PODOSTROBUS GEN. NOV., A PETRIFIED PODOCARPACEOUS MALE CONE FROM THE RAJMAHAL HILLS, INDIA

A. R. RAO

Department of Botany, Bangalore University, Bangalore

&

M. N. BOSE

Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

Podostrobus gen. nov. is based on the specimens previously described as *Masculostrobus rajmahalensis*, *M. podocarpoides* and *M. sahnii*. The microsporangia in these cones are with bi- or trisaccate pollen grains.

INTRODUCTION

THE genus *Masculostrobus* was instituted by Seward (1911) for some cone incrustations of suspected gymnospermous affinity. His diagnosis did not include the structure of the pollen grains as they were not isolated then. Recently, Barnard (1968) re-examined the original specimens of *Masculostrobus* and other of its kind and was able to recover from the cones non-saccate grains. In view of this it is implied that the genus *Masculostrobus*, should connote non-saccate grains borne on gymnosperm-like cones. Other types of cones also referable to gymnosperms but containing grains with bi- or tri-saccate grains cannot naturally be referred to the genus *Masculostrobus*, although it has been done so in various cases till recently (Grauvogel-Stamm, 1969). Barnard himself has suggested that the five cones from the southern hemisphere originally referred to *Masculostrobus* should be placed under the genus *Pityanthus* (Nathorst) Seward (1919). We are not inclined to agree with this view, although we do feel that the various species of *Masculostrobus* described from the Jurassic of India can no longer be known by that name. This has also been suggested by Grauvogel-Stamm (1969). *Pityanthus* implies an abietinean affinity which is not clearly in evidence in our Indian species. Besides, the Abietineae were unknown in the Jurassic of the southern hemisphere, on the other hand it is abundantly clear (Florin, 1940 and Rao, 1953) that the petrified male cones from the Indian Jurassic strata with their two- or three-winged grains are more likely podocarpaceous. It is well known that this family of conifers evolved and differentiated in the southern hemisphere. Except for a few species, most of the living members of this family are also mostly confined to the southern hemisphere. In view of these we regard *Pityanthus* as unsuitable for our Indian petrified cones. We propose this new generic name *Podostrobus* for cones bearing microsporangia with bi- or tri-saccate pollen grains and with evident podocarpaceous affinity. In this connection we re-examined the slides and specimens of the Indian cones which were originally placed under *Masculostrobus*. These studies form the subject matter of this paper.

The following two species of *Podostrobus* are recognized from India and one from East Antarctica (Townrow, 1967):

1. Species from Nipania, Rajmahal Hills, India.

P. rajmahalensis (Rao) comb. nov.

P. sahnii (Vishnu-Mittre) comb. nov.

2. Species from Carapace Nunatak, E. Antarctica.

P. warrenii (Townrow) comb. nov.

DESCRIPTION

Genus — *Podostrobus* nov.

Diagnosis — Microstrobilus (podocarpaceous) comprising sporophylls in a close spiral; distally sporophylls upturned and overlapping. Sporangia placed on abaxial side, bearing bi- or tri-saccate pollen grains.

Type species — Masculostrobus rajmahalensis Rao (1943, p. 123; Pl. 5, Fig. 25) — Sl. No. K24/16.

Podostrobus rajmahalensis (Rao) comb. nov.

Pl. 1, Figs. 1-8

1938 — *Masculostrobus rajmahalensis* Rao, p. 152.
1940 — *Masculostrobus rajmahalensis* Rao, p. 204.
1943 — *Masculostrobus rajmahalensis* Rao, p. 127, pl. 5, figs. 25-27; pl. 6, figs. 28-37.
1953 — *Masculostrobus rajmahalensis* Rao, p. 26.
1957 — *Masculostrobus rajmahalensis* Rao : Vishnu-Mittre, p. 83, text-figs. 1-2.
1957 — *Masculostrobus podocarpoides* Vishnu-Mittre, p. 83, pl. 1, figs. 1-2; text-figs. 3-4.
1957 — *Masculostrobus* sp. : Vishnu-Mittre, p. 84, pl. 1, fig. 3.
1963 — *Masculostrobus rajmahalensis* Rao: Sitholey, p. 46, pl. 13, figs. 93-93a.
1963 — *Masculostrobus podocarpoides* Vishnu-Mittre : Sitholey, p. 46, pl. 13, figs. 91-92.
1969 — *Masculostrobus podocarpoides* Vishnu-Mittre : Randhawa et al, pl. 51, fig. 3.

