

# DICHOTOMOPTERIS, A NEW TYPE OF FERN FROND FROM THE LOWER GONDWANA OF INDIA

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## ABSTRACT

*Dichotomopteris* gen. nov. is instituted for the fern fronds earlier described under *Merianopteris*, *Alethopteris* and *Ptychocarpus* from the Lower Gondwanas of India. Two species of *Dichotomopteris*, *D. major* n. comb. and *D. lindleyii* n. comb. are identified on basis of both sterile and fertile specimens.

## INTRODUCTION

THE Indian Lower Gondwana ferns have hitherto been described under the northern genera, viz. *Sphenopteris*, *Pecopteris*, *Alethopteris*, *Merianopteris* and *Ptychocarpus*. It is felt by many that since during the Permian period the flora of the northern hemisphere was different from that of the southern, the Gondwanaland, the placement of Lower Gondwana plants under the northern genera may not always be correct. A detailed study of the specimens referable to *Merianopteris*, *Alethopteris* and *Ptychocarpus* from the Raniganj Stage has shown that they are morphologically distinct form from the northern genera under which they are described and so a new generic name has been proposed here for them.

## DESCRIPTION

### *Dichotomopteris* gen. nov.

*Generic diagnosis* — Fronds large, imparipinnate, tri-pinnate; pinnae contiguous at base, no veins in contiguous part; pinnules of pinnae lobed or entire and contiguous, with distinct mid-vein dissolving into secondary veins in distal region which further dichotomise, mid-vein also gives out two or more lateral veins on either side, each lateral vein dichotomises once or twice, when divided into three veins, only distal vein dichotomise and proximal remains undivided; sori present on underside of pinnules upon lateral vein endings, sori form two distinct rows one on either side of

midrib; sporangia separate, 4-8 in a sorus, annulus absent; spores differently sculptured and trilete.

*Genotype* — *Dichotomopteris major* n. comb.

*Comparison* — The fronds described earlier under *Alethopteris*, *Ptychocarpus* and *Merianopteris* from the Lower Gondwanas of India have been placed under this genus. *Dichotomopteris* differs from *Alethopteris* Sternberg in the evanescent nature of mid-vein and the absence of veins from pinnae rachis in the base of pinnules. *Merianopteris* Heer differs from *Dichotomopteris* by the anastomosing of basalmost pair of lateral veins with the lateral veins of adjacent pinnules. Moreover, the mid-vein of pinnule in the former is persistent up to the apex. *Pecopteris* Brongniart differs from *Dichotomopteris* in the absence of basal contiguity of pinnules and the presence of a distinct mid-vein persisting right up to the apex. *Mariopteris* Kidston shows contiguity of basal pinnule as in *Dichotomopteris*, but differs from it in possessing a distinct sphenopteroid type of venation.

Among the fertile fronds, *Scolecopteris* Zenker differs from *Dichotomopteris* in having stalked sporangia and *Ptychocarpus* Weiss and *Asterotheca* Presl by the fusion of their sporangia. *Oligocarpia* Goeppert possesses annulus which is absent in *Dichotomopteris*. *Rajahia* Konno *et al.* (1970) differs from the Indian frond in having sporangia arranged in groups. Thus, the fern fronds described under *Dichotomopteris* differ from all the other fossil fern genera. The distinguishing characters of *Dichotomopteris* are the contiguous pinnules, evanescent mid-vein, characteristic dichotomizing lateral veins and the characteristic arrangement of sori. I have, therefore, proposed a new generic name for these fronds.

Two species of *Dichotomopteris* are recognizable from Indian Lower Gondwanas, viz., *Dichotomopteris major* n. comb. and *D. lindleyii* n. comb.

*Dichotomopteris major* (Feistmantel) n. comb.

Pl. 1, Figs. 1-4

*Synonymy*

1881 *Merianopteris major* Feistmantel, p. 83, pl. 19A, figs. 9-11.

