First record of gymnosperm wood from the Tertiary sediments of North-east India

R. C. Mehrotra and B. D. Mandaokar

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow-226007, India
E-mail: rcmehrotra@yahoo.com; bdmandokar@yahoo.com

ABSTRACT

Mehrotra R. C. & Mandaokar B. D. 2010. First record of gymnosperm wood from the Tertiary sediments of North-east India. Geophytology 38(1-2): 15-18.

A new species of podocarpaceous fossil wood, *Podocarpoxylon manipurensis*, is described from the Tipam Group (Late Miocene) exposed at a new fossiliferous locality in Manipur, India. This is the first record of a gymnosperm wood from the Tertiary sediments of North-east India.

Key-words: Fossil wood, Podocarpaceae, Late Miocene, Manipur, India.

INTRODUCTION

A large number of fossil woods have been described from North-east India (Sen & Bera 2005, Mehrotra et al. 2005, 2006), but none of them is from Manipur. During a field excursion, one of the authors (BDM) discovered a new fossiliferous locality near Nungba (Lat. 24°45′N: Long. 93°26′E). This locality is situated at a distance of about 80 km from Imphal on Imphal-Jiribam road in the Tamenglong District of Manipur (Text-figure 1A). The fossil wood collected from this locality is a solitary piece of secondary xylem belonging to gymnosperm. The geological section of the locality shows bands of conglomerates, shales, siltstones and sandstones (Text-figure 1B). The fossil wood is found in the sandstone belonging to the Tipam Group (Late Miocene).

MATERIAL AND METHOD

The silicified fossil wood measures 6 cm in length and 5 cm in width. It was sliced into cross, tangential and radial planes with the help of a diamond edged blade. Thin sections were prepared by the usual method of grinding and polishing using different grades of carborundum powder, mounted in canada balsam and studied under high power microscope. The wood is satisfactorily preserved to reveal the structural details. The slides are deposited in the museum of the Birbal Sahni Institute of Palaeobotany, Lucknow, India.

