



FOSSIL RIVULARIACEAE FROM THE EARLY EOCENE OF KUTCH, INDIA

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ABSTRACT

A fossil blue-green alga belonging to family Rivulariaceae is described here from the Panandhro lignite quarry (Early Eocene), Kutch, Gujarat for the first time. The colony is characterised by a number of sheathed, erect and parallel trichomes with heterocysts.

Key words : Rivulariaceae, Panandhro lignite, early Eocene, Kutch.

INTRODUCTION

The paper records a fossil member of the family Rivulariaceae for the first time from the Tertiary sediments of India. The specimens were recovered in the course of palynological study of the Panandhro lignite quarry succession (figs. 1, 2). Other algal remains in the assemblage are *Botryococcus*,

Psiloschizosporis (spore of *Zygnema*) and dinocyst.

Family Rivulariaceae belongs to the order Nostocales containing the genera *Calothrix*, *Dichothrix*, *Rivularia*, *Gloeotrichia*, *Leptochaete* and *Homoeothrix* (Desikachary, 1959). They are cosmopolitan in distribution and mostly grow in fresh water habitats on various substrata.

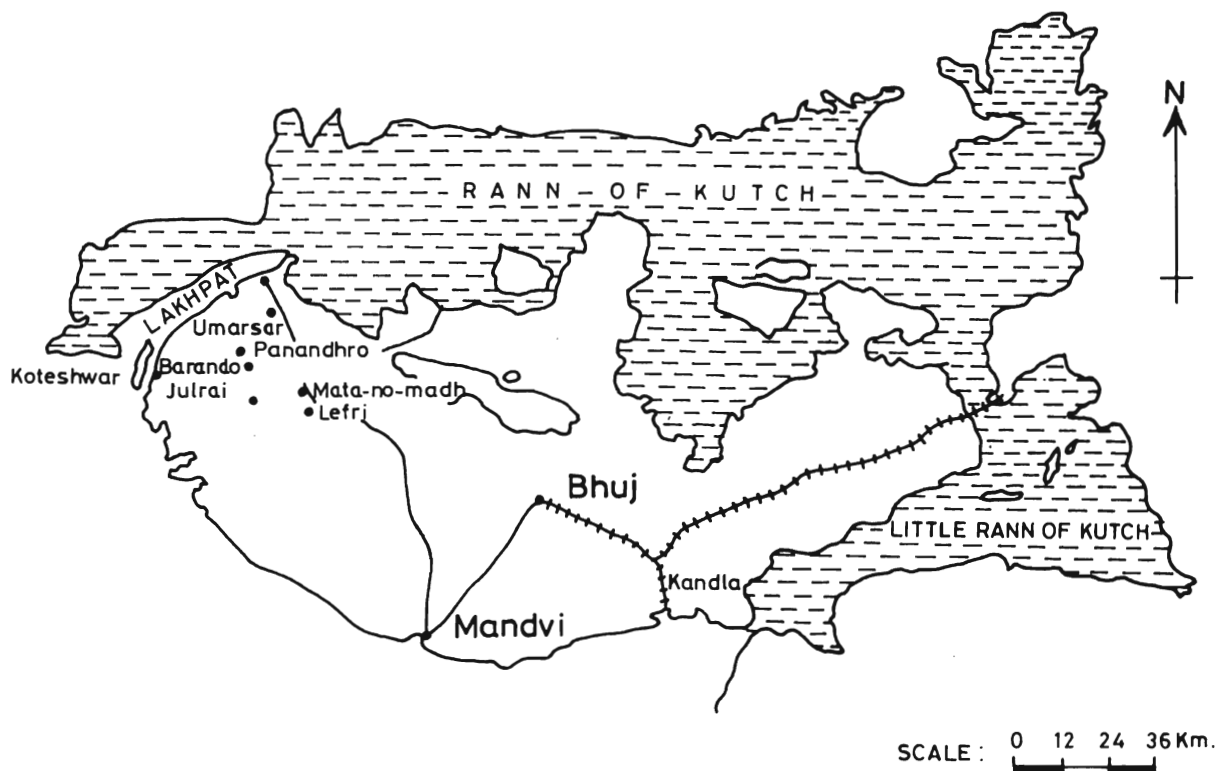


Fig. 1. Location map of the area (after Misra and Navale, 1992).

