A NEW SPECIES OF FOSSIL GYMNOSPERMOUS WOOD *PLANOXYLON* STOPES FROM ADHARI (M.S.)

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ABSTRACT

A coniferous wood collected at Adhari, Dist. Chanda, Maharashtra State, shows combination of characters found in two different families Abietineae and Araucarineae. Its characters agree with those of the genus *Planoxylon* Stopes (1916) but the species seems to be different. It is from the Lower Triassic horizon (Kamthi Stage) of India whereas the species *Planoxylon Hectori* Stopes was from New Zealand belonging to the Cretaceous period.

INTRODUCTION

SEVERAL fossil woods were collected from Adhari (Lat. 20° 8′, Long. 79° 11′) in the District Chanda (Maharashtra State) belonging to the Lower Triassic horizon (Kamthi Stage). Most of them are of conifers and their preservation is good. One of them had mixed characters of the Abietineae and Araucarineae, and it forms the subject matter of this paper.

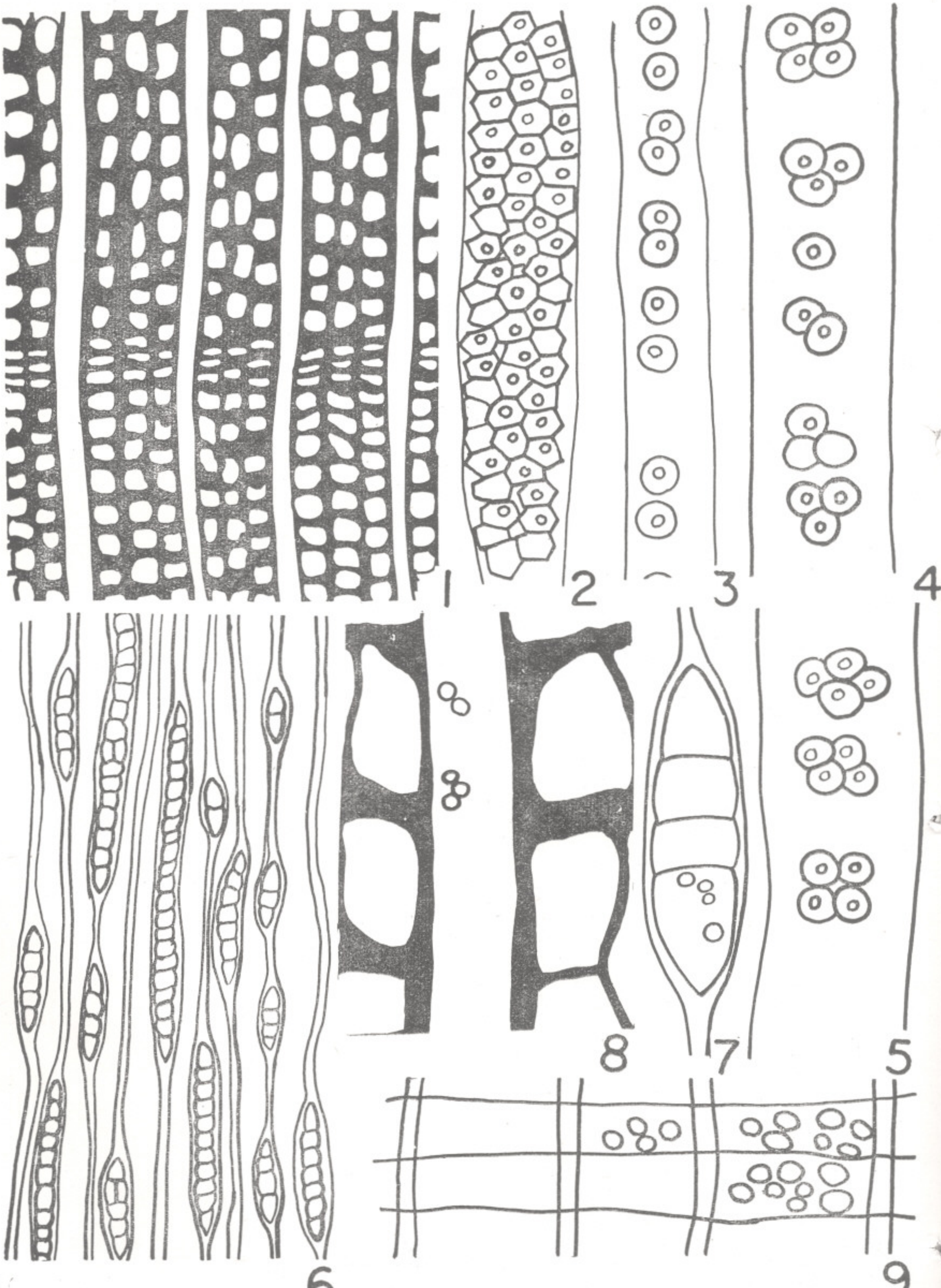
DESCRIPTION

A piece of yellowish-brown silicified coniferous wood measuring 16×12·4 cm was found interesting on account of strong mixture of characters. It is a piece of decorticated secondary wood without pith. The characters noticed in it are as follows: (1) T. S. shows 7-8 growth rings. The secondary xylem was differentiated into spring wood and autumn wood (Text-fig 1; Pl. 1, Fig. 1). The spring wood is 114 cells wide. The tracheids are 48×72 μ, thick-walled, rectangular, with rounded corners and broad lumen. The autumn wood is 2-3 cells wide. The tracheids are 40×16 μ, horizontally stretched and their lumen is small. (2) T. L. S. of the wood shows uniseriate and biseriate medullary rays (Text-fig. 6; Pl. 1, Fig. 6). The uniseriate condition is more predominant than the biseriate. The height of the medullary rays varies from 2-28 cells, average hight being 11 cells (25 counts). The ray-cells are barrel-shaped and measure 48×28 μ. An important feature of the wood is its medullary ray-cells. Pits of the Abietinean type are seen on them (Text-figs. 7,8; Pl. 1, Figs. 7, 8, 9,10). (3) The pits on radial walls of the tracheids are (a) multiseriate hexagonal and