SYSTEMATIC DESCRIPTION

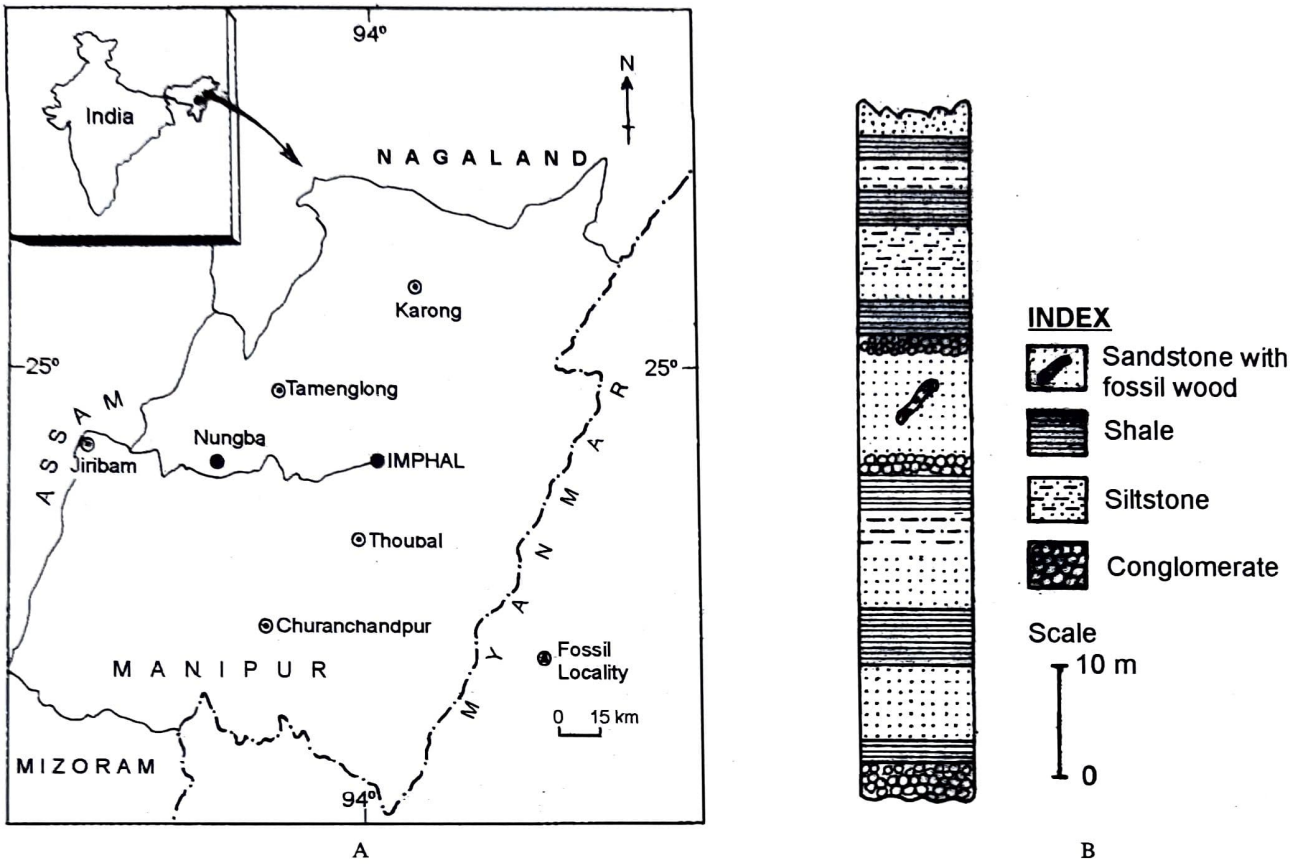
Family: Podocarpaceae

Genus: *Podocarpoxylon* Gothän 1905

Podocarpoxylon manipurensis Mehrotra & Mandaokar, sp. nov.

Plate 1, figures 1-5

Description: Growth-rings present, delimited by narrow zone of dark coloured late wood tracheids, transition from early to late wood abrupt. Late wood narrow, 2-4 cells wide and composed of dark coloured, thick-walled and tangentially flattened tracheids having radial diameter 16-27 μm and tangential diameter 27-44 μm. Early wood zone, comprising major portion of the growth rings, is made up of about 30 cells in width and is composed of large, thin-walled tracheids with big lumen, radial diameter 33-50 μm and tangential diameter 44-60 μm. Pits common on the radial wall of tracheids, bordered, circular to oval in shape with rounded apertures, 8-22 μm in diameter, usually arranged in one row and rarely in two rows, opposite to sub-opposite when biseriate. Parenchyma scanty and difficult to locate in cross section. Xylem rays fine, uniseriate, 22-33 μm in width and 1-9 cells or 55-165



Text-figure 1. A. Map of Manipur showing fossil locality. B. Stratigraphic section of the fossil locality.

μm in height; ray cells thin-walled. Cross-field pits poorly preserved, appearing one in each field, bordered, circular to oval in shape, 11-22 μm in diameter.

Holotype: Specimen No. BSIP 39475.

Locality: Nungba, Tamenglong District, Manipur, India.

Horizon and Age: Tipam Group, Late Miocene.

Etymology: The specific epithet is named after Manipur State from where the fossil wood was collected.

