

RE-EVALUATION OF SOME INDIAN LOWER GONDWANA FILICALEAN TAXA

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Abstract

A critical assessment of the morphological characters of fern fronds described from the Indian Lower Gondwana under *Santhalea*, *Dichotomopteris* and *Leleopteris* has been done. The observations indicate that the genus *Leleopteris* is synonymous to *Santhalea*.

In the course of the study of Lower Gondwana plant megafossils from the Rajmahal Hills (Prasad, Maithy & Shukla, in press), some sterile fronds of ferns from the Tattitola beds of Pachwara Formation belonging to genera *Santhalea* Maithy and *Dichotomopteris* Maithy were collected. While identifying the specimens, we scrutinised the work on the Indian Lower Gondwana ferns done by Maithy (1974, 1975, 1977), Srivastava and Chandra (1982) and Pant and Misra (1983).

Maithy (1974) instituted the genus *Dichotomopteris* for some Lower Gondwana ferns earlier described by various authors under the genera *Merianopteris*, *Pecopteris*, *Alethopteris* and *Ptychocarpus*. The generic diagnosis of *Dichotomopteris* as given by Maithy (1974) is "Fronds large, imparipinnate, tripinnate; pinnae contiguous at base, no veins in contiguous part; pinnules of pinnae lobed or entire and contiguous, with distinct midvein dissolving into secondary veins in distal region which further dichotomise, midvein 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 under side 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; spore differently sculptured and trilete".

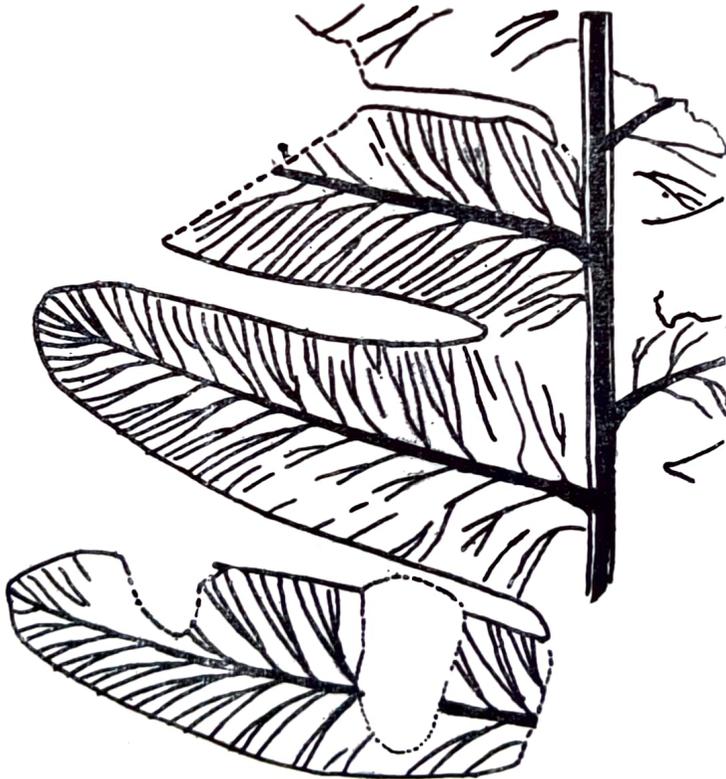
Five species of this genus have so far been described (Maithy 1974, 1975, 1977; Pant & Misra' 1983). *Dichotomopteris major* Maithy and *D. lindleyii* Maithy are based on both sterile as well as fertile fronds, whereas for other three species *D. falcata* Maithy, *D. ovata* Maithy and *D. asansoloides* Pant & Misra only sterile fronds are known.

Maithy (1977) instituted the genus *Santhalea* for the sterile fern fronds earlier described by Maheshwari and Prakash (1965) as *Pecopteris* sp. and *Alethopteris* sp. The generic diagnosis of *Santhalea* as given by Maithy (1977) is "Fronds large, imparipinnate, tripinnate; rachis winged; pinnules decurrent, attached to rachis by broad base, venation pecopteroid; single midvein persistent up to apex, lateral veins towards apical part, simple, whereas in basal part divides into two, three or four veinlets; when three, the distal one divides into two and the proximal remains undivided and when four the proximal remains undivided and in the distal one the proximal one divides into two veinlets and distal one remains unforked. Reproductive structures unknown".