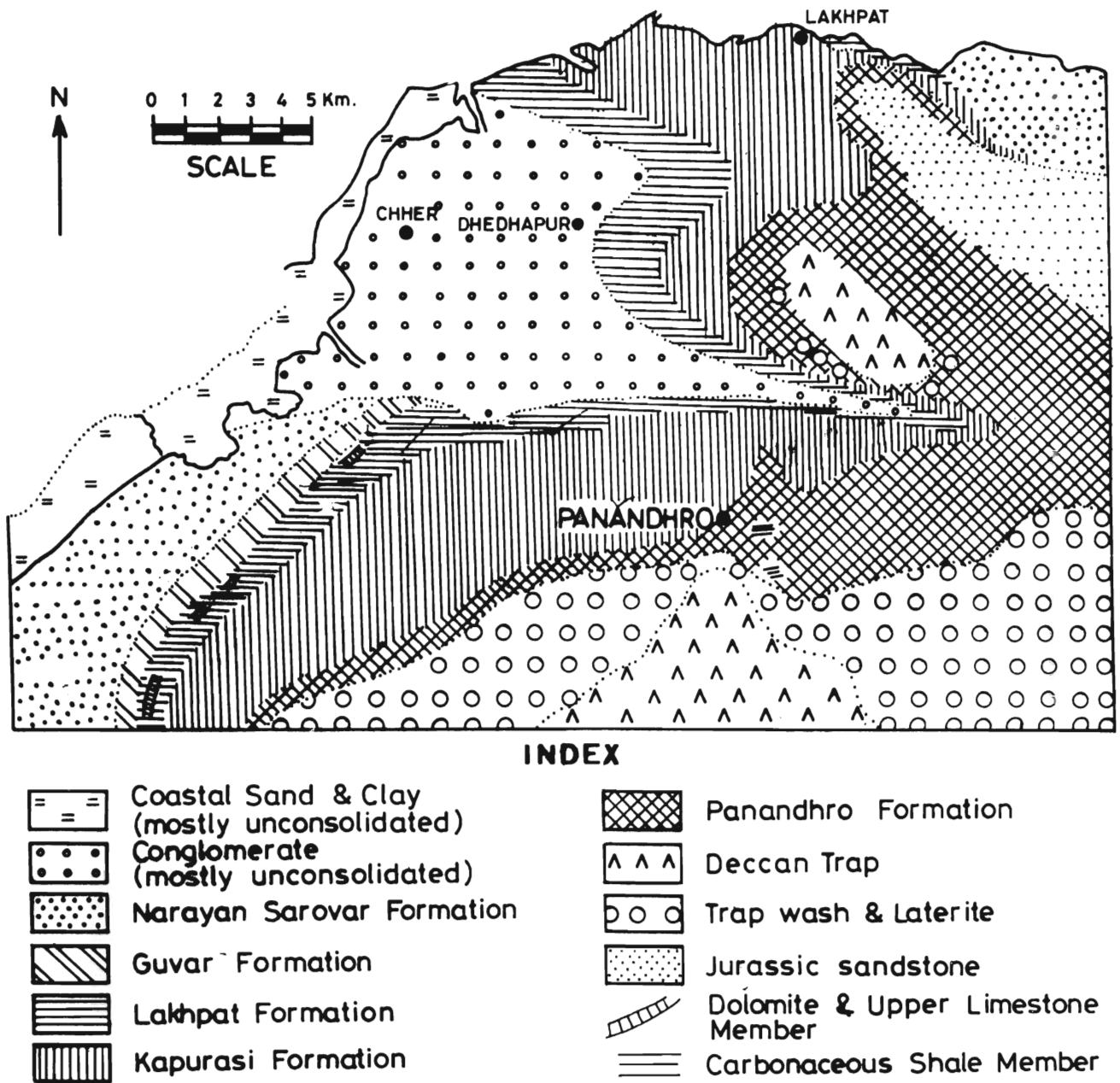


Fig. 2. Geological map of a part of western Kutch (after Saraswati and Banerjee, 1984).

Several workers studied the algae from carbonate facies of the Kutch basin of Eocene, Oligocene and Miocene ages (Pal and Gangopadhyaya, 1970; Pal and Ghosh, 1974; Tandon and Gupta, 1971; Tandon *et al.*, 1978 and Kar, 1979). All the recorded algae belong to Rhodophyceae and Chlorophyceae. Besides these records, *Botryococcus* and *Pediastrum* have frequently been observed in

palytological preparations (Vimal, 1953; Mathur, 1966 and Kar, 1982, 1985) along with pollen-spores and dinocysts. However, Rivulariaceae has not been observed in any of those studies.