COMPARISON AND DISCUSSION

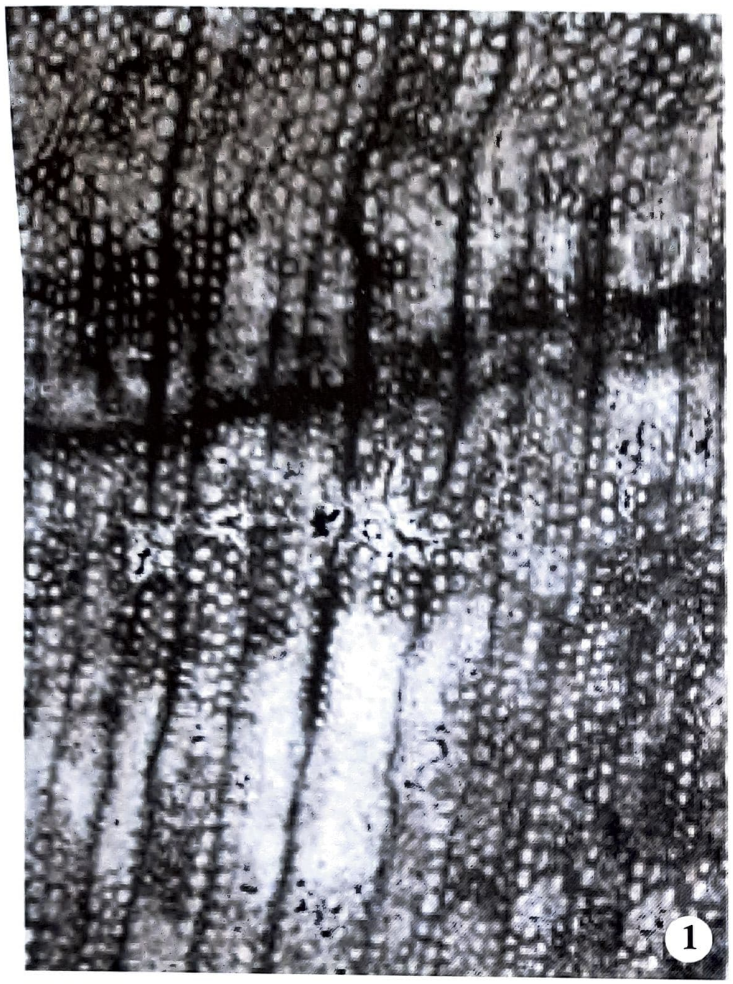
The important characters of the fossil wood, viz. presence of growth-rings, scanty parenchyma, uniseriate xylem rays, bordered tracheid pits with rounded apertures arranged mostly in a single row and solitary cross-field pits, indicate its affinities with Cupressaceae and Podocarpaceae. Of these, the former can be distinguished in having larger amount of parenchyma and in the number of cross-field pits (Greguss 1955, 1972) and therefore the fossil shows maximum resemblance with Podocarpaceae.

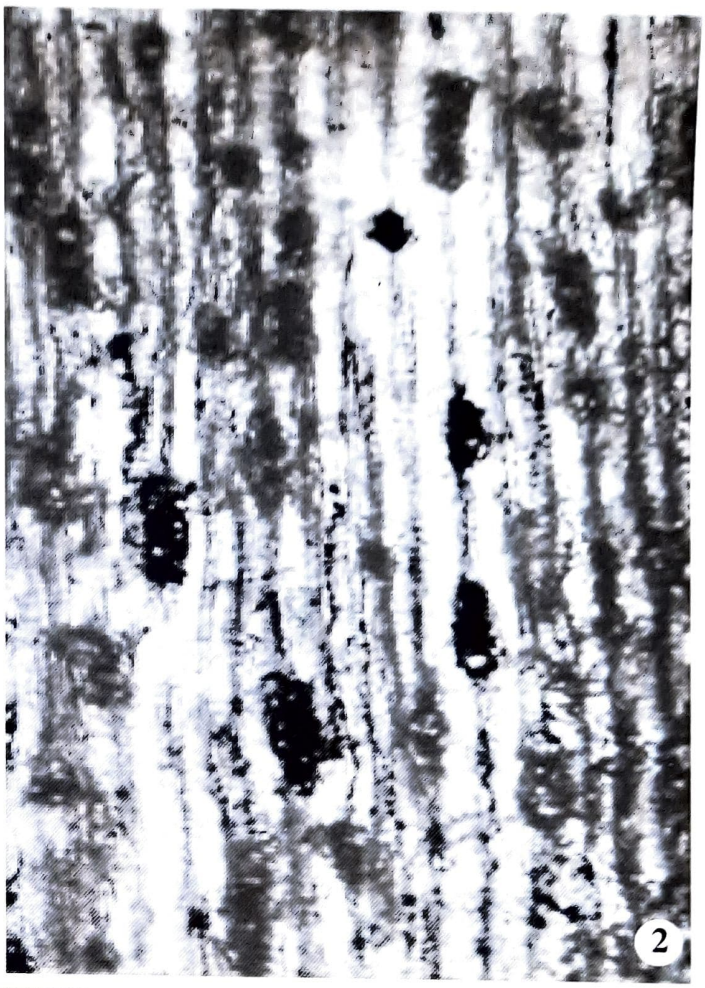
Though a large number of podocarpaceous fossil woods are described under different generic names, such as *Podocarpoxylon* Gothän 1905, *Phyllocladoxylon* Gothän 1905, *Mesembrioxylon* Seward 1919 and *Circoporoxylon* Kräusel 1949, yet the genus *Podocarpoxylon* has been preferred over the other names by Bose and Maheshwari (1974). So far, a number of podocarpaceous fossil woods have been described from various Tertiary sediments of India

