

DISCOVERY OF *LEPIDOSTROBUS* BRONGNIART FROM LOWER GONDWANA FORMATION OF KASHMIR*

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ABSTRACT—The paper records the discovery of *Lepidostrobus* Brongniart, a fossil cone characteristic of Northern Hemisphere, from Lower Gondwanas of Kashmir. A new specific name *Lepidostrobus kashmirensis* sp. nov. is introduced for the cone on the basis of size of complete strobili, its pedunculate nature and narrow acuminate sporophylls.

INTRODUCTION

The genus *Lepidostrobus* Brongniart is so far known mainly from Permian and Carboniferous flora of 'Northern Hemisphere' and a very few specimens from localities of 'Southern Hemisphere' viz., Lower Carboniferous and Permocarbiniferous of South America and Lower Carboniferous of Australia (Surange, 1966, p. 182; White, 1964, p. 68). This is the first record of this genus from Kashmir and it supports the views of many palaeobotanists and geologists like Zalessky (1918), Grabau (1926), Sahni (1936 a, 1936b) etc., regarding the floral affinities and possibilities of land connections of Northern and Southern Hemispheres (i.e., Angara and Gondwana lands).

The specimens of this genus were identified from a large collection of plant fossils made by the second author from tuffaceous shales of Liddar valley, near Pahlgam (34°01' : 75°19' 30"), Anantnag district, Kashmir. The collec-

tion included a large number of new forms which will be published elsewhere. One specimen is a complete cone and the other is only a lateral fragment. Both are having parts and counterparts.

SYSTEMATIC DESCRIPTION

LYCOPODIALES

Genus : *LEPIDOSTROBUS* Brongniart

LEPIDOSTROBUS KASHMIRENSIS sp. nov.

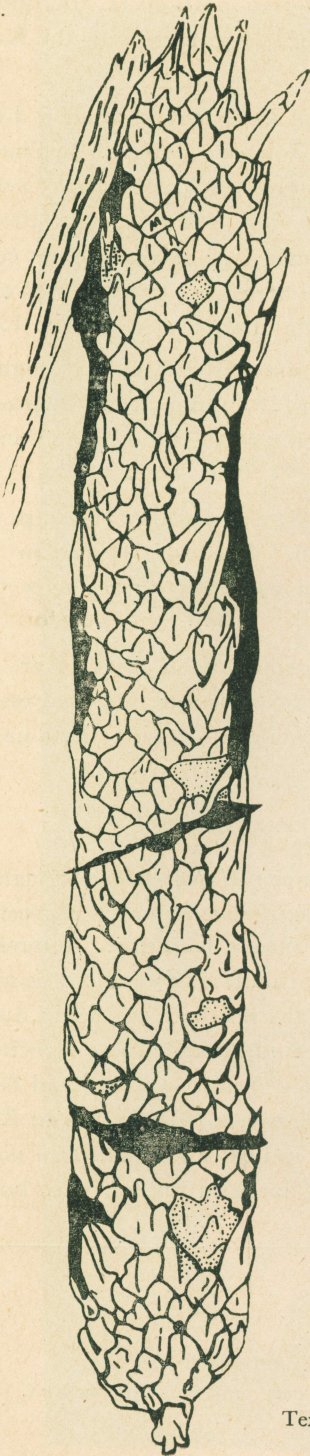
Diagnosis—Cone cylindrical, more than 18 cm long and 2.4 cm wide; width from base to apex almost same; pedunculate; terminal bracts (upturned portions of the sporophylls) more than 1.8 cm long and 0.5 cm broad which end in narrow long spiny apices; keel up to the whole length of the bract.

DESCRIPTION OF THE SPECIMENS

Plate 5 Fig. 1 and Text fig. 1

The specimen is a complete cone, cylind-

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Text Fig. 1.

18.7 cm long, 2.4 cm wide width almost the same from basal to apical ends; pedunculate, peduncle naked, short, 6 mm long, 3 mm wide; central axis not seen; sporophylls spirally arranged, closely placed, overlapping half of the sporophylls on either side and one or more above; attachment of sporophylls with axis not clear; terminal and a few lateral bracts 1.8 cm long and 0.5 cm wide at its maximum width (most of the bracts are broken or not clear), triangular, ending into single long narrow apice; keel well developed which runs the whole length of the bract; ligule and heel not seen.

Holotype :G.S.I. Type No.18171.(The counter part of the specimen is not figured here and have G. S. I. Type No. 18172).

Plate 5 Figs. 2 and 3

The other specimen is a lateral fragmentary part of similar cone with almost the same character, as described for above specimen, though it shows little more clear sporophylls.

Figured specimen: G. S. I. Type No. 18173 and 18174.

REMARKS

The cone is included in *Lepidostrobus* Brongniart, because of its morphological similarities with the specimens of this genus described by Halle (1927, pp. 179-180; plate 49, figs. 3 and 4) from Shansi flora. The characteristic pedunculate nature of the present specimen, is however not known from Shansi. The specimens described by Halle are all incomplete and he has not given any idea about the exact dimensions of the specimens. Halle has not assigned them to any particular species and made only generic identification.

