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FOSSIL PLANTS FROM SARNU HILL FORMATION, BARMER BASIN, RAJASTHAN

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ABSTRACT

A few fossil plants have been described here for the first time from the Sarnu Hill Formation, Barmer Basin. These are *Phlebopteris athgarhensis*, *Ptilophyllum acutifolium* and ?*Sphenopteris* sp. The age of the formation has also been discussed.

Key-words — Fossil plants, Sarnu Hill Formation, Barmer Basin, Rajasthan (India).

साराँश

सारनु गिरि शैल समूह, बाड़मेर बेसिन, राजस्थान से पादपाश्म – सुभेन्दु कुमार बक्सी एवं प्रनब नसकर

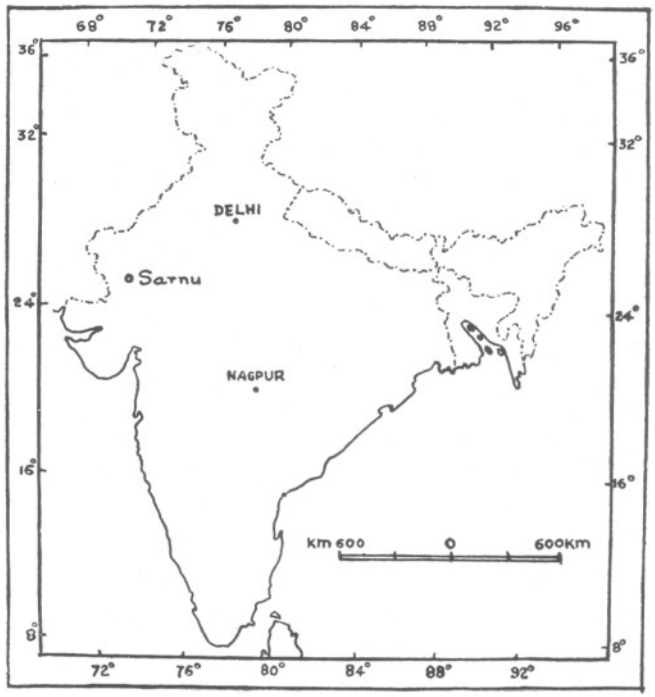
सारनु गिरि शैल-समूह, बाड़मेर बेसिन, से प्राप्त कुछ पादपाश्मों का यहाँ पहली बार वर्णन किया गया है। ये फ़्लीबाप्टेरिस अथगढ़ेन्सिस, टाइलोफिलम् ऍक्यूटिफोलियम् तथा स्फीनॉप्टेरिस हैं। इस शैल-समूह की आयु का विवेचन भी किया गया है।

INTRODUCTION

A survey of the published papers reveals that both Blanford (1877) and La-Touche (1911) have correlated the sandstone hills outcropping near Sarnu Village on the basis of lithology and field relationship. Blanford (1877) and La-Touche (1911) and later also Bose (1952) just recorded the occurrence of fragmentary ill-preserved dicotyledonous leaves from Barmer (proper) outcrops without giving any description and illustration. But none of them mentioned the occurrence of fossil plants from the Sarnu Village outcrops (Text-fig. 1). Das Gupta (1975) just names these rocks of Sarnu as Sarnu Hill Formation in his regional rock-stratigraphic correlation chert (p. 93) and assigned a Lower Cretaceous age for the formation. On the basis of both fossil plant assemblages and lithology, the authors also assign the Sarnu Hill rocks the rank of ' formation ', which is completely different from and older than the Barmer Formation occurring in Barmer proper and beyond towards north.

The Sarnu Hill Formation is exposed in the hills adjacent to the Sarnu Village (25° 42' 10": 71° 46' 45"), 45 km South-east of Barmer town, the administrative head-quarter of Barmer District, Rajasthan. The exposed thickness of the formation is about 100 ft and is an orthoquartzitic type of sandstone — siltstone sequence with inter-bedded highly ferrugenous thick shale. The base of the formation is nowhere seen although at places, the basic intrusives seem to underlie this formation sending offshoots into the formation in the form of sills and dykes.

The plant bearing bed is about 45 cm thick, occupying the top of the hills. All the fossils recovered are preserved as impressions in dove-white fine sandstone — siltstone sequence. Some of the impressions are partly coloured red, probably due to the leaching of iron. The fragmentary leaves constitute the fossil remains of the bed.



MAP 1

No plant microfossil could be recovered from such a highly bleached lithology.

DESCRIPTION

FAMILY — MATONIACEAE

Genus — *Phlebopteris* Brongniart

Phlebopteris athgarhensis Jain

Pl. 1, figs 1a, 1b, 1c, 2a, 2b, 3

Fronds fragmentary, pinnae detached, available maximum length 7 cm. Pinnae rachis stout, 0·15 cm in diameter. Pinnules falcate, attached to the rachis by their entire base, about 0·2 cm or less wide. Bases mostly decurrent, alternately or sub-oppositely disposed. Pinnae 0·19-3 × 0·2 cm in size. Margin entire, apex slightly rounded, sometimes acute. Midrib prominent, 0·05 cm in diameter, persisting up to apex. Lateral veins inclined more or less at an angle of 45° with the midrib, dichotomizing, forked 1-3 times, lateral anastomoses seen mostly at base and apex. Fertile pinnae similar to sterile ones, possessing 12-20 sori in each row on either side of the midrib; sori circular, 0·08-0·1 cm in diameter, sporangia 5-7 in numbers per sorus.