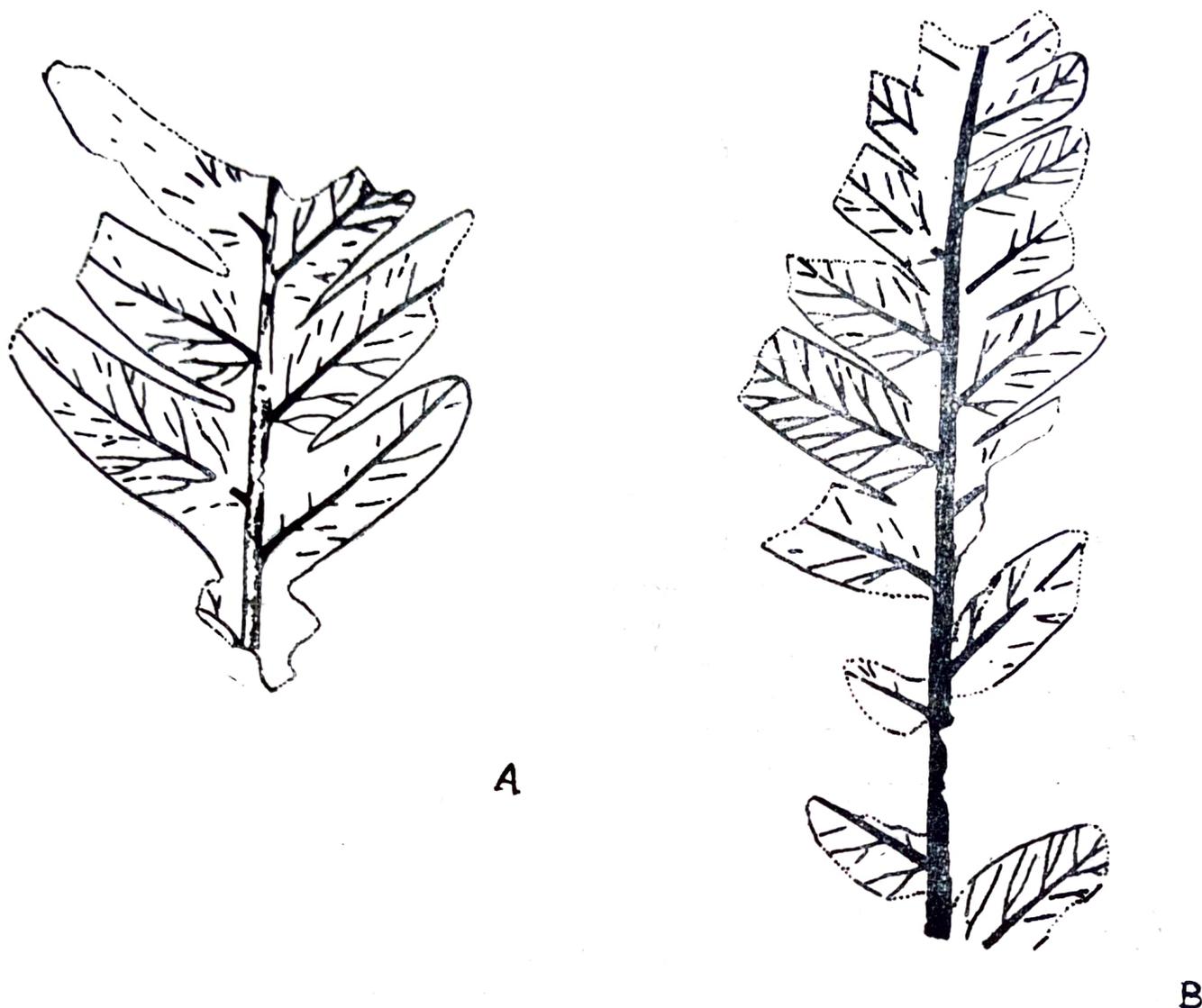
Srivastava and Chandra (1982) instituted the generic name *Leleopteris*. Their generic diagnosis reads "pinnae alternate or subopposite; bipinnate robust fronds, impari-

