

Early Cretaceous megafossils from Balidih, Rajmahal Basin, India

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An assemblage of megafossils from Balidih locality of Rajmahal Basin is investigated. The assemblage includes - *Equisetites rajmahalensis*, *Phyllopteroides laevis*, *Pachypteris* sp. cf. *P. indica*, *Thinnfeldia indica*, *Ptilophyllum acutifolium*, *P. cutchense*, *Anomozamites* sp. cf. *A. fissus*, *Taeniopteris* sp. cf. *T. spatulata*, *Elatocladus confertus*, *Araucarites cutchensis* and *Coniferocaulon* sp. The megafloristic composition, relationship and the presence of an index Neocomian species *Phyllopteroides laevis* conclusively proves Neocomian age for Balidih fossiliferous intertrappean bed of Rajmahal Formation.

Key-words—Megafossils, Balidih, Rajmahal Formation, Early Cretaceous, India.

INTRODUCTION

THE fossiliferous intertrappean beds at Balidih locality are exposed in a nala at the base of a hill-ock. Fossils are preserved as impressions on khaki-brown coloured siltstone and sandstones. At places carbonized crusts are also present but on maceration, cuticle could not be recovered inspite of our repeated efforts. This fossiliferous locality is in the north-east of Balidih village just adjacent to the recently constituted village (Map-1). Sen-Gupta (1988) correlated Balidih with Dudhkhoh and recorded *Taeniopteris spatulata* McClelland, *T. crenata* McClelland, *Ptilophyllum acutifolium* Morris and *Pterophyllum fissum* Feistmantel from this locality. Further collections have been made from Balidih locality which yielded a rich megafossil assemblage including the following 10 genera belonging to pteridophytes and gymnosperms :

Equisetites rajmahalensis Oldham & Morris

Phyllopteroides laevis Cantrill & Webb

Pachypteris sp. cf. *P. indica* (Oldham & Morris)
Bose & Roy

Thinnfeldia indica Feistmantel

Ptilophyllum acutifolium Morris

P. cutchense Morris

Anomozamites sp. cf. *A. fissus* Feistmantel

Taeniopteris sp. cf. *T. spatulata* McClelland

Elatocladus confertus (Oldham & Morris) Halle

Araucarites cutchensis Feistmantel

Coniferocaulon sp.

Genus-*Equisetites* Sternberg

Equisetites rajmahalensis Oldham & Morris

Pl. 1, fig. 1

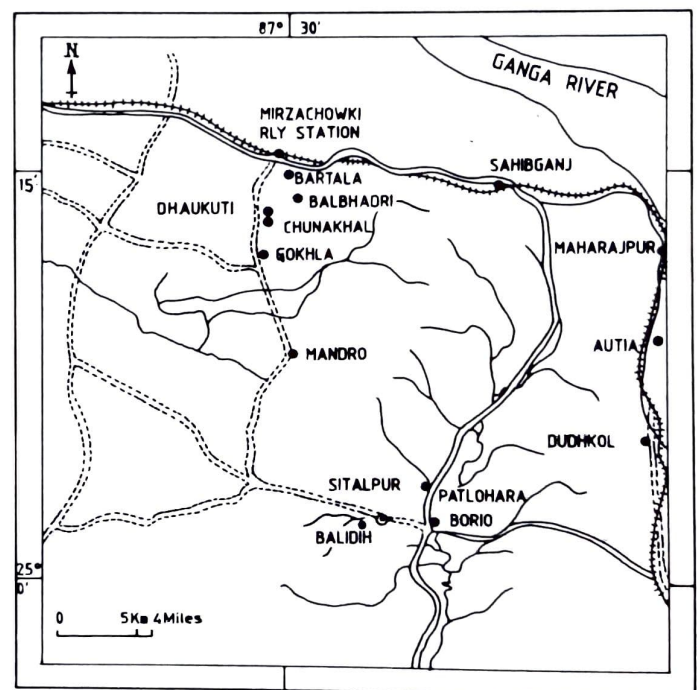
Description- Largest available stem piece is 5.5 cm in length and 1.1 cm in width, ridges and grooves indistinct.

Genus-*Phyllopteroides* Medwell

Phyllopteroides laevis Cantrill & Webb

Pl. 1, fig. 2

Description-The largest specimen is 3.5 cm long and about 1 cm broad, incomplete from base, pin-



Map 1. showing the fossiliferous locality of Balidish village, Rajmahal Basin

nule linear-lanceolate, apex acute, margin wavy-straight. Midrib distinct, lateral veins arise at acute angles, forked mostly once or twice.

