

EOCENE FOSSIL ALGAE FROM THE SUBCROPS OF THE BENGAL BASIN

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ABSTRACT

Fossil calcareous algae are described from the bore-hole samples from Debagram, Jaguli and Jalangi in West Bengal. The algal biota consists of: *Lithothamnium* aff. *bofilli* Lemoine, *Lithophyllum* sp., *Mesophyllum* sp., *Jania occidentalis* Johnson, *Lithoporella melobeioides* (Foslie) Foslie and *Neomeris bengalensis* sp., nov. The assemblage is indicative of an Eocene age for the strata containing them.

INTRODUCTION

During the last three decades about twentyfive wells have been drilled in the Bengal Basin in connection with exploration for hydrocarbon resources. Ten wells were drilled under Indo-Stanvac Petroleum Project and about fifteen by the Oil and Natural Gas Commission (Fig. 1).

Sylhet Limestone Formation with dominantly carbonates and minor shale and sandstone interbands has been penetrated in the wells located at various parts of the basin, particularly at Debagram, Dhananjoypur, Jalangi, Jaguli, Maju and Radha. Calcareous algae belonging to Rhodophyta and Chlorophyta have been recorded in the limestones of this formation. Records of the occurrence of fossil algae in the Sylhet Limestone of the Bengal Basin were made by earlier workers (Srivastava, 1982 a, b, c; 1984; 1985) but this is the first time that detailed description of these algae is being provided.

GEOLOGICAL SETUP

The first comprehensive account of the subcrop geology of the Bengal Basin was given by Biswas (1961, 1963). Ramaswamy and Sengupta (1960) and Roy Barman (1983) also worked out the details of the sub-surface geology of the area. The generalised lithostratigraphic column is given in Figure 2.

Structurally, the Bengal Basin has been divided into four parts (Ramaswamy and Sengupta, 1960): (i) Basin margin zone, (ii) Stable shelf Zone, (iii) Hinge Zone, and (iv) Deep basin Zone. Sylhet Limestone has been penetrated in the wells drilled in the Basin margin zone of the Bengal Basin. The basin slopes towards southeast and accordingly, this Formation is encountered at increasing depths while moving from west to east.