The geology of this area was extensively studied by several workers and the most referred works are by Biswas and Raju (1971, 1973) and Saraswati and Banerjee (1984). These researchers proposed

different lithological classification and fixed early Eocene (Ypresian) age for this lignite-bearing sequence. The lithological sequence of this field was dealt with by Misra and Navale (1992).

MATERIALS AND METHODS

The samples were collected from Panandhro main lignite quarry. The Rivulariaceae-bearing sample (no.25, fig. 3) overlies the lignite seams and it is made up of black carbonaceous clay. The samples were processed through acid digestion following the conventional procedure. The slides are deposited in the repository of Museum, Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATIC DESCRIPTION

Division Cyanophyta

Class Cyanophyceae

Order Nostocales

Family Rivulariaceae

Diagnosis : Thallus broken, size and shape variable, filaments in group (up to 14), erect, parallel, unbranched, rarely curved at base. Trichome 96-110 μ m, tapering, cells in single rows, shape not discernible due to bad preservation, hairs not preserved. Heterocyst appears solitary, basal in some trichomes (figs 4a-b). Akinetes not seen.

Remarks : The above observation is based on seven specimens. The colonies are broken and consist of a large number of erect and parallel trichomes. Spore- or akinete-like structures have not been observed in any filament. The gaps between the trichomes give appearance that sheaths are covered by thick mucilage. These characters show similarity with *Rivularia* and *Gloeotrichia*. The distinction between these two genera is artificial (Fritsch, 1952). The forms producing akinete are referred to *Gloeotrichia*. Hence, the present specimens may be assigned to genus *Rivularia*.

In *Rivularia*, the lime mud occupies the mucilage between the trichomes. However, it is not possible to assign the definite affinity with any extant genera because of broken thallus, absence of spore or akinete and bad preservation of cells.

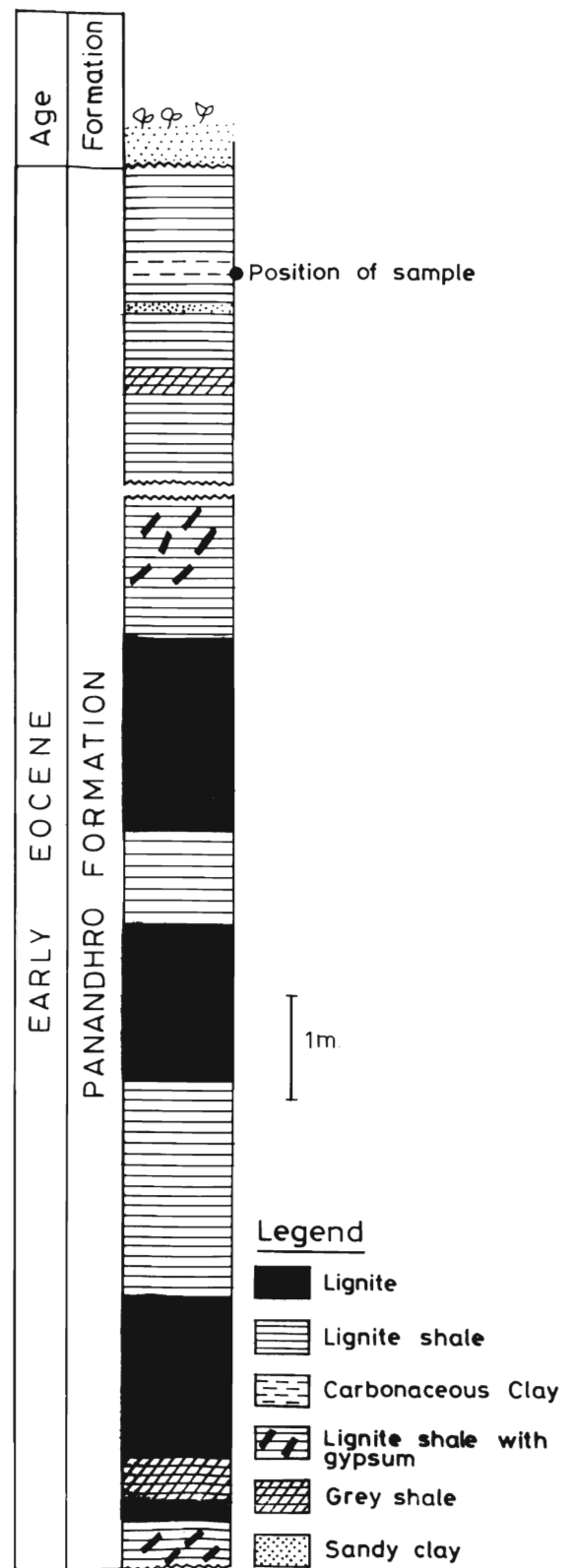


Fig. 3. Lithocolumn showing the position of the sample.