Remarks- Three specimens were collected. All the three specimens are incomplete and fragmentary. In gross morphology and venation pattern they are exactly similar to *Phyllopteroides laevis* Cantrill & Webb (1987, Fig. 3B & F). This species has been earlier recorded from Chunakhal and Murlipahar localities of the Rajmahal Basin by Banerji in 1992 and 1996 respectively.

Genus- *Pachypteris* Brongniart

Pachypteris sp. cf. *P. indica* (Oldham & Morris)

Bose & Roy

Pl. 1, fig. 5

Description- Two fronds preserved as impression with counterparts. Frond is bipinnate or tripinnate. Primary rachis 2 mm wide, with a median groove, pinnae attached alternately at an angle of 45°-50°, secondary rachis 1-1.2 mm broad, grooved. Pinnules oblong-oblancheolate, alternately attached at angles of 30°-40°, distal pinnule pinnatifid, pinnules measuring 5-7mm x 1-1.2 mm, margin entire, apex obtuse-acutely rounded.

Remarks-The above specimens are placed provisionally under the genus *Pachypteris* on the basis of gross morphological features. In general appearance the specimens resemble *Pachypteris indica* (Oldham & Morris) Bose & Roy known from Kachchh.

Genus-*Thinnfeldia* Ettingshausen

Thinnfeldia indica Feistmantel

Pl.1, figs 8 & 9

Description- Fronds pinnate, lanceolate, imparipinnate, measuring 13.0 cm in length. Rachis 1.0 mm to 3.00 mm broad, finely striated. Pinnae sub-opposite, attached at an angle of 45° -60°, lan-

ceolate-rhomboidal in shape, margin entire, slightly wavy at places, apex subacute-obtuse, base broad, acroscopic and basiscopic margins truncate to decurrent forming a wing along the rachis, pinnae measuring 0.8-4.0 cm x 0.8-1.5 cm, midrib mostly distinct upto apex, lateral veins arise at acute angles, forked once or twice at different levels, concentration of veins 16-20 per cm.

Remarks- This species is widely distributed in Rajmahal Basin and is known from Buskoghata, Botio, Basgobedo, Pathargama and Bartala Hills (Feistmantel 1877; Gururaja & Pant 1970; Zeba-Bano *et al.* 1979, Sen-Gupta 1988). In gross features the present fronds resemble *Thinnfeldia indica* Feist. described by Zeba-Bano *et al.* (1979) from Pathargama. The exact affinity of these fronds is still open due to the lack of any conclusive evidence of cuticle or fertile organs to prove its pteridospermic affinity.

Genus- *Anomozamites* Schimper

Anomozamites sp. cf. *A. fissus* Feistmantel

Pl. 1, fig. 10

Description- Single incomplete specimen collected with its counterpart. It measures 9.5 cm in length and 4.8 cm in width. Leaf incomplete, lamina segmented, segments 1.3 cm broad, upto 2.3 cm long, oblong with obtusely rounded or slightly pointed tips. Midrib 2.5 mm broad at the base, finely striated. Lateral veins arise at an angle of 85°-90°, concentration of veins 16 per cm at base and 25-30 per cm towards distal end, forked mostly at base.

Comparison and Remarks- The present specimen is similar to *Anomozamites fissus* Feistmantel (1879) in having segmented lamina with notched distal end of the segments. Segments are twice as long as broad and veins are dichotomising. But the present

PLATE 1

- Fig. 1. *Equisetites rajmahalensis* Oldham & Morris; B.S.I.P. specimen no. 37655 x 1.
 Fig. 2. *Phyllopteroides laevis* Cantrill & Webb; B.S.I.P. specimen no. 37656 x 2.
 Fig. 3. *Prilophyllum cutchense* Morris; B.S.I.P. specimen no. 37657 x 1.
 Fig. 4. *P. acutifolium* Morris; B.S.I.P. specimen no. 37658 x 1.
 Fig. 5. *Pachypteris* sp. cf. *P. indica*; B.S.I.P. specimen no. 37659 x 1.5.
 Figs. 6 & 7. *Taeniopteris* sp. cf. *T. spatulata*; B.S.I.P. specimen no. 37660 x 2

- and 37661 x 1.
 Figs. 8 & 9. *Thinnfeldia indica* Feistmantel; B.S.I.P. specimen no. 37662 x 1 and 37663 x 1
 Fig. 10. *Anomozamites* sp. cf. *A. fissus*; B.S.I.P. specimen no. 37664 x 1.
 Fig. 11. *Coniferocaulon* sp.; B.S.I.P. specimen no. 37665 x 1.
 Fig. 12. *Araucarites cutchensis* Feistmantel; B.S.I.P. specimen no. 37666 x 1.
 Fig. 13. *Elatocladus confertus* (Oldham & Morris) Halle; B.S.I.P. specimen no. 37667 x 2.