pinnate; pinnules pecopteroid, alternately arranged to the pinnae rachis, broadly attached, apex broad to acute, base broad, decurrent, midvein distinct, evanescent towards apical region; lateral veins 4-8 curved/arched, dichotomising only once, 6-8 sori arranged in linear rows on either side of midvein, each sorous 6-8 loculi, spores trilete with verrucae". The type species of *Leleopteris* as designated by Srivastava and Chandra (1982) is *L. raniganjensis* based only on sterile fronds. To this new genus, they have also transferred two earlier described species, the *Dichotomopteris ovata* Maithy (1977) and *Ptychocarpus srivastavae* Surange (1966) as *L. ovata* (Maithy) Srivastava & Chandra and *L. srivastavae* (Surange) Srivastava & Chandra respectively. *Ptychocarpus srivastavae* Surange (1966) was earlier considered by Maithy (1974) to be the fertile frond belonging to *Dichotomopteris lindleyii* (Royle) Maithy.

According to Srivastava and Chandra (1982) the genus *Leleopteris* could be distinguished from *Dichotomopteris* by its constantly having only once forked lateral veins (single dichotomy) of pinnules. *Leleopteris* also distinguishable from *Santhalea* in the presence of the midvein of pinnule which is distally evanescent. However, on examining the holotype of the type species of the genus *Leleopteris* (*L. raniganjensis*), we found that the characters of this type specimen do not agree with the generic circumscription as well as specific diagnosis of *Leleopteris ranigan-jensis* Srivastava & Chandra (1982). The pinnules possess a distinct midvein which is nowhere evanescent rather persistent up to the apex of the pinnules (where apex of the pinnule is preserved). Lateral veins towards distal part of the pinnules are usually simple and those towards the proximal region are mostly once forked (single dichotomy), but not as rule. Rarely a lateral vein forks twice (double dichotomy; (see Text-fig. 2 A-B; Pl. 1, figs. 3, 4, 5, 6, 7). Therefore, the two



Text-fig. 1—*Santhalea banshiensis* Maithy, a portion of pinnae showing persistent midvein and dichotomy of lateral veins into two, three or four veinlets in the pinnules. B. S. I. P. specimen no. 35573. x 2.



Text-fig. 2A-B. Figured holotype of *Leleopteris raniganjensis* Srivastava & Chandra (B. S. I. P. specimen no. 35978), redrawn to show the persistent midvein and lateral veins with simple as well as single and double dichotomy, now transferred to *Santhalea* Maithy. x 4.

criteria, i. e. midvein evanescent towards apex of pinnule and lateral veins dichotomising only once, taken as criterion by Srivastava and Chandra (1982) for the institution of new genus *Leleopteris* does not hold good concerning the type species of the genus. In all its available features, this specimen resembles in its morphology totally to *Santhalea bansloiensis* earlier described by Maithy (1977). As such *Leleopteris raniganjensis* Srivastava and Chandra (1982) is synonymous to *Santhalea bansloiensis* Maithy. Pant and Misra (1933) have transferred *Santhalea bansloiensis* Maithy (1977) to *Dichotomopteris* Maithy considering that the boundaries between the two genera are not sharp enough. However, on the other hand, in the same paper these authors have shown, in their table-1 on page-30, the distinctions between the genus *Asansolia*, *Dichotomopteris asansoloides* and *Santhalea* and thus, accepted their morphological distinctions. Further, in their table-2 on pages 33, 34 while comparing various characters of some Indian Lower Gondwana fern taxa they have used the name *Santhalea bansloiensis* Maithy for this species instead of using the new

combination proposed by them in the text (p. 32) of that paper. Also in the explanation of plate of their specimen they have again used the name *Santhalea bansloiensis* Maithy. From these it appears that these authors were rather confused regarding the generic identity of species.