alternate (Text-fig. 2, Pl. 1, Fig. 2). They measure 12·4×11 μ. The pit-pore is circular, 4·3 μ in diameter. (b) Uniseriate circular and separate pits (Text-fig. 3; Pl. 1, Fig. 5). (c) Circular pits occur in stellate clusters of 3-4 cells and measure 11 μ (Text-figs. 4, 5; Pl. 1, Figs. 3, 4). These clustered or grouped pits in 3-4 are similar to those in *Cedroxylon transiens* of Gothan. (4) The number of crossfield pits in R. L. S. varies from 4-8. They are circular to oval, 8·1×7 μ. They constitute a special feature of this wood (Text-fig. 9; Pl. 1, Fig. 11).

IDENTIFICATION

The present wood has compressed hexagonal pits as in the Araucarineae and circular separate pits as in the Abietineae. Besides, it has 3-4 circular pits in groups and also Abietinean pits on the medullary ray-cells. This is a distinct feature of this wood. Presumably this wood, like some other Palaeozoic woods, is synthetic and has generalized characters of early gymnosperms, combining characters of different genera. In addition they have some different characters which might have been modified later or were lost. One of such composite generalized wood genera is *Planoxylon* Stopes (1916), as pointed by Bailey (1933). The present specimen closely agrees with that genus and can be seen from the details given in Table 1.

Only two species of the genus *Planoxylon* Stopes (1916) are known (1): *Planoxylon Lindleii* (Witham) Stopes from Upper



TEXT-FIG. 1-9

TABLE 1 — SHOWING THE CHARACTERS OF THE VARIOUS SPECIES OF *PLANOXYLON* STOPES

PART A

NAME OF THE SPECIES	GROWTH RING	RADIAL PITTING	CROSS-FIELD PITS	MEDULLARY RAYS
(1)	(2)	(3)	(4)	(5)
Planoxylon indicum sp. nov.	Very distinct	Uniseriate, circular separate Circular pits in clusters of 3-4. Multiseriate, hexagonal, alternate.	Circular to oval 4-8	Uniseriate, sometimes biseriate, 2-28 cells
Planoxylon Lindleii (Witham) Stopes	Distinct	1-3 rows of alternate hexagonal. Clusters not known	Not known	Uniseriate, 1-12 cells
Planoxylon Hectori Stopes	Very distinct	Uniseriate, circular, separate. Circular pits in clusters of 3-4. 3-Seriate hexagonal alternate.	In vertical pairs of 1-3	Uniseriate rarely biseriate, 1-24 cells