Locality — Sarnu Hill, Barmer Basin, Rajasthan.

Figured Specimens — S-P_3/PN, S-P_{3a}/PN, S-P_2/PN, S-P_7/PN.

FAMILY — BENNETTITALES

Genus — *Ptilophyllum* Morris

Ptilophyllum acutifolium Morris

Pl. 1, figs 1a, 1b, 4

Fragmentary pinnate frond with prominent rachis. Fronds are of varying size, the largest being about 7 cm long. Pinnae attached on the upper surface of the rachis, arising at low angle (30°), alternate, occasionally sub-opposite, closely set, sometimes

imbricate. Rachis 0·15 cm in diameter. Pinnae about 1·5-2 cm long and 0·4 cm wide, linear, obtusely acuminate apex. Veins diverging sub-parallel, arising from entire base, 12-14 in numbers, forked near the margin.

Locality — Sarnu Hill, Barmer Basin, Rajasthan.

Figured Specimens — S-P_3/PN, S-P_{1a}/PN.

INCERTAE SEDIS

Genus — Sphenopteris Brongniart

? *Sphenopteris* sp.

Pl. 1, fig. 5a, 5b

Detached fragmentary pinnate fronds (?bipinnate). Pinnules varying in size, measuring about 0·4-0·5 cm in length, arising at acute angle from the rachis. Rachis 0·05 cm broad. Pinnules elongated and margins dissected unequally into 5-6 well-formed lobes. Lobes broadly rounded. Margins are entire. Venation moderately well-defined. There is nothing like a midrib, instead a single vein arises at the base and once forked in each lobe.

Locality — Sarnu Hill, Barmer Basin, Rajasthan.

Figured Specimens — S-P_4/PN, S-P_{4a}/PN.

Discussion — The megafloral assemblage of Sarnu Hill Formation, so far obtained from the area, comprises species belonging to the family Matoniaceae and Bennettitales, and are represented by *Phlebopteris athgarhensis* and *Ptilophyllum acutifolium* respectively. A doubtful form has also been recorded as ? *Sagenopteris*. This is the result of limited palaeobotanical work on this formation.

The present megafloral assemblage compares closely with the known megafloral assemblage from the Athgarh beds, near Ghantikhel Village of East Coast, India (Jain, 1967). Jain (1967) assigned an Upper Jurassic age for the Athgarh beds. This floral assemblage also compares partly with the Pariwar Formation floral assemblage of Jaisalmer District, Rajasthan. Maheshwari and Singh (1974) concluded that this assemblage is more akin to that known from the Kutch Basin of Gujarat and is probably of Upper Jurassic age. Das Gupta *et al.* (1975), on the other hand, showed that their megafloral assemblage from Pariwar Formation shows affinity with the flora of Rajmahal ' Series '. But Signal and Singh (1966) and Das Gupta (1975) assigned a Lower Cretaceous (Neocomian) age of the Pariwar Formation on the basis of foraminiferal assemblage and subsurface stratigraphical correlation respectively.

The work of Bose and Sukh-Dev (1959), Sukh-Dev (1961) and Sukh-Dev (1970) in Bansa, Chandia and surrounding areas of Madhya Pradesh and the work of Roy (1968) in Kutch and Kathiawar show the presence of two common elements with the study area except the presence of characteristic Wealden elements, viz., *Weichselia reticulata*, *Onichiopsis psilotoides* and *Onichiopsis paradoxus*.

So far, with limited search, the diagnostic Lower Cretaceous elements mentioned above are not yet encountered in this flora which obviously weakens the assignment of a Lower Cretaceous age for the formation for the time being. But it should be admitted at the same time that their apparent absence from the flora does not also rule out the possibility of a Lower Cretaceous age for the formation. A reverse case might be cited here to elucidate this point. For example, Raghavapuram Mudstone of East Coast Gondwanas is decidedly Lower Cretaceous in age on the basis of rich animal fossils such as ammonites, foraminifers and fish remains (Bhalla, 1965; Baksi, 1966, 1967, 1972). It is also rich in plant fossils containing a host of so-called Rajmahal-Jabalpur elements but except those two diagnostic Wealden ones (Baksi, 1968). Furthermore, in the same area and the surrounding ones, definite Lower Cretaceous mioflora has been reported from the subcrop sediments (Venkatachala & Jain, 1970; Venkatachala *et al.*, 1972). So, here the absence of the characteristic Wealden elements from this Raghavapuram Mudstone does not minimise the weightage of a Lower Cretaceous age for this formation. In this context of argument, it may be surmised that Sarnu Hill Formation may be anything in the age interval of Upper Jurassic-Lower Cretaceous. While discussing the age of Raghavapuram Mudstone based on plant fossils, Baksi (1968, p. 213) rightly pointed out that the absence of these characteristic Wealden elements in Indian fossil flora is more a case of inadequate search or a