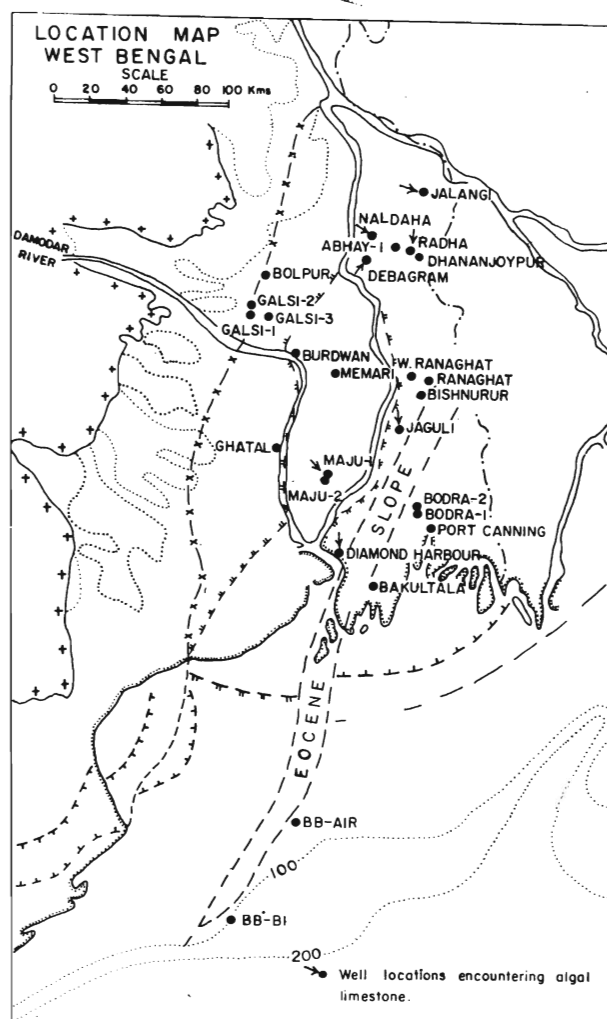


Fig. 1 Location map of area

AGE	LITHOLOGIC COLUMN	GENERALISED LITHOLOGIC DESCRIPTION	LITHOSTRATIGRAPHIC UNITS	
			SHELF FACIES	BASIN FACIES
RECENT-PLEISTOCENE		LOOSE GRAVE SAND & SILT	BENGAL ALLUVIUM	BENGAL ALLUVIUM
PLIOCENE		DOMINANTLY SILTY WITH MINOR SST CLAYSTONES & CALC BANDS	DEBAGRAM FORMATION	RANAGHAT FORMATION
MIOCENE	LATE	MAINLY SILTSTONES WITH MINOR SST. CLAYSTONES & OCC. CALC BANDS.	PANDUA FORMATION	MATLA FORMATION
	MIDDLE			
	EARLY	MAINLY SILTSTONES, SST & CARB. SHALE	DIAMOND HARBOUR FORMATION	
OLIGOCENE	LATE		BURDWAN FORMATION	MEMARI FORMATION
	EARLY	SANDSTONE OCC. LIGNITIC & SILTSTONIC SHALE		
EOCENE	LATE	MAINLY CALC. SHALE	KOPILI FORMATION	
	MIDDLE	FORAMINIFERAL & ALGAL LST WITH INTERBEDDED SST.	SYLHET LIMESTONE	
	EARLY			
PALEOCENE	LATE			
	EARLY	DOMINANTLY COARSE TO MEDIUM GRAINED SST. WITH LIGNITE & COALY SHALES	JALANGI FORMATION	
CRETACEOUS	LATE		SHALE LST. SHALE SST.	GHATAL FORMATION
		COARSE KAOLINIC SST. DULL RED SST. & SHALE ALTERNATION	BOLPUR FORMATION	
	EARLY	BASALT FLOWS ALTERNATION (?)	RAJMAHL TRAPS	
PERMO-CARBONIFEROUS		SAND, SHALE CARBO. SHALE, COAL & SST.	PRE-TRAPPEANS (?)	GONDWANAS (?)
PRE CAMBRIAN	+++++	GNEISS WITH DOLERITE SILLS & DYKES	BASEMENT	

(AFTER - ROY BARMAN, 1965)

Fig. 2 Showing lithology, lithologic description and lithostratigraphic units

The lithology of the Sylhet Limestone Formation is dominantly biochemical deposits (biomicrite to biomicrosparrite) with clastic breaks (calcareous quartzarenites and argillites). The clastic breaks are possibly the product of intermittently increasing gradient between source and depositional sites. Algae and foraminifers are very common (constituting upto 60%).

CHECK LIST OF FOSSIL ALGAE

Rhodophycophyta: Corallinaceae

Melobesiodeae

Lithothamnium aff. *bofilli* Lemoine.

Lithophyllum sp.

Mesophyllum sp.

Lithoporella melobesioides (Foslie) Foslie

Corallinoideae

Jania occidentalis Johnson

Chlorophycophyta : Dasycladaceae

Neomeris bengalensis n. sp.

Repository: The specimens are deposited in the Central Palaeontology Repository of the Geological Survey of India, Calcutta.

SYSTEMATIC DESCRIPTION

Genus Lithothamnium PHILIPPI 1837
Lithothamnium aff. *bofilli* LEMOINE 1939
(Plate I — 1-2)

Description: Thallus crustose, mammilose; hypothallus well developed, made up of rectangular cells, 12-13 μ x 8-10 μ perithallial cells up of rectangular, 10 μ x 8 μ . Conceptacles hemispherical, 247 μ x 66 μ ; 6-8 openings in the conceptacles.

Remarks: *L. bofilli* is known from the Lutetian of Spain and Middle to Upper Eocene of Algeria (Lemoine, 1939). Rao (1943) reported the species also from Nongstein Road section in the basal band of Cherra Limestone. Pal and Dutta (1979) reported the species from the Prang Member of Sylhet Limestone Formation of the Jaintia Hills.

Locality: Debagram well (2138 m - 2155 m below surface).

Age: Lutetian.

Type No.: DG/18

Genus Lithophyllum PHILIPPI 1837
Lithophyllum sp.
(Plate I — 3-4)

Description: Basal hypothallus characteristically coaxial; perithallus formed of horizontal layers of cells. Hypothallial cells 20 μ x 15 μ , perithallial cells 16 μ x 16 μ . Conceptacles not seen.

Remarks: The specimen is small and fragmentary and does not permit specific identification.

Locality: Debagram (2138 m - 2155 m) and Jaguli (4895 m - 4900 m) wells.

Type No.: A/49

Genus Mesophyllum LEMOINE 1928
Mesophyllum sp.
(Plate II — 8)

Description: Medullary hypothallus formed of coaxial layers of cells showing pronounced growth zones, each zone about 4-6 layers thick. The larger cell's measure 20-25 μ x 15-18 μ , smaller ones are 16 μ x 16 μ ; perithallial cells, 3-4 layers thick, with rectangular cells 15 μ x 10 μ . Conceptacle not seen.