Our collection also includes a good many specimens of *Santhalea bansloiensis*. *Santhalea* clearly differs from *Dichotomopteris* in the presence of distinct winged rachis, pinnules with persistent midvein up to apex and in having the both simple and forked lateral veins (up to four lateral veinlets). In our opinion these differences are enough to give *Santhalea* a distinct generic status. An up to date list of synonyms of *Santhalea bansloiensis* Maithy are given below :

Genus—*SANTHALEA* Maithy

Santhalea bansloiensis Maithy

- 1977 *Santhalea bansloiensis* Maithy, p.98, pl.2, figs. 3-6; text-figs. 2a-C.
 1982 *Leleopteris raniganjensis* Srivastava & Chandra, p. 99, pl. 1, figs. 3, 4; text-fig. 2.
 1983 *Dichotomopteris bansloiensis* (Maithy) Pant & Misra, p.32, pl. 3, fig. 9.

In the generic diagnosis of *Leleopteris* Srivastava & Chandra, characters of both sterile and fertile frond have been given, though, the genotype is only a sterile one. As such the generic diagnosis is ambiguous. Moreover, as pointed earlier that the genotype of *Leleopteris* is synonymous to *Santhalea*. Therefore, the problem remains with the placement of two other species of *Leleopteris*, viz., *L. ovata* (Maithy) n. comb. Srivastava & Chandra and *L. srivastavae* (Maithy) n. comb. Srivastava & Chandra. Both the forms concur with the generic circumscription of *Dichotomopteris*, therefore, they should be placed back again to *Dichotomopteris* Maithy as *D. ovata* and *D. lindleyii* respectively as originally done by Maithy (1977, 1974). Srivastava and Chandra (1982) emphasized that in their specimen of *D. ovata* (which they described as *Leleopteris ovata*), lateral veins are constantly once forked. However, on examination of their figured specimens distinct twice dichotomy of veins have been noted (see Pl. 1, figs. 5, 6, 7). However, Pant and Misra (1983) have also described *D. ovata* in which the lateral veins of pinnules show both single as well as double dichotomies (see Pant & Misra, 1983; pl. 5, figs. 18-22; text-figs. 2B-D; printed upside down). As such a fresh list of the synonyms of two species of *Dichotomopteris* is essential which are listed below:

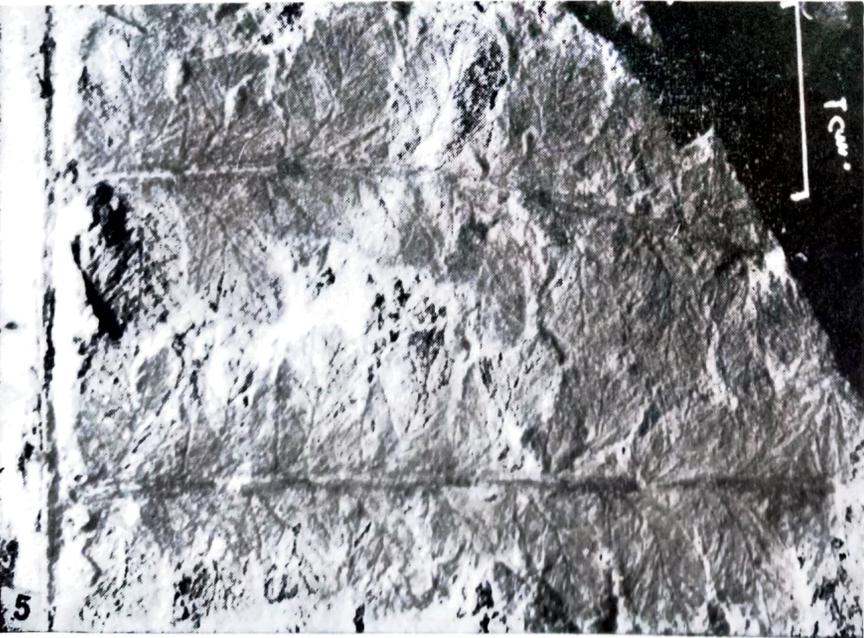
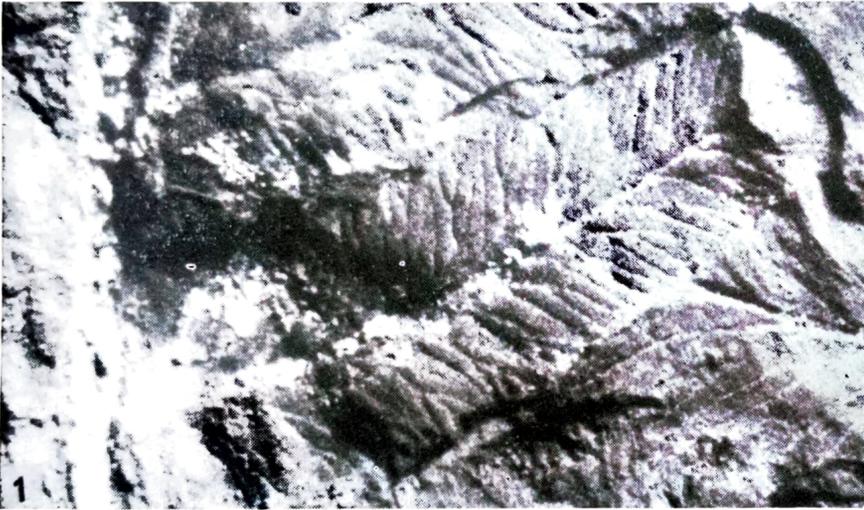
Genus—*DICHOTOMOPTERIS* Maithy, 1974