→

Plate 1

1-5. *Podocarpoxylon manipurensis* sp. nov. 1. Cross section showing early and late wood tracheids, x40. 2. Tangential longitudinal section showing structure of the xylem rays, x100. 3. Radial longitudinal section showing the cross field, x200. 4. Tangential longitudinal section showing biseriate pits of the tracheids, x250. 5. Tangential longitudinal section showing uniseriate pits of the tracheids, x400.





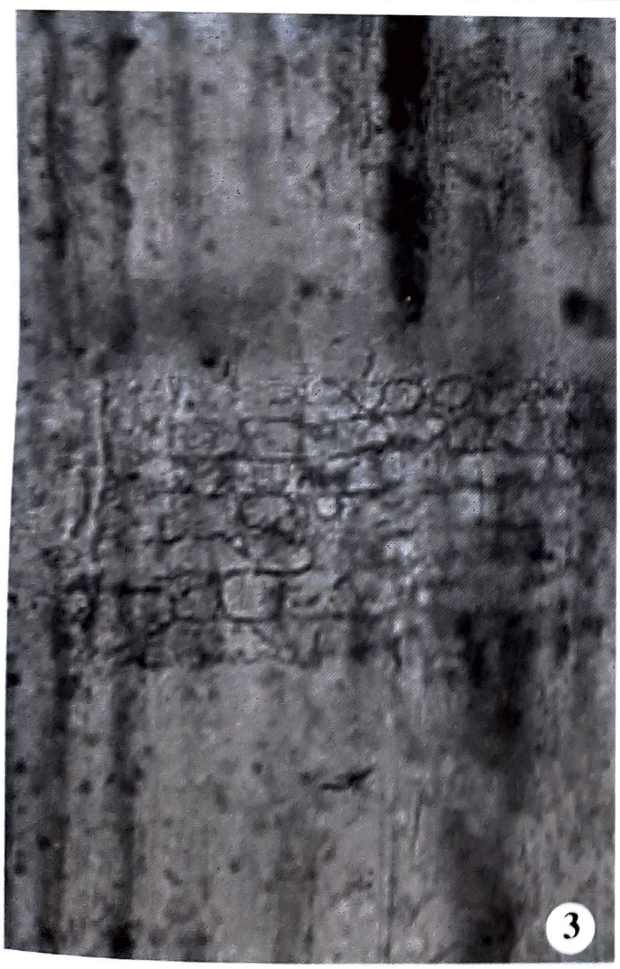


Plate 1

under either *Podocarpoxylon* or *Mesembrioxylon*. These are known from the Deccan Intertrappean beds (Mahabale & Rao 1973, Bande & Prakash 1984, Trivedi & Srivastava 1989), Cuddalore Sandstone-Mio-Pliocene (Kräusel 1949, Ramanujam 1953, 1954, Agashe 1969, Trivedi & Srivastava 1989), ?Oligo-Miocene sediments of Rajahmundry (Mahabale & Satyanarayana 1978) and Neogene of Kutch (Lakhanpal et al. 1975). Trivedi and Srivastava (1989, 1990) transferred most of the Indian species of *Mesembrioxylon* to *Podocarpoxylon* which was instituted by Gothän (1905) for the fossil woods of *Podocarpus* and *Dacrydium*. However, they did not transfer *Mesembrioxylon fusiforme* Sahni (Mahabale & Rao 1973), *M. dudukurense* Mahabale & Rao 1973 and *M. rajmahalense* Jain (Mahabale & Satyanarayana 1978) to *Podocarpoxylon*. One more species, *Podocarpoxylon pantii* Bera & Sen 2004, has been described from the Neogene sediments of West Bengal. The present fossil wood was compared with all the known species and was found quite different from them, especially in having smaller xylem rays. This is the first record of gymnosperm fossil wood from North-east India. The only other gymnosperm fossil known from the Tertiary sediments of North-east India is a leaf described by Awasthi et al. (1992) as *Podocarpus oligocenicus* from the Oligocene sediments of Makum Coalfield, Assam.