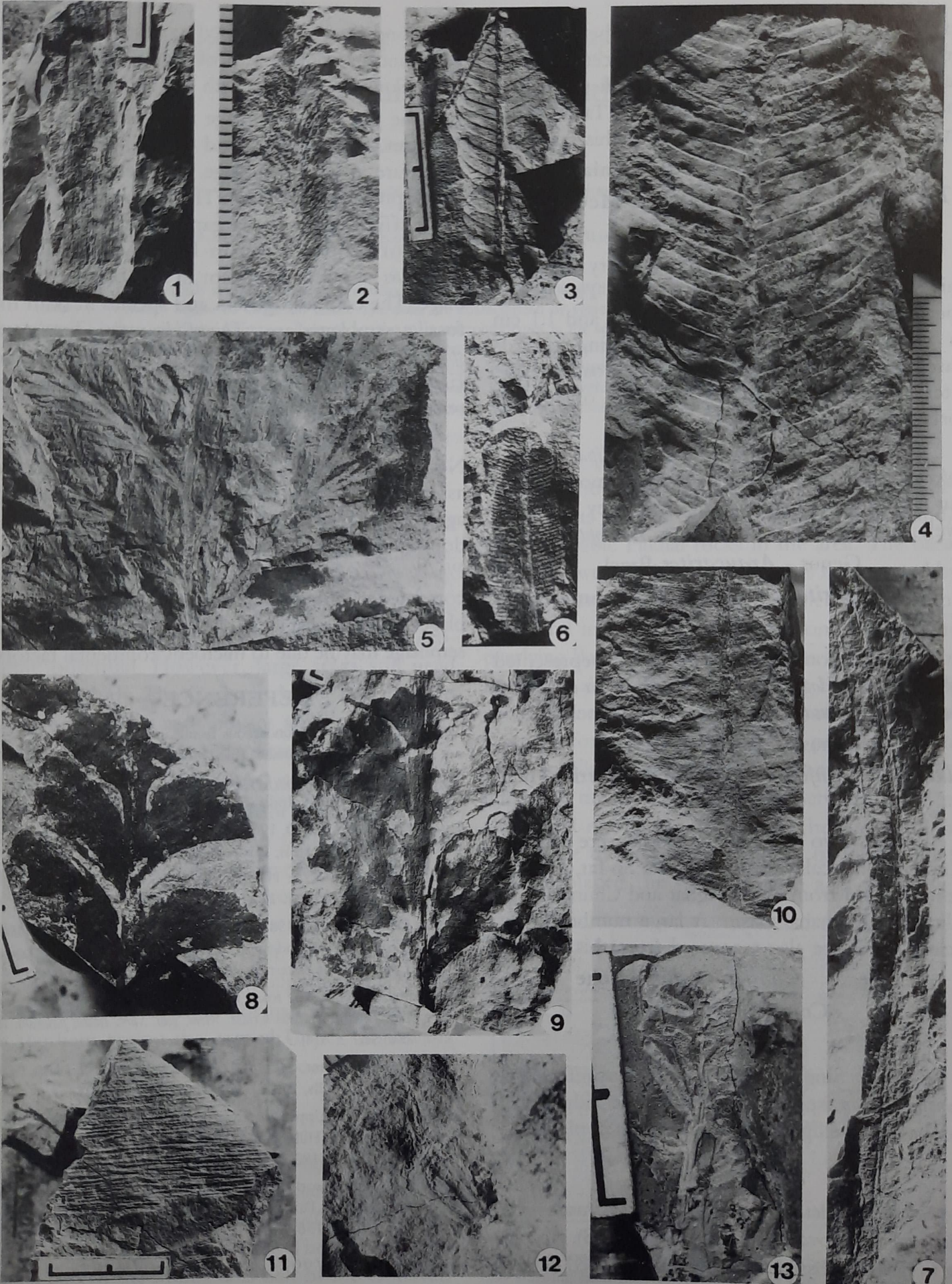


PLATE 1

specimen differs by its large size of the leaf, with broader and longer segments and concentration of veins. Though this species is widely distributed in the Rajmahal Basin (Sen-Gupta 1988, Table 3) but from Balidih it is the first record of this taxa.