Diagnosis — Microstrobilus about 3·5-7 mm. long and 1·5-2 mm. wide at widest part. Axis slender, traversed by a few vascular bundles, each bundle composed of scalariform tracheids. Sporophylls closely set, spirally arranged; distal parts of sporophylls attenuated, upturned and overlapping those above. Each sporophyll supplied with a vascular bundle arising from the axis. Sporangia abaxially placed, broadly ovoid, measuring 400-750 × 350-500 μ, thin-walled. Pollen grains bisaccate, 54-60 × 30-40 μ, diploxylonoid, bilaterally symmetrical. Central body distinct, ovoid, intramicroreticulate. Proximal attachment of sacci to central body equatorial, distal attachment sub-equatorial. Sacci hemispherical, intrareticulate.

Holotype — K.24/16 of the Geological Survey of India, Calcutta.

Locality — Nipania, Rajmahal Hills, Bihar.

Age and Horizon — Upper Jurassic; Rajmahal Series.

Podostrobus sahnii (Vishnu-Mittre) comb. nov.

Pl. 1, Figs. 9-14

1956 — *Masculostrobus sahnii* Vishnu-Mittre, p. 99, pl. 1, figs. 1, 4, 6-15.
1o63 — *Masculostrobus sahnii* Vishnu-Mittre: Sitholey, p. 46.
1967 — Male cone of *Nipanioruha granthia* emend. Vishnu-Mittre: Randhawa et al, pl. 51, fig. 7.

Diagnosis — Elongate oblong microstrobilus, 4·5-7 × 1·5-3·5 mm. Axis slender, vascular bundles made up of scalariform tracheids. Sporophylls in close spiral; distal part of each sporophyll upturned and overlapping. Sporangia thin-walled, abaxially placed, broadly ovoid, 600-965 × 400-480 μ. Pollen grains mostly 2-3 saccate, rarely 4-saccate. Occasionally wings fused at their roots (often various stages of fusion met with), forming a sort of rim or fringe round central body. Central body subcircular, distinct, intramicroreticulate. Proximal attachment of sacci to central body equatorial, distal attachment subequatorial. Sacci ± equal in size, less than hemisphere, intrareticulate.

Holotype — Slide No. 187 of the Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality — Nipania, Rajmahal Hills, Bihar.

Age and Horizon — Upper Jurassic; Rajmahal Series.

Remarks — Out of the two species described above, *P. sahnii* (Vishnu- Mittre) is rather rare. Except for the nature of pollen grains, they resemble each other in most of the characters. In *P. rajmahalensis* (Rao) the pollen grains are bisaccate, whereas, in *P. sahnii* (Vishnu-Mittre) they are mostly bi- or tri-saccate. Three of the specimens of *Masculostrobus sahnii* originally figured by Vishnu-Mittre (1956, figs. 2, 3 & 5) do not show any well preserved pollen grains as such they have not been considered here for description.

REFERENCES

Barnard, P. D. W. (1968). A new species of *Masculostrobus* Seward producing *Classopollis* pollen from the Jurassic of Iran. *J. Linn. Soc.* (Bot.). **61**(384): 167-176.

Florin, R. (1940). The Tertiary fossil conifers of South Chile and their phytogeographical significance. With a review of the fossil conifers of southern lands. *K. svenska Vetensk-Akad. Handl.* **19**(2): 1-107.

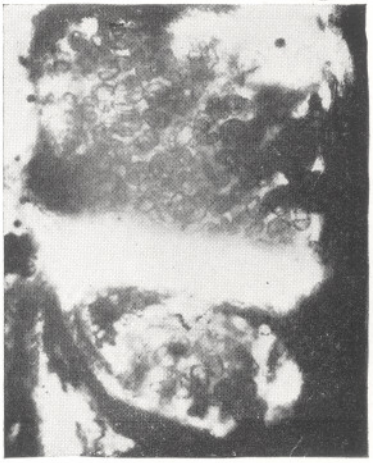
Grauvogel-Stamm, L. (1969). Nouveux types d'organs reproducteurs mâles de coniferes du grès à *Voltzia* (Trias Inférieur) des Vosges.