DISCUSSION

The fossil record of Rivulariaceae is very scanty. Its earliest record, though doubtful, is from Middle Proterozoic of Australia (Schopf and Blacic, 1971). Definite fossil record of this family is known from the Cambrian of Newfoundland (Edhorn and

Anderson, 1977). From India, there are only two records of this family. These are *Primorivularia* from the Kushalgarh Formation of the Delhi Supergroup, Rajasthan by Mandal *et al.* (1984) and three species of *Rivularia* by Ghosh and Maithy (1995) from the Cretaceous of Tiruchirapalli District, Tamil Nadu.

The occurrence of Rivulariaceae (*Rivularial Glecotrichia*) in the Panandhro mine is significant. It is because all the species of *Rivularia* (7 species) and *Gloeotrichia* (10 species) grow in fresh water except *Rivularia bullata* (Poir) Berk ex Born. et Flah. which is marine. However, Desikachary (1959, pp 549) states that it occurs in fresh water habitat also. The presence of these algae in lagoonal to marine (inner-shelf) sediments rich in microplankton and mangrove vegetation is palaeoecologically meaningful. They might have been derived from a fresh water source and transported into the marine realm where they were ultimately buried like other spores and pollen grains.

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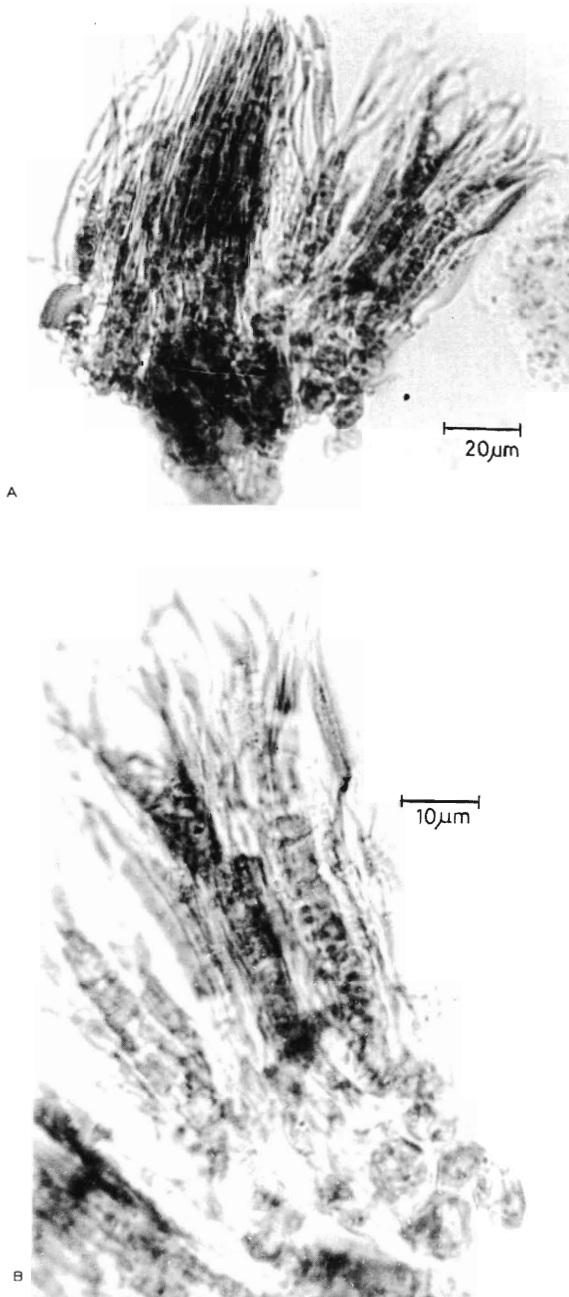


Fig. 4a. The fossil specimen in a colony. (slide no. BSIP 12178).
b. An enlarged portion of the colony.

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