PART B

ABIETINEOUS PITS ON RAY-CELLS			PITH	XYLEM PARENCHYMA	HORIZON	LOCALITY
T.S.	T.L.S.	R.L.S.				
	(6)		(7)	(8)	(9)	(10)
Present	Present	Not seen	Absent	Absent	Lower Triassic (Kamthi Stage)	Adhari (District Chanda), Maharashtra, India.
Not seen	Not seen	Present	Absent	Scanty	Upper Liassic	Whitbi, Yorkshire, England.
Present	Present	Present	Present	Scanty	Cretaceous (Upper or Middle)	Amuri Bluff, New Zealand.

Liassic of England, and (2) *Planoxylon Hector* Stopes from the Cretaceous of New Zealand.

In *Planoxylon Hectori* Stopes there are multiseriate hexagonal alternate pits, uniseriate circular separate pits, and also circular pits in clusters of 3-4. Our wood shows all these characters. In *P. Lindleii* (Witham) Stopes also there are multiseriate, hexagonal, alternate pits. In *P. Hectori* Stopes, the Abeitineous pits are seen on the medullary ray-cells and are seen in T. S. T. L. S. and R. L. S. In the present wood

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TEXT-FIGS. 1-9 — A new species of fossil Gymnospermous wood *Planoxylon indicum* Mahabale & Vagyani from *Adhari* (M.S.). 1. T.S. of wood showing secondary xylem differentiated into spring wood and autumn wood × 143. 2. R.L.S. showing multiseriate, hexagonal, alternate pits × 595. 3. R.L.S. showing uniseriate, circular, separate pits × 595. 4 & 5. R.L.S. showing circular pits in clusters of 3-4 × 595. 6. T.L.S. showing uniseriate and biseriate medullary rays × 143. 7. T.L.S. showing medullary rays with Abietineous pits × 595. 8. T.S. showing medullary rays with Abietineous pits × 595. 9. R.L.S. showing 4-8 circular to oval, field pits × 595.

they are seen only in T. S. and T. L. S. (Text-figs. 7, 8; Pl. 1, Figs. 7, 8, 9 & 10).

In *P. Lindleii* they are seen only in R. L. S. The present wood differs from *P. Hectori* in having 4-8 field pits which are 1-3 in that species. The height of medullary rays in *P. Hectori* is 1-24 and in *P. Lindleii* 1-12. But in the present species it is 2-28. The present species thus though shows resemblance with *P. Hectori*, it is only generically identical with it. It mainly differs from it in having 4-8 field pits and medullary rays 2-28 cells high. Therefore, it seems to be a different species. Besides, it is from a still lower horizon than that of *P. Hectori*. However, it is worthy to note that both of them are from the Mesozoic Southern Hemisphere conifers.

DISCUSSION

In the Mesozoic period one comes across many coniferous woods which show a mixture of Araucarian and Abietinean characters, e.g. *Planoxylon* Stopes, *Protocedroxylon* Gothan, *Protopiceoxylon* Gothan, *Thylloxylon* Gothan, *Araucarionpitys* Jeffrey, *Cedroxylon* Krauss, *Xenoxylon* Gothan, *Anomaloxylon* Gothan, etc. The genus *Planoxylon* Stopes has a wide range within the Mesozoic period from Upper Liassic to Middle Cretaceous and it occurs in both the Southern and Northern Hemispheres. The present wood is from Lower Triassic horizon which is considered to be equivalent to the Middle Gondwanas and belongs to the Kamthi Stage. This shows that the genus *Planoxylon* Stopes evolved from Lower Triassic to Middle or Upper Cretaceous. According to Bailey (1933) these coniferous woods are transitional forms and can be classified as Protopinaceae or Araucariopityeae. Amongst the living gymnosperms they fall within the span of structural variability and relationships of the genera *Cedrus*, *Keteleeria* and a few others such as *Abies*, *Pseudolarix* and *Tsuga*; but they do not definitely belong to any one of them.

