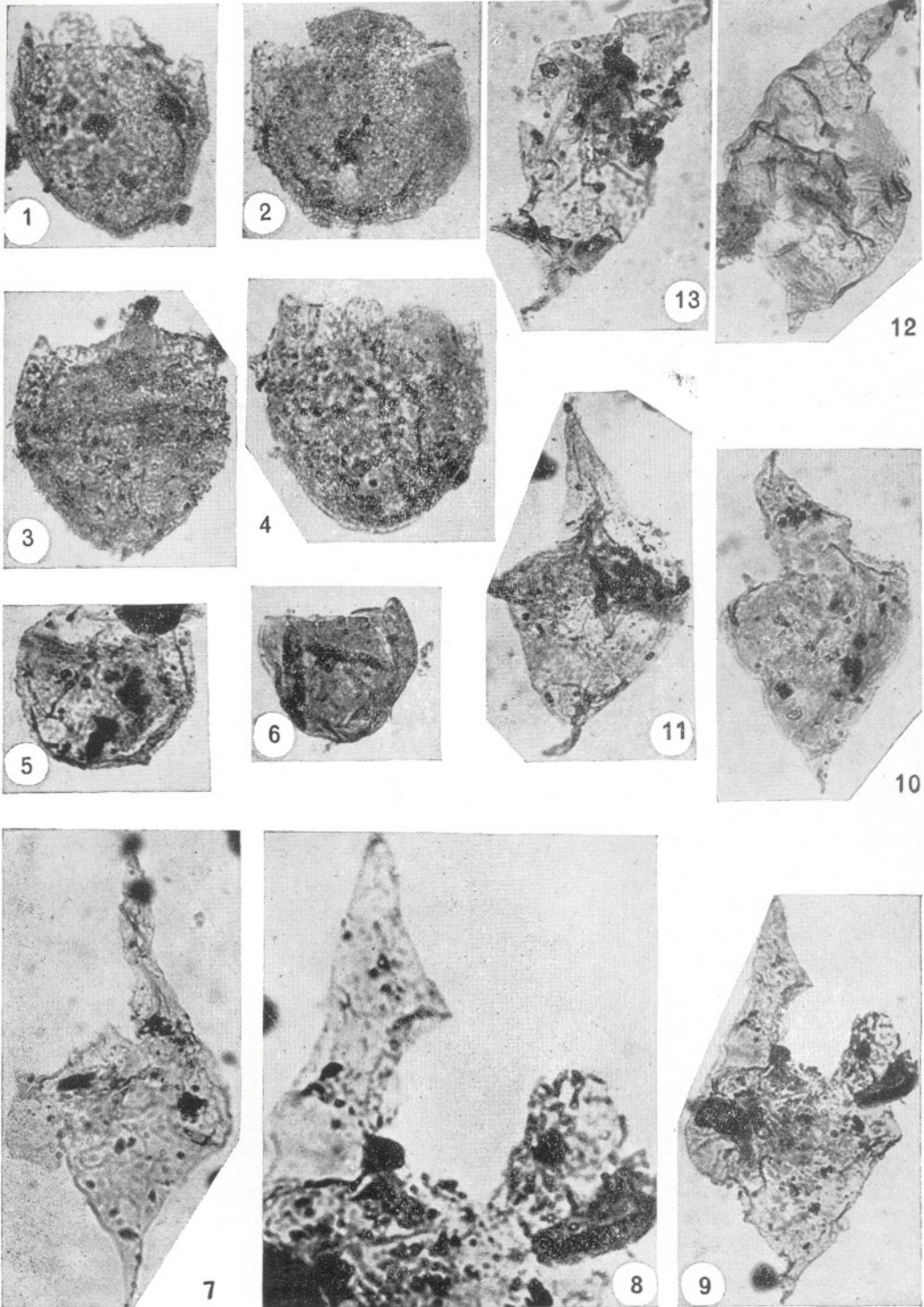


PLATE 1