Remarks: The specimen is small and fragmentary. As such, specific identification is not possible.

Locality: Jaguli well (4895 m - 4900 m)

Type No.: A/14

Genus *Lithoporella* FOSLIE 1909

Lithoporella melobesioides (FOSLIE) FOSLIE 1943
(Plate II — 6)

Description: Specimens monostromatic, with rectangular cells, $50\mu \times 20\mu$.

Remarks: This is a cosmopolitan Lower Tertiary alga. In India, it is known from the Palaeocene Nerinea beds of Pondicherry, the uppermost (Paleocene) strata of the Bagh beds of Narmada Valley, from the Andamans and the Lower Eocene Lakadong Member of Sylhet Limestone of the Jaintia Hills.

Locality: Debagram well (2138m -2155m).

Type No.: DG/18

Genus *Jania* LAMOUREUX 1812

Jania occidentalis JOHNSON 1965
(Plate II — 5)

Description: Segments and fragments of segments showing tiers of coxial cells, surrounded by narrow layer of marginal cells. Axial cells $50-60\mu \times 13-15\mu$. Marginal cells almost squarish, $14\mu \times 14\mu$.

Remarks: This species was originally reported from the Middle Palaeocene of Guatemala (Johnson, 1965). In India, it is known from the Late Paleocene (Landenian) Lakadong Member of the Khasi Hills (Pal and Datta, 1979).

Locality: Jaguli (4895 m - 4900 m) and Debagram (2138 - 2155) wells.

Age: Lower Eocene.

Type No.: DG/18

Genus *Neomeris* LAMOUREUX 1816

Neomeris bengalensis n.sp.
(Plate II — 7)

Description: Slightly oblique longitudinal section of a fragment showing pear-shaped sporangia; the broadest part is 660μ broad. The sporangia $85\mu \times 60\mu$. Calcification restricted to the outermost layer containing sporangia.

Remarks: Of the Lower Tertiary species of *Neomeris*, *N. sp. A* from the Danian of Niniyur Group (Varma, 1954, pl. 9, Figs. 1 & 7) has sporangial cavities that are much larger than those in the present species. Sporangia in *N. sp. B* (Varma, 1954, pl. 9, Figs. 2-3) are nearly double the size of the sporangia in the present specimen. *Neomeris sp.* from the Umlatodoh Member of Sylhet Limestone of the Jaintia Hill (Pal and Dutta, 1979, pl. 3, Fig. 17) is a much larger specimen with sporangia $160\mu \times 107\mu$ in size. As

such, the present specimen is assigned to a new species.

Locality: Jalangi well (3321 m - 3333 m)

Holotype No.: A/46

Etymology: It is named after the Bengal Basin.

CONCLUSIONS

The algal biota of the Sylhet Limestone Formation of the Bengal Basin indicates an Eocene age for the strata containing them. Most of the algal species recorded here indicate an Eocene age except *Jania occidentalis*, a Paleocene form, which, however, occurs in association with definite Eocene forms like *Lithothamnium aff. bofilli*. Following the normal practice, the younger age, that is, Eocene is accepted for the assemblage. Biswas (1961) recorded *Hantkenina* along with several species of *Bathysiphon*, *Spiroplectammina*, *Lagena*, *Nodosaria*, *Dentalina*, *Bolivina*, *Uvigerina*, *Globorotalia*, *Reusella* and *Angulogerina*. The assemblage points to an Eocene age. He has also recorded *Pellatispira* (of Eocene age) in the topmost part of the formation in the subcrops of West Bengal. According to him, the Sylhet Limestone Formation of West Bengal vary in age within the range Middle to Upper Eocene, corresponding to the time span of *Nummulites beaumonti* - *N. obtusus* - *Pellatispira sp.* The base of the formation corresponds to the highest range of *Assilina daviesi* and the sequence apparently represents the basal part of Middle Eocene. The top of the formation corresponds to upper Eocene in all the wells without exception. The foraminiferal time sequence corresponding to the Lower Eocene species of *Assilina* of the Indus basin and the Paleocene species of *Miscellanea* have not been encountered so far in marine facies in any of the West Bengal wells. The assemblage is dominated by crustose coralline algae followed by articulate coralline and dasyclads. These grew in clear, warm, shallow marine environment within the photic zone.

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EXPLANATION OF PLATES

PLATE I

1. *Lithophyllum* aff. *bofilli* (x 146).
2. Same (x 58).
3. *Lithophyllum* sp. (x 58).
4. Same (x 146).

PLATE II

5. *Jania occidentalis* (x 146).
6. *Lithoporella melobesiodes* (x 58)
7. *Neomeris bengalensis* (x 58)
8. *Mesophyllum* sp. (x 146)