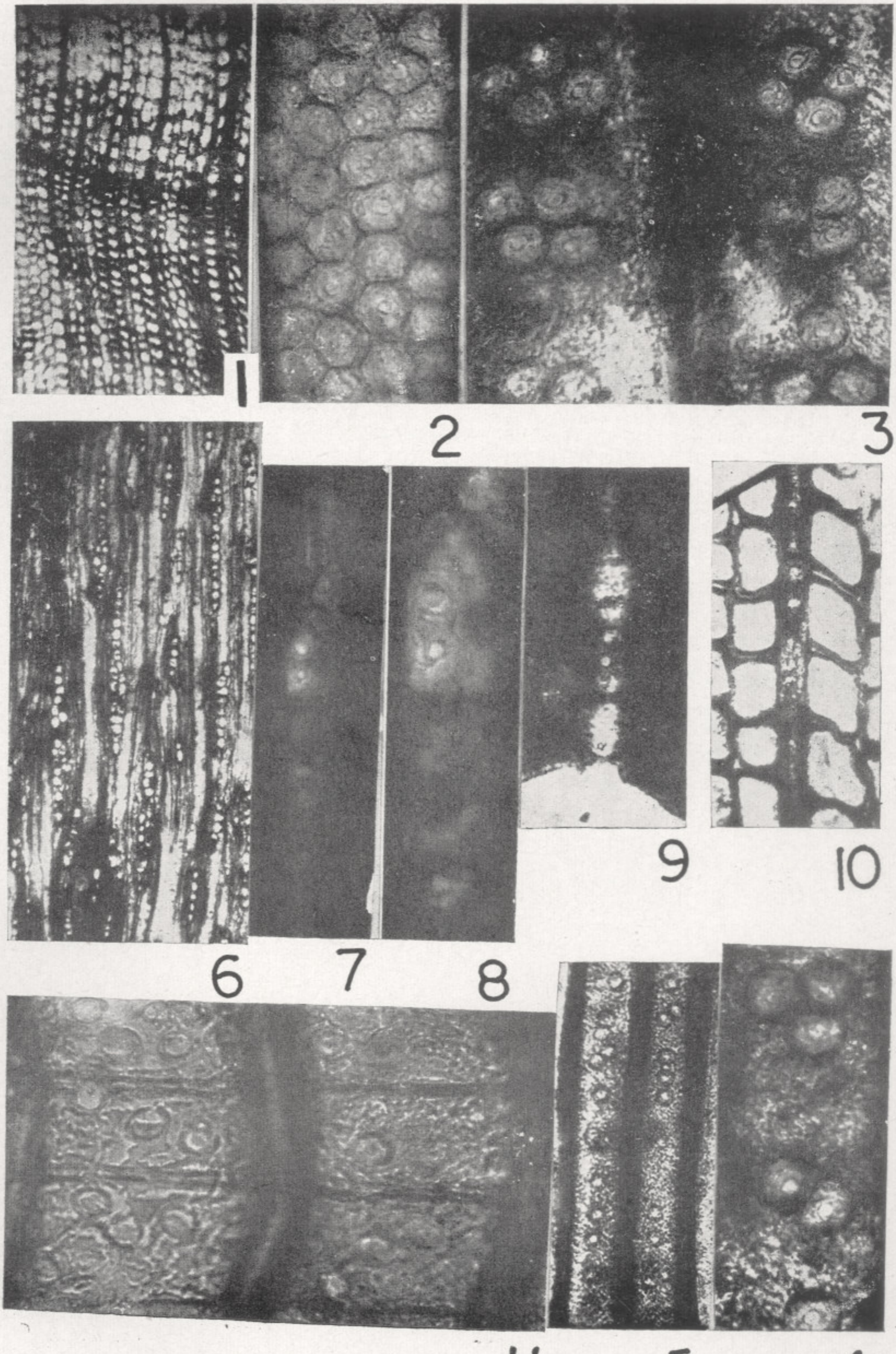
The presence of one species of *Planoxylon*, *P. Lindleii*, in Northern Hemisphere is of rare occurrence; but in the Southern Hemisphere it seems to be more abundant, being known from New Zealand and India. In India besides Adhari, some of the coniferous microfossils from Rewa coal basin studied by Saksena (1963) are having all these types of pits, especially clustered ones, which indicate that even in India the genus was of wider occurrence in the Middle Gondwanas. It is very likely that it might prove to be a characteristic conifer of Mesozoic period when several members of the Pinaceae were not sharply segregated into modern genera such as *Cedrus* or *Abies*; and, therefore, a comparison of these Mesozoic conifers with highly differentiated modern genera would be misleading regarding its affinities.

