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PHLEBOPTERIS MINUTIFOLIUS SP. NOV. FROM THE BHUJ FORMATION OF KACHCHH, INDIA

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ABSTRACT

A new species of the genus *Phlebopteris*, viz., *P. minutifolius* is reported from Walkamota, District Kachchh, Gujarat. Both sterile and fertile fronds have been described. The sori have yielded trilete spores having laevigate exine.

Key-words — *Phlebopteris*, Sterile and fertile fronds, Trilete spores, Bhuj Formation, Lower Cretaceous (India).

सारांश

भारत में कच्छ के भुज शैल-समूह से फ्लेबॉप्टेरिस माइन्यूटिफ़ोलियस नव जाति – जयश्री बैनर्जी

गुजरात के कच्छ जनपद में वल्कामोटा से फ्लेबॉप्टेरिस प्रजाति की एक नव जाति – फ्ले० माइन्यूटिफ़ोलियस – अभिलिखित की गई है। बन्ध्य एवं अबन्ध्य दोनों ही प्रकार के प्रपर्णों का वर्णन किया गया है। बीजाणुधानीयों से चिकने बाह्यचोल वाले त्रिअरीय बीजाणु प्राप्त हुए हैं।

INTRODUCTION

ONLY a few species of the genus *Phlebopteris* have so far been reported from the Jurassic-Lower Cretaceous formations of India. These are *P. athgarhensis* Jain (1968) described from a hill about 1.6 km south-south-east of Ghantekhal Village, Cuttack District, Orissa, *P. polypodioides* Brongniart from Marwar Ghat about 0.8 km NE and about 0.4 km NNW of Bansa, Patparha and Tekan, Shahdol District, Madhya Pradesh; Songad, Surendranagar District, Gujarat (Sukh-Dev, 1970), *Phlebopteris* sp. from Chunakhal, Santhal Parganas, Bihar (Bose & Sah, 1968) and *Phlebopteris* sp. from east of Habur Village, Jaisalmer District, Rajasthan (Maheshwari & Singh, 1976). In none of those species details of sporangia and spores are known.

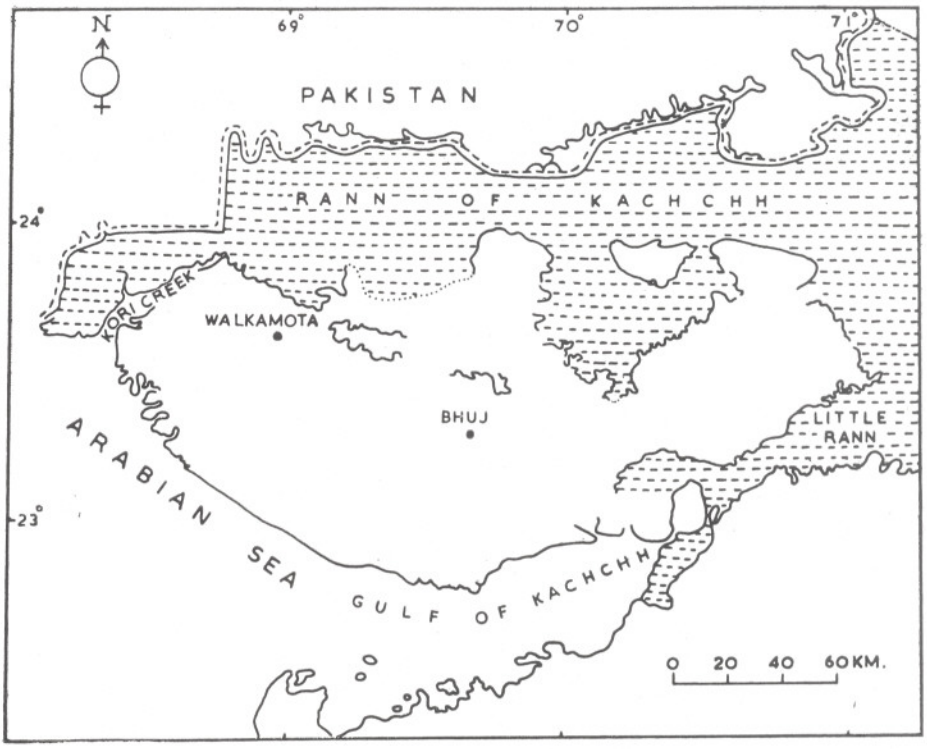
Recently a few specimens of *Phlebopteris* have been collected from shale dumps lying around a freshly dug out well, about 1 km east of the village Walkamota (Text-fig. 1), District Kachchh (formerly spelt as Cutch). In the fertile specimens both sporangia and spores are well-preserved. From one specimen small pieces of cuticle could also be obtained from the rachis.

DESCRIPTION

Phlebopteris minutifolius sp. nov.

Pl. 1, figs 1-11; Text-fig. 2A-H

Diagnosis (*based on isolated pinnae*) — Pinnules small, sub-opposite, falcate, attached at an angle of about 45°-50° by entire base. Margins entire. Apex acute or subacute. Midrib prominent, lateral veins arising at narrow angles and forming elongated meshes along midrib, veins from corners of these meshes further branching and occasionally joining each other. Fertile pinnules having 4 sori, 2 each on either side of midrib. Each sorus having 7 or 8 sporangia attached to central receptacle, annulus of sporangium vertical. Spores triangular or subtriangular in equatorial view, 38-50 μm, trilete; exine laevigate, about 1 μm thick, slightly more thickened around trilete rays.