*Emended diagnosis* — Frond large, tri-pinnate; rachis smooth, 3-4 mm. broad, lateral branches  $\pm$  opposite, pinnae arranged at wide angle of 70°-80°, alternate to one another, oblong in outline, either distinctly lobed into pinnules (basal part of frond) or entire with crenulate margin; pinnules attached to pinnae rachis at wide angle, 80°-90°, contiguous to each other by base; cleft between pinnules deep; pinnule obovate with rounded apex, terminal pinnule, broadly triangular with rounded apex; mid-vein distinct up to half distance, then bifurcating into secondary veins which further dichotomise, mid-vein gives out two lateral veins on either side, each dichotomises once or sometimes twice; when dividing into three veins, distal vein always dichotomises but proximal remains undivided; 2 to 4 sori present only in basal half on under side of pinnules upon lateral vein endings, sori form two distinct rows on either side of mid-vein; sporangia separate, 5-6 in a sorus; spores triangular with rounded corners, exine ornamented with curved bacula longer than broad, Y-mark distinct. Spores identical to *Horriditriletes curvibaculosus* Bharadwaj and Salujha (1964).

*Lectotype* — 5194, Geological Survey of India, Calcutta.

*Isotype* — 35105 and 35106, Birbal Sahni Institute of Palaeobotany, Lucknow.

*Locality* — Raniganj Coalfield, West Bengal.

*Horizon* — Raniganj Formation (Lower Gondwana).

*Dichotomopteris lindleyi* (Royle) n. comb.

Pl. 1, Figs. 5-8

*Synonymy*

1833 *Pecopteris lindleyana* Royle, p. 29, pl. 2, fig. 4.

1881 *Alethopteris lindleyana* Feistmantel, p. 80, pl. 18A, figs. 2, 2a, pl. 19A, figs. 3, 3a; pl. 23A, figs. 11, 11a, pl. 39A, figs. 10, 11.

1963 *Ptychocarpus srivastavae* Surange, p. 72, fig. 41, A-C.

*Emended diagnosis* — Frond large, tri-pinnate; rachis smooth, lateral branches alternate, pinnae alternate, oblong, distinctly lobed into pinnules, pinnules attached to pinnae rachis at wide angle, 80°-90°, contiguous laterally to each other towards the base,  $\pm 1/3$  length of pinnule from base fused with adjoining pinnules, pinnule oblong with acutely rounded apex, margin show strong curvature; terminal pinnule elongate, triangular, mid-vein distinct up to 3/4th distance from base, bifurcating upwards into secondary veins which further dichotomises, lateral veins usually 4 or 5 on either side of mid-vein, each dichotomises twice, rarely once; when dividing into three veins, distal vein always dichotomises but proximal remains undivided; sori arranged in two rows on underside of entire length of pinnules upon lateral vein endings; 6, rarely 8 sori in each row, sporangia separate, 5-6 in a sorus; spores circular, 60-80  $\mu$ , Y-mark distinct, exine bearing minute, round elliptical, puncta usually clearly separated from adjacent ones. Spores identical with *Eupunctisporites ponatiensis* Bharadwaj (1962).

*Holotype* — V4192, British Museum (Natural History), London.

*Isotype* — 5184, Geological Survey of India, Calcutta and 8669, Birbal Sahni Institute of Palaeobotany.

*Locality* — Raniganj Coalfield, West Bengal.

*Horizon* — Raniganj Formation (Lower Gondwana).

*Comparison* — The specimens earlier described under *Alethopteris lindleyi* Feistmantel (1881) and *Ptychocarpus srivastavae* Surange (1964) are placed under this species. The present species differs from *D. major* in the shape and venation of the pinnules, the number of sori and its arrangement and the spores in the two plants.

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## EXPLANATION OF PLATE

## PLATE 1

*Dichotomopteris major* (Feistm.) n. comb.

1. A portion of sterile frond showing arrangement of pinnae and pinnules,  $\times 1$ ; 35105, Birbal Sahni Institute of Palaeobotany.

2. Two sterile pinnules enlarged to show the lateral contiguity of pinnules near the base and the pattern of venation.  $\times 6$ .

3. Two fertile pinnules showing the arrangement of sori. Two rows of sori arranged on both sides of midvein.  $\times 6$ ; 35106, Birbal Sahni Institute of Palaeobotany.

4. A spore identical to *Horriditriletes curvibaculosus* Bhard. & Saluj. recovered from the sporangia.  $\times 1000$ .

*Dichotomopteris lindleyii* (Royle) n. comb.

5. A portion of sterile frond showing arrangement of pinnae and pinnules,  $\times 1$ ; 35107; Birbal Sahni Institute of Palaeobotany.

6. A sterile pinnule enlarged to show the venation pattern.  $\times 3$ .

7. Two fertile pinnules showing the distribution of sori. 5187, Geological Survey of India, Calcutta.

8. A group of spores identical to *Eupunctisporites poniatiensis* Bhard. recovered from the sporangia.  $\times 500$ .