Text-fig.1-*Lepidostrobus kashmirensis* sp.nov. Diagrammatic sketch to show the general shape and structure of the strobili.

Abbott (1963, p. 297) has distinguished the *Lepidostrobus* Brongniart from *Sigillariostrobus* Schimper by the absence of peduncle as one of the characters; the present authors however do not attach much significance to it. In their opinion many of the characters of the two genera are quite distinct and the presence or absence of the peduncle does not make much difference.

Although, about thirty five species of *Lepidostrobus* Brongniart, are described by different workers, a few of them have subsequently been revised by Nemjec (1954). The morphological characters of present form does not tally with the specific characters of known species, as such a new specific name is given to the present cone, which is also the first record from India. The name of the species is given after Kashmir State where it was collected from the Lower Gondwana.

A few cones of this genus recorded from other parts differ in one way or the other from presently described species. Thus, *Lepidostrobus variabilis* Lindley and Hutton from British Lower Coal Measures (Lindley and Hutton, 1831-33, Plate II) is distinguished from *Lepidostrobus kashmirensis* in having slightly shorter bracts which are not so acuminate. Pedunculate nature of the former is also not known.

A few other specimens of *Lepidostrobus variabilis* Lindley and Hutton (Zeiller, 1886, p. 499, Plate 76, fig. 34) later included in *Lepidostrobus squarrosus* Kidstoni (Nemjec, 1954,

pp. 11, 23) have free portions of sporophylls much declined aside, uncommon in the Kashmir species.

A specimen of *Lepidostrobus variabilis* Lindley and Hutton (Zalessky, 1904, p. 40; Plate 6, fig. 7) later included in *Lepidostrobus ornatus* (Brongniart) (Nemjec, 1954, p. 12), though similar in the dimensions as the present cone, differs in having narrow sporophylls with their free ends upward and adpressed (*ibid* p. 17).

Lepidostrobus ornatus (Parkinson) Brongniart (Nemjec, 1954, p. 19) differs from the present species in size, being shorter and having smaller sporophylls.

Lepidostrobus kidstoni Zalessky (1909, p. 104; Nemjec, 1954, pp. 23, 25) is bigger in size with shorter and narrower sporophylls than the present cone.

From above comparison, it is clear that the present species can be differentiated on the basis of size of strobili, its pedunculate nature and narrow acuminate sporophylls.

CONCLUSIONS

The occurrence of *Lepidostrobus* Brongniart in association with *Glossopteris* and *Gangamopteris* in Lower Gondwanas of Kashmir, is interesting because of the fact that it is supposed to be mainly restricted to the northern continent during the Palaeozoic period, though a few specimens have been recorded from Australia and South America. The presence of this genus in Kashmir Gondwanas indicates the mixing of northern and southern floras on the northern border

EXPLANATION OF PLATE 5

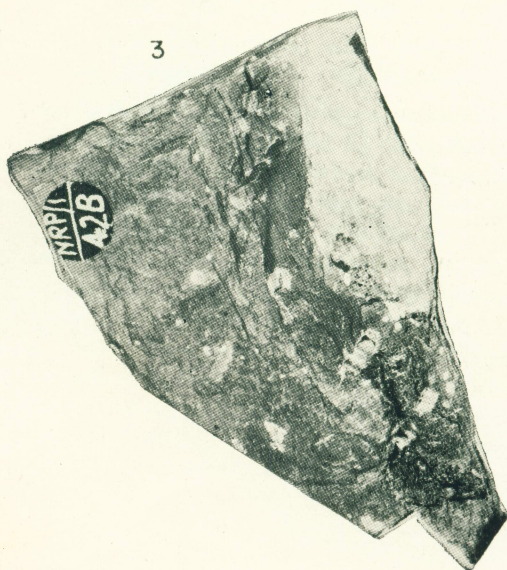
1. *Lepidostrobus kashmirensis* sp. nov. Holotypè. G.S.I. Type No. 18171. (Natural size)
- 2 and 3. Lateral fragmentary part of *Lepidostrobus kashmerensis* sp. nov. Both part and counter part. G.S.I. Type Nos. 18173 and 18174 (Natural size).



1



2



3

of Gondwanaland. It favours the possibility of some land connections between Angaraland and Gondwanaland, as considered by earlier workers (Sahni, 1936a, 1936b; Wadia, 1938) through which this genus might have migrated; though possibility of migration of spores from north through water of Tethys or by wind is not ruled out.

In the east, the genus is known from Shansi flora (Halle, 1927, p. 180) with which the Kashmir species resembles in the shape of strobili. Halle considered that the Shansi species belonged to *Lepidodendron oculus felis* (Abbado) Zeiller, which occurs in the same bed where *Lepidostrobus* is found and is the only determinable species of the *Lepidodendron* in Shihotse Series (Central Shansi, China). However, from Pahlgam (Kashmir) not a single specimen of this genus has been found, in fact *Lepidodendron* is not even known in the Peninsular Gondwanas of India. Its occurrence has, however been reported from other areas of Gondwanas viz. Australia, South Africa, Brazil (Krishnan, 1954, pp. 9-12).

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