ACKNOWLEDGEMENT

The authors are thankful to the Director, Birbal Sahni Institute of Palaeobotany, Lucknow, for providing infrastructure facilities and permission to publish this work.

REFERENCES

Agashe S. N. 1969. Studies on the fossil gymnosperms of India - Part I. A new species of *Mesembrioxylon*, *M. mahabalei* sp. nov. Palaeobotanist 17(3): 312-316.

Awasthi N., Mehrotra R. C. & Lakhanpal R. N. 1992. Occurrence of *Podocarpus* and *Mesua* in the Oligocene sediments of Makum Coalfield, Assam, India. Geophytology 22: 193-198.

Bande M. B. & Prakash U. 1984. A podocarpaceous fossil wood from the Deccan Intertrappean beds of Malabar Hills, Bombay. Geophytology 14(2): 171-178.

Bera S. & Sen I. 2004. *Podocarpoxylon pantii* sp. nov., first record of podocarpaceous wood from the Tertiary sediments of Bengal Basin, eastern India. In: Srivastava P. C. (Editor) - Vistas in Palaeobotany and Plant Morphology: Evolutionary and Environmental Perspectives - Prof. D. D. Pant Memorial Volume, U.P. Offset, Lucknow: 241-248.

Bose M. N. & Maheshwari H. K. 1974. Mesozoic conifers. In: Surange K. R. et al. (Editors) - Aspects and Appraisal of Indian Palaeobotany, Birbal Sahni Institute of Palaeobotany, Lucknow: 212-223.

Gothän W. 1905. Zur Anatomie lebender und fossiler, Gymnospermen Hölzer. Abh. Preuss. Geol. Landesanst 44: 1-108.

Greguss P. 1955. Identification of living gymnosperms on the basis of xylotomy. Akadémiai Kiadó, Budapest.

Greguss P. 1972. Identification of living conifers. Akadémiai Kiadó, Budapest.

Kräusel R. 1949. Die fossilen Koniferen- Hölzer (unter ausschluss von *Araucarioxylon* Kraus) II. Teill Kritische unterschungen Zur diagnostic lebender und fossiler Koniferen- Hölzer. Palaeontographica Abt. B 89: 83-203.

Lakhanpal R. N., Guleria J. S. & Awasthi N. 1975. A podocarpaceous wood from the Pliocene of Kutch. Geophytology 5: 172-177.

Mahabale T. S. & Rao S. V. 1973. Fossil flora of Rajahmundry area. Proc. Symposium Deccan Trap Country, Indian National Science Academy Bulletin 45: 192-214.

Mahabale T. S. & Satyanarayana T. 1978. Fossil flora of Andhra Pradesh (India)-I. Petrified gymnospermous woods from Godavari District. Biovigyanam 4: 55-73.

Mehrotra R. C., Bhattacharyya A. & Shah S. K. 2006. Petrified Neogene woods of Tripura. Palaeobotanist 55(1-3): 67-76.

Mehrotra R. C., Liu Xiu-Qun, Li Cheng-Sen, Wang Yu-Fei & Chauhan M. S. 2005. Comparison of the Tertiary flora of South-west China and North-east India and its significance in the antiquity of the modern Himalayan flora. Rev. Palaeobot. Palynol. 135: 145-163.

Ramanujam C. G. K. 1953. On two species of *Mesembrioxylon* from the vicinity of Pondicherry, South India. Palaeobotanist 2: 101-106.

Ramanujam C. G. K. 1954. On some silicified woods from near Pondicherry, South India. Palaeobotanist 3: 40-50.

Sen I. & Bera S. 2005. Petrified wood remains from the Neogene of Tripura, India. Geophytology 35: 65-73.

Seward A. C. 1919. Fossil Plants - 4. New York, London.

Trivedi B. S. & Srivastava R. 1989. Gymnospermous woods from Early Tertiary of Chhindwara District of Madhya Pradesh. Phytomorphology 39(1): 61-68.

Trivedi B. S. & Srivastava R. 1990. Nomenclatural note on some new combinations in *Araucarioxylon* Kraus and *Podocarpoxylon* Gothän (fossils). Taxon 39(4): 658-659.