Dichotomopteris ovata Maithy, 1974

- 1960 *Merianopteris* sp. Archangelsky & Sota, p. 118, pl. 4, fig. 19; text-figs. 74-75.
 1977 *Dichotomopteris ovata* Maithy, p. 99, pl. 2, fig. 7, text-fig. 3.
 1982 *Leleopteris ovata* Srivastava & Chandra, p. 99, pl. 1, figs. 1, 2; text-fig. 1.
 1983 *Dichotomopteris ovata* Pant & Misra, p. 325, pl. 5, figs. 18-22; text-figs. 2B-D.

Dichotomopteris lindleyii (Royle) Maithy, 1974

- 1883 *Pecopteris lindleyana* Royle, p. 29, pl. 2, fig. 4.
 1850 *Pecopteris lindleyana* McClelland, p. 56, pl. 13, figs. 10a-c.
 1876a *Pecopteris lindleyana* Feistmantel, p. 76.



- 1876b *Alethopteris lindleyana* Feistmantel, p. 360, pl. 20, fig. 7.
 1880 *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.
 1902 *Cladophlebis roylia* Arber, p. 548.
 1905 *Cladophlebis roylia* Arber, p. 142, fig. 33a, b.
 1955 ?*Ptychocarpus* sp. Srivastava, p. 71, pl. 1, figs. 4-8; text-fig. 2.
 1964 *Alethopteris lindleyi* Surange, p. 76, figs. 44, 45A-B.
 1964 *Ptychocarpus srivastavae* Surange, p. 72, fig. 41A-C.
 1974 *Dichotomopteris lindleyi* Maithy, p. 366, pl. 1, figs. 5-8.
 1975 *Dichotomopteris lindleyi* Maithy, p. 33; pl. 1, fig. 5; pl. 2, fig. 8.
 1981 *Dichotomopteris lindleyi* I ele, Maithy & Mandal, p. 135, pl. 2, figs. 10-19; pl. 5, figs. 45-46; text-figs. 7, 8.
 1982 *Leleopteris srivastavae* Srivastava & Chandra, p. 101, pl. 1, figs. 5, 6; pl. 2, figs. 12, 13; text-figs. 34-F.

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Explanation of Plate

1. *Santhalea bansloiensis* Maithy (B. S. I. P. specimen no. 32853), A pinnule enlarged to show dichotomy of lateral veins into two, three or four veinlets. x 4.
2. Figured holotype of *Leleopteris raniganjensis* Srivastava & Chandra (B. S. I. P. specimen no. 35978), now transferred here to *Santhalea* Maithy n. comb. x 1.
- 3,4. Portions of pinnae in fig. 2, enlarged to show persistent midvein and double dichotomy of lateral veins in the pinnules (marked by arrow). x 4.
5. *Leleopteris ovata* figured by Srivastava & Chandra (B. S. I. P. specimen no. 35977), specimen now treated as *Dichotomopteris* Maithy, n. comb. x 2.
- 6,7. Pinnules in fig. 5, enlarged to show double dichotomy of lateral veins (marked by arrow). x 4.