It is now generally believed that Permian onwards conifers of the Northern and Southern Hemispheres were differentiated not in the same way and in different environmental conditions, and as such they are different. The occurrence of *P. Lindleii* in Liassic of England and of *P. Hectori* in New Zealand and *Planoxylon* described here seems to be similar in distribution to that of *Podocarpus*, majority of which occur in Southern Hemisphere today, but a section of it '*Nageia*' with seven living species had representatives in the Pre-Cretaceous period in Northern Hemisphere in trans-Himalayan region.

That Southern and Northern Mesozoic conifers were different is shown to be so by Meyen (1971) on the basis of leaf impressions, and by Surange (1971) on the basis of his study of the Permian woods. The occurrence of *Planoxylon* in India and New Zealand fully confirms this view, and makes one believe that they were differentiated in entirely different climate, warm in Southern Hemisphere, and cold temperate in Northern Hemisphere. *P. Lindleii* was perhaps growing in warm temperate regions of the Northern Hemisphere. The genus *Planoxylon* seems to have emerged from Triassic, but it got differentiated in Liassic and lasted till Cretaceous. It is very likely that a critical re-examination of many Southern fossil coniferous woods may bring to light some more localities of *Planoxylon* or other similar transitional genera mentioned above.

Planoxylon indicum n. sp.

Diagnosis — Growth rings distinct, 7-8. Secondary xylem differentiated in spring and autumn wood; pith absent. Medullary rays uniseriate and biseriate, mostly uniseriate, 2-28 cells high, average height 11 cells. Abietineous pits present or medullary ray-cells in T. S and T. L. S. Radial


1
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pits uniseriate, circular, separate, and circular pits are in clusters of 3-4; also multiseriate hexagonal pits present. Cross-field pits 4-8, circular to oval.

Holotype — $\frac{ADR}{4/70}$ Museum Botany Department, University of Poona, Poona-7.

Locality — Adhari (Dist. Chanda), Maharashtra State.

Horizon — Lower Triassic (Kamthi Stage), India.

ACKNOWLEDGEMENTS

We are thankful to Dr K. R. Surange for useful suggestions, and one of us (B.A.V.) to Dr M. S. Balakrishnan of the Botany Department, University of Poona, for facilities.

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EXPLANATION OF PLATE

PLATE 1

Figs. 1-11. A new species of fossil gymnospermous wood *Planoxylon* Stopes from *Adhari* (M.S.)

1. T.S. showing secondary wood differentiated into spring wood and autumn wood. × 20.

2. R.L.S. showing multiseriate, hexagonal, alternate pits. × 70.

3-4. R.L.S. showing circular pits in clusters of 3-4. × 70.

5. R.L.S. showing uniseriate, circular, separate pits. × 20.

6. T.L.S. showing uniseriate and biseriate medullary rays. × 15.

7-9. T.L.S. showing medullary ray-cells with Abietineous pits. × 100, 250, 90 respectively.

10. T.S. showing medullary ray-cells with Abietineous pits. × 100.

11. R.L.S. showing 4-8, circular to oval, fielp pits. × 50.