chance finding than actual absence of them. It is quite well known that the occurrence of *Weichselia reticulata*, *Onichiopsis psilotoides* and *O. paradoxus* are not prolific in any of the Indian localities so far reported. Moreover, they are small in size. So careful searches in future might prove their presence in this formation. The authors failed to recover any microfossil from this formation so far, which could have thrown some light on the age problem.

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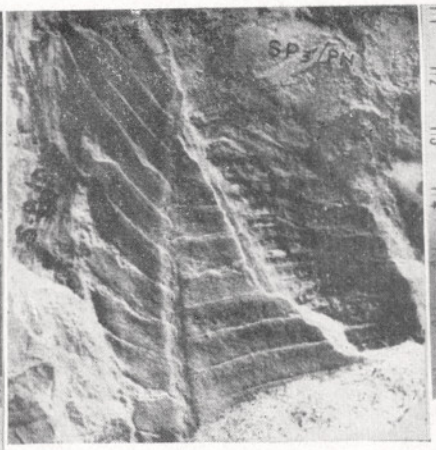
EXPLANATION OF PLATE

PLATE 1

1a. *Phlebopteris athgarhensis* Jain. × 0.65, S-P_{3a}/S-P'_3/PN. *Ptilophyllum acutifolium* Morris ×0.65, S-P_3/PN.
1b. *P. athgarhensis* Jain. × 1.05, S-P'_3/PN. *P. acutifolium* Morris. × 1.05, S-P_3/PN.
1c. *P. athgarhensis* Jain. × 1.0, S-P_{3a}/PN.
2a. *P. athgarhensis* Jain. × 0·8, S-P_2/PN.
2b. Same as above. × 1.1.
3. *P. athgarhensis* Jain. × 0·65, S-P_7/PN.
4. *P. acutifolium* Morris. × 1.2, S-P_{1a}/PN.
5a. *Sphenopteris* sp. × 0.9, S-P_4/PN, S-P_{4a}/PN.
5b. *S.* sp. × 4.0, S-P_{4a}/PN.

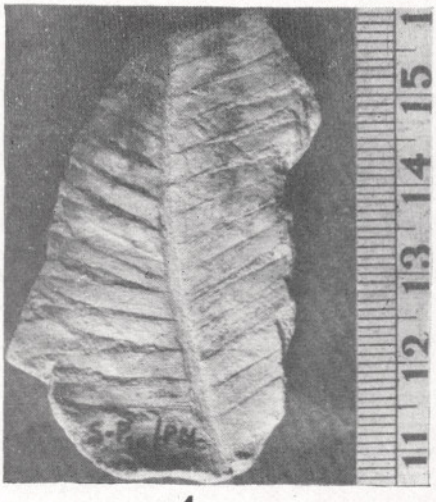
1 a



1 b

2 a

1 c



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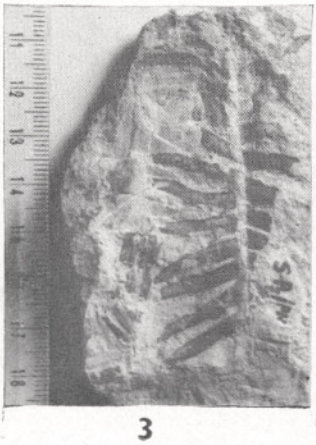
2 b



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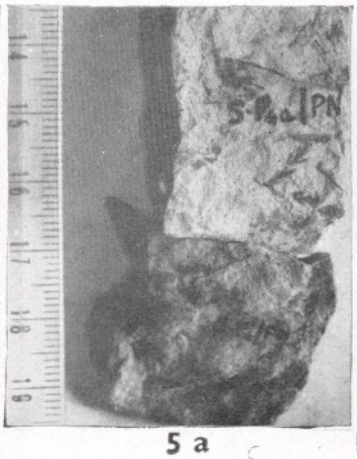

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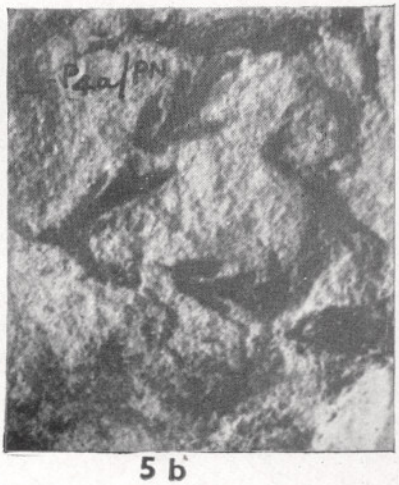

5 b

PLATE 1