

# Megafloral assemblages from two new localities of Rajmahal Formation

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Mega-fossil assemblages from the two newly discovered localities i.e. Gilamari and Khutnashi have been investigated. The Gilamari assemblage includes *Equisetites* sp., *Cladophlebis denticulata*, *Ptilophyllum cutchense*, *P. acutifolium*, *Dictyozamites* sp., *Williamsonia* sp., *Taeniopteris* sp., *Brachyphyllum rhombicum*, *Araucarites* sp. and *Elatocladus tenerrimus*, whereas the Khutnashi assemblage shows the presence of *Ptilophyllum tenerrimum*, *Pterophyllum distans*, *Anomozamites* sp., *Pagiophyllum* sp. and *Elatocladus tenerrimus*. The occurrence of trace fossils along with the leaf fragments and small seeds indicates low energy depositional environment at Gilamari.

**Key-words** - Mega-fossils, Gilamari and Khutnashi, Rajmahal Hills (E. Cretaceous), Bihar (India).

## INTRODUCTION

THE fossils were collected from Gilamari about 4 km north east of Dhokuti village (Map 1). These fossils were recovered from a nala section and are preserved as impression on yellowish-grey shales. The Khutnashi locality is about one km north east of Dubauli village. The fossiliferous inter-trappean beds were exposed at the base of Khutnashi Hill adjacent to Kamalghorai village. These fossils are also preserved as impression on yellowish-buff coloured sandstone.

The mega-fossil assemblages from the Rajmahal Formation recorded in the present investigation are listed below:

### Gilamari Area

*Equisetites* sp. Pl. 1, fig. 1

*Cladophlebis denticulata* (Brongn.) Fontaine 1889, Pl.1, fig. 2

*Ptilophyllum acutifolium* Morris 1840, Pl.1, fig. 3

*Ptilophyllum cutchense* Morris, 1840, Pl.1, fig. 5

*Williamsonia* sp., Pl.1, fig. 4

*Dictyozamites* sp.

*Taeniopteris* sp., Pl.1, fig. 10

*Araucarites cutchense* Feistmantel, 1876

*Elatocladus tenerrimus* (Feistmantel) Sahni 1928, Pl.1, fig. 11

*Brachyphyllum rhombicum* (Feistmantel) Sahni 1928, Pl.1, fig. 12

### Khutnashi Area

*Ptilophyllum tenerrimum* Feistmantel 1877, Pl. 1, fig. 6

*Anomozamites* sp., Pl.1, fig. 7

*Pterophyllum distans* Morris 1863, Pl., fig. 8

*Pagiophyllum* sp., Pl.1, fig. 9

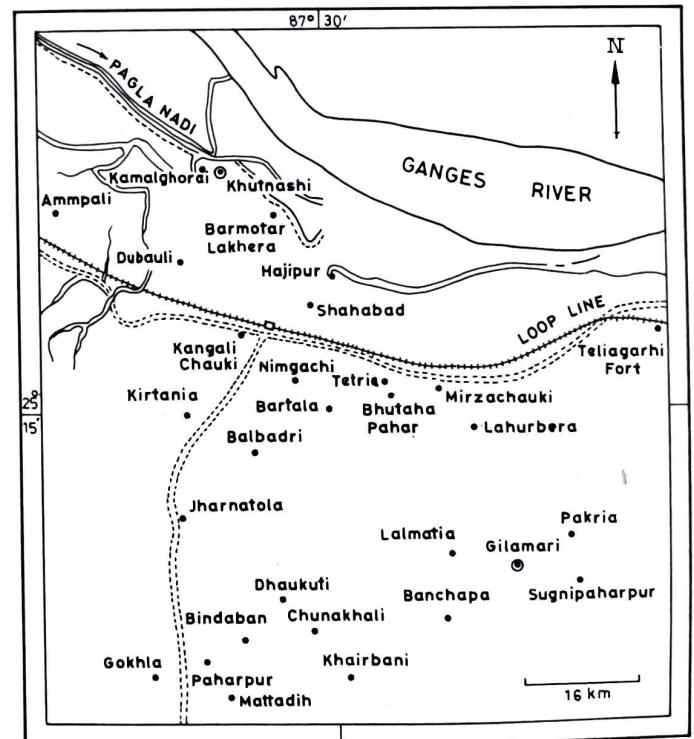
## DESCRIPTION

Genus - *Equisetites* Sternberg 1833

*Equisetites* sp.

Pl.1, fig. 1

Description - Narrow fragments of stems preserved as impression with longitudinal ridges and grooves,



Map 1 - Showing fossiliferous localities at Gilamari and Khutnashi in Rajmahal Basin, Bihar.

largest one is about 6.5 cm in length and 1 cm in width, with a distinct node. Leaf sheaths not preserved.

Genus - *Williamsonia* Carruthers 1870

*Williamsonia* sp.

Pl.1, fig. 4

*Description* - Solitary specimen with counterpart preserved as impression, at places carbonised crusts present. Flower seems to be attached laterally by a small peduncle on a slender branch. Peduncle 3 mm long. Branch is not well preserved, full width unknown, maximum preserved width 3 mm. Flower onion-shaped, measuring 5 x 3 cm, bracts incomplete, overlapping each other, probably with longitudinal striations. Receptacle cone-shaped, 1.2 x 1.5 cm in size; seminal and interseminal scales inconspicuous, perhaps 3 mm in length.

*Comparison* - This specimen compares closely in overall shape and size to *W. kakadbhitensis* Bose & Banerji (1984) but in the latter the seminal and interseminal scales are about 1.5 mm long, whereas in the present specimen they are about 3 mm in length. The conical receptacle resembles with *W. guptai* Sharma (1968) but the length of seminal and interseminal scales varies in both the species.

Genus - *Dictyozamites* Oldham 1863

*Dictyozamites* sp.

*Description* - Single fragment of a pinnate leaf preserved with six pinnae attached on one side of rachis. Pinnae rachis about 2 mm wide. Pinnae incomplete, arising at an angle of 60°-70°, closely set, 0.5 cm broad, base weakly auriculate; margin entire; apex incomplete. Venation reticulate.

*Remarks* - Extremely poor preservation of this specimen restricts its specific identification.

Genus - *Anomozamites* Schimper 1870

*Anomozamites* sp.

Pl.1, fig.7

*Description* - Single specimen preserved as impression with counterpart. Leaf incomplete, preserved length 14.8 cm, seems to be linear-lanceolate. Rachis 1.5

mm broad at base, medianly grooved. Lamina divided into rectangular cuneate segments; segments sub-opposite to alternately attached by entire base, measuring 1.2-2 x 0.9-1 cm, gradually becoming smaller and narrower towards apex and base, lateral margin straight-slightly curved upwards and downwards, apex truncated-obtusely pointed. Veins 1 mm apart, emerges almost at right angle, mostly unforked, rarely forked once.

*Comparison* - The present specimen from Khutnashi differs from almost all the known species of *Anomozamites* either in size, shape or concentration of veins. *Anomozamites crenata* (McClelland) Bose & Banerji (1981) differs by its smaller size of segments having more concentration of veins. In *A. amarjolense* Sharma *et al.* (1971) distal margin of lamina segment is slightly notched near middle region. *A. fissus* Feistmantel (1879) can readily be distinguished by its deeply notched distal margin. In having high concentration of veins and smaller segments *A. haburensis* Bose & Banerji (1981) differs from the present species, whereas, *A. hasnapurensis* Bose & Banerji distinguished by its smaller size of segment where veins are mostly forked contrary to the present specimen, in this specimen, veins are mostly unforked. Additional specimen, in future may prove it to be a new species.

Genus - *Taeniopteris* Brongniart 1828

*Taeniopteris* sp.

Pl. 1, fig. 10

*Description* - Two fragmentary specimens are recovered, incomplete at apex and base, 1.2-2.2 cm in width, midvein 1.5-2 mm broad, lateral veins are not preserved.

*Remarks* - Besides the *Taeniopteris* leaf this specimen also shows the trace fossils probably representing the trailing habit of an insect. The occurrence of trace fossils indicates that the deposition has taken place in low-energy environment.

#### Plate 1

1. *Equisetites* sp.; B.S.I.P. specimen no. 36850, x 1.
2. *Cladophlebis denticulata* (Brongn.) Fontaine; B.S.I.P. specimen no. 36851, x 1.
3. *Ptilophyllum acutifolium* Morris; B.S.I.P. specimen no. 36852 x 1.
4. *Williamsonia* sp.; B.S.I.P. specimen no. 36853, x 1.
5. *Ptilophyllum cutchense* Morris; B.S.I.P. specimen no. 36855, x 1.
6. *P. tenerrimum* Feistmantel; B.S.I.P. specimen no. 36855, x 1.
7. *Anomozamites* sp.; B.S.I.P. specimen no. 36856 x 1.
8. *Pterophyllum distans* Morris, B.S.I.P. specimen no. 36857 x 1
9. *Pagiophyllum* sp.; B.S.I.P. specimen no. 36858 x 1.
10. *Taeniopteris* sp.; B.S.I.P., specimen no. 36859 x 1.
11. *Elatocladus tenerrimus* (Feistmantel) Sahni; B.S.I.P. specimen no. 36860 x 1.
12. *Brachyphyllum rhombicum* (Feistmantel) Sahni; B.S.I.P. specimen no. 36861 x 1.

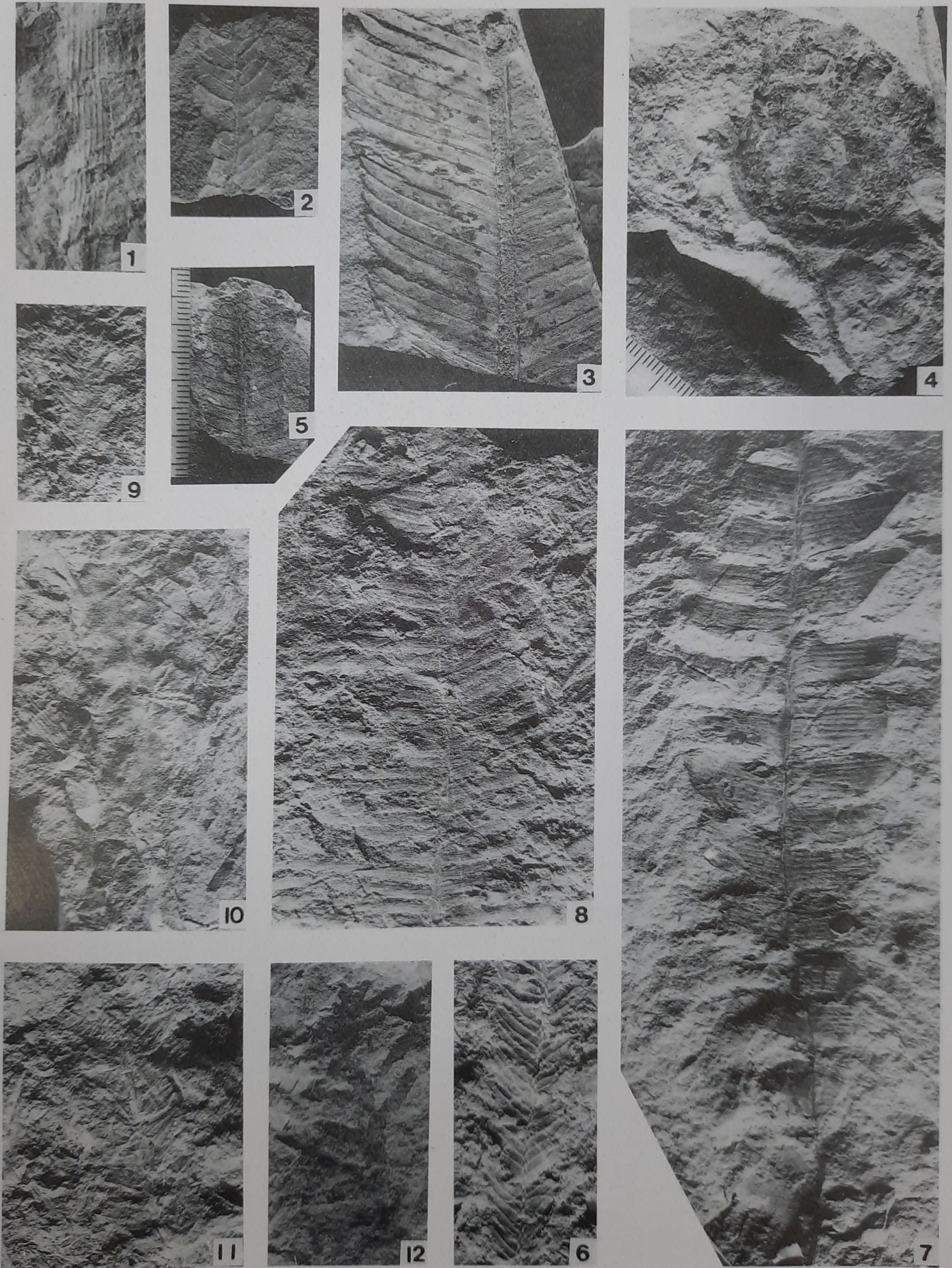


PLATE 1

**Genus - *Pagiophyllum* Heer 1881*****Pagiophyllum* sp.**

Pl. 1, fig. 9

*Description* - Small fragment of sterile twig preserved is about 3 cm in length. Axis slender. Leaves spirally disposed, slightly falcate, measuring 5-7 x 1-1.8 mm in size; apices gradually pointed; base decurrent, medianly keeled.

*Remark* - In the absence of cuticle it is difficult to identify the specimen upto specific level. In gross features it looks somewhat like *P. rewaensis* Bose & Sukh-Dev (1972).

**Genus - *Brachyphyllum* Brongniart 1828*****Brachyphyllum rhombicum* (Feistmantel) Sahni 1928**

Pl.1, fig. 12

*Remarks* - Recently Sen-Gupta (1988) described this species for the first time from Nipania area suggesting the occurrence of this species in the upper fossiliferous intertrappean beds of the Rajmahal Formation.

**MEGAFLORAL COMPARISON**

The Gilamari fossil assemblage shows some similarity with the assemblage of exposed 3rd intertrappean bed of Dhokuti and Chunakhal localities. Chunakhal and Dhokuti assemblages have large number of pteridophytes but in Gilamari it is represented by only two genera, i.e. *Equisetites* and *Cladophlebis*. Scarcity of pteridophytes may also be due to facies variation or due to unfavourable condition for preservation. However, the flora shows close similarity with the Early Cretaceous flora of Shivaganga Formation (Sukh-Dev & Rajanikanth 1988) of Therani and Karai areas of Tiruchirapalli District, Tamil Nadu. The common elements are *Equisetites*, *Cladophlebis*, *Taeniopteris*, *Ptilophyllum*, *Dictyozamites*, *Elatocladus*, *Brachyphyllum* and

*Araucarites*. Gilamari assemblage may be contemporaneous with the Shivaganga assemblage of Early Cretaceous. The absence of pteridophytic remains in Khutnashi assemblage indicates slightly older aspect than Gilamari assemblage. The exact stratigraphic position of the intertrappean bed at Khutnashi is not known but the floral correlation suggests its affinity with the Bhutaha Pahar assemblage (Loc. A) of Sahni & Rao (1933). The fossiliferous intertrappean bed of Butaha Pahar corresponds to exposed 2nd intertrappean bed of Rajmahal Hills (Sen-Gupta, 1988).

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