1


2

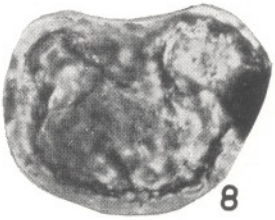

3


4


5


6

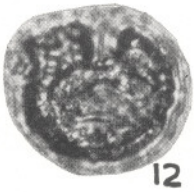

7

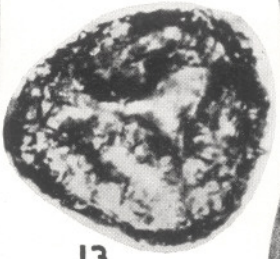

8

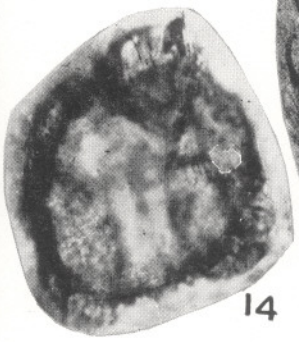

9


10


11


12


13


14

Bull. Serv. Carte géol. Als. Lorr. **22**(2): 93-120.

RANDHAWA et al. (1969). Evolution of life. *Publ. Inf. Directorate New Delhi.*: I-xxviii + 1-360.

RAO, A. R. (1938). Two petrified strobili from the Rajmahal Hills, Bihar. *Proc. 25th. Indian Sci. Congr. Calcutta*: 151-152.

Idem (1940). Palaeobotany in India. *J. Indian bot. Soc.* **18**(4-6): 201-208.

Idem (1943). *Nipaniostrobus*, a new genus of *Dacrydium*-like seed-bearing cones, and other silicified plants from the Rajmahal Series. *Proc. natn. Acad. Sci. India.* **13**(2): 113-133.

RAO, A. R. (1943). Jurassic spores and sporangia from the Rajmahal Hills, Bihar. *Proc. natn. Acad. Sci. India.* **13**(3): 181-197.

Idem (1953). Some observations on the Rajmahal flora. *Palaeobotanist.* **2**: 25-28.

SEWARD, A. C. (1911). The Jurassic flora of Sutherland. *Trans. R. Soc. Edinb.* **47**(643-709).

Idem (1919). Fossil plants. Vol. IV. Ginkgoales, Coniferales, Gnetales: I-XVI + 543.

SITHOLEY, R. V. (1963). Gymnosperms of India-1. Fossil Forms. *Bull. natn. bot. Gdns. Lucknow.* **86**: 1-78.

TOWNROW, John A. (1967). Fossil plants from Allan and Carapace Nunataks, and from the Upper Mill and Shackleton glaciers, Antarctica. *N. Z. Jl. Geol. & Geophys.* **10**(2): 456-473.

VISHNU-MITTRE (1956). *Masculostrobus sahnii* sp. nov., a petrified conifer male cone producing three-winged and one- and four-winged abnormal pollen grains from the Jurassic of the Rajmahal Hills, Bihar. *Grana palynol.* (N.S.). **1**(2): 99-107.

Idem (1957). Studies on the fossil flora of Nipania (Rajmahal Series), Bihar — Coniferales. *Palaeobotanist.* **6**: 82-112.

EXPLANATION OF PLATES

1-8. *Podostrobus rajmahalensis* (Rao) comb. nov.; fig. 1, sl. no. 774, × 5; fig. 2, sl. no. 5, × 5; fig. 3, sl. no. 191, × 5; fig. 4, holotype — slide no. K24/16, × 27; fig. 5, showing a few pollen grains from the holotype, × 55; figs. 6-8, three pollen grains magnified — figs. 6-7, sl. no. K24/16, × 530, fig. 8, sl. no. 774, ×500.

9-14. *Podostrobus sahnii* (Vishnu-Mittre) comb. nov.; fig. 9, sl. no. 190, × 15; fig. 10, holotype — sl. no. 187, × 15; figs. 11-14, four pollen grains magnified — figs. 11-12, sl. no. 187, × 500; fig. 13, showing three wings fused at their roots, sl. no. 187, × 850; fig. 14, sl. no. 187, × 850.