Genus - *Taeniopteris* Brongniart

Taeniopteris sp. cf. *T. spatulata* McClelland

Pl. 1, figs 6 & 7

Description- Numerous fragmentary leaves of this species are preserved at Balidih. The largest specimen measures 11.5 cm in length and 1.1 cm in width. The lamina gradually tapering towards base, margin entire, midrib 1.5 mm broad at base, lateral veins mostly arise at an angle of 80° and forked at various levels.

Remarks-The specimens resemble *Nipaniophyllum bobsonii* Bose *et al.* (1985) in external morphology, but for want of anatomical features they are tentatively described under the genus *Taeniopteris*.

Genus - *Araucarites* Presl.

Araucarites cutchensis Feistmantel

Pl. 1, fig. 12

Remarks-From Balidih conifers are represented by the genus *Elatocladus confertus* (Oldham & Morris) Halle and *Araucarites cutchensis* Feistmantel.

Genus - *Elatocladus* Halle

Elatocladus confertus (Oldham & Morris) Halle

Pl. 1, fig. 13

Remarks-Two fragmentary shoots were collected from Balidih locality as impressions. So far, this species is known from Sakrigalighat and Chunakhal localities of Rajmahal Basin. A large number of detached leaves are also recovered from this locality.

Genus - *Conifero-caulon* Fliche

Conifero-caulon sp.

Pl. 1, fig. 11

Remarks- Single fragment of a stem referred to *Conifero-caulon* sp. shows transverse ridges and grooves with elliptical protuberances at places.

DISCUSSION

So far, no detail collection has been made from this locality discovered by Sen-Gupta (1988). According to him this fossiliferous intertrappean bed belongs

to second intertrappean bed exposed in Rajmahal Basin and its contact with overlying and underlying basalt flows are covered with soil and vegetation.

The present assemblage is dominated by cycadophytes. Pteridophytes and conifers are comparatively rare in the assemblage. The genus *Thinnfeldia* is the predominant taxon. This assemblage shows close affinity with Pathargama megafossil assemblage of Rajmahal Basin but, the absence of *Ginkgoites* is quite significant in the Balidih assemblage. The common genera and species in both the fossil assemblages are - *Thinnfeldia indica*, *Taeniopteris spatulata*, *Ptilophyllum acutifolium*, *Pterophyllum* and *Elatocladus* species suggesting floral similarity between these two localities of Rajmahal Basin.

The presence of *Phyllopteroides laevis*, an index Neocomian species, from Balidih locality and also assemblage correlation suggests an Early Cretaceous age for this megafossil assemblage. On the basis of dominance of cycadophytes and the presence of *Phyllopteroides laevis* in the assemblage, it can also be correlated with the Chunakhal and Murlipahar assemblages but the qualitative variation in totality of assemblage may be due to microenvironmental factors.

REFERENCES

- Banerji, Jayasri 1992. Osmundaceous fronds in Lower Cretaceous beds at Chunakhal, Rajmahal Hills, Bihar, India. *Alcheringa* **16**: 1-13.
- Banerji, Jayasri 1996. Early Cretaceous megafloora from Murlipahar, Rajmahal Basin, India *Geophytology* **25**: 41-46.
- Bose, M.N. & Sah, S.C.D. 1968. Some pteridophytic remains from the Rajmahal Hills, Bihar. *Palaeobotanist*, **16**: 12-18.
- Bose, M. N., Pal, P.K. & Harris, T.M. 1985. The *Pentaxylon*-plant. *Phil. Trans. R. Soc. Lond.* **B310**: 77-108.
- Cantrill, D.J. & Webb, J.A. 1987. A re-appraisal of *Phyllopteroides* Medwell (Osmundaceae) and its stratigraphic significance in the Lower Cretaceous of eastern Australia. *Alcheringa* **11**(1) : 59-85.
- Feistmantel, O. 1879. The fossil flora of the Upper Gondwana outliers on the Madras Coast. *Mem. geol. Surv. India, palaeont. indica* Ser. 2. **1**(4) : 191-224.
- Gururaja, M.N. & Pant, S.C. 1970. A note on the fossil plants from Rajmahal Hills, Bihar. *Ind. Min.* **24**(4) : 386-388.
- Sen-Gupta, S. 1988. Upper Gondwana stratigraphy and palaeobotany of Rajmahal Hills, Bihar, India. *Mem. geol. Surv. India, palaeont. indica*, **48**: 1-182.
- Zeba-Bano, Maheshwari, Hari K. & Bose, M.N. 1979. Some plant remains from Pathargama, Rajmahal Hills, Bihar. *Palaeobotanist* **26**(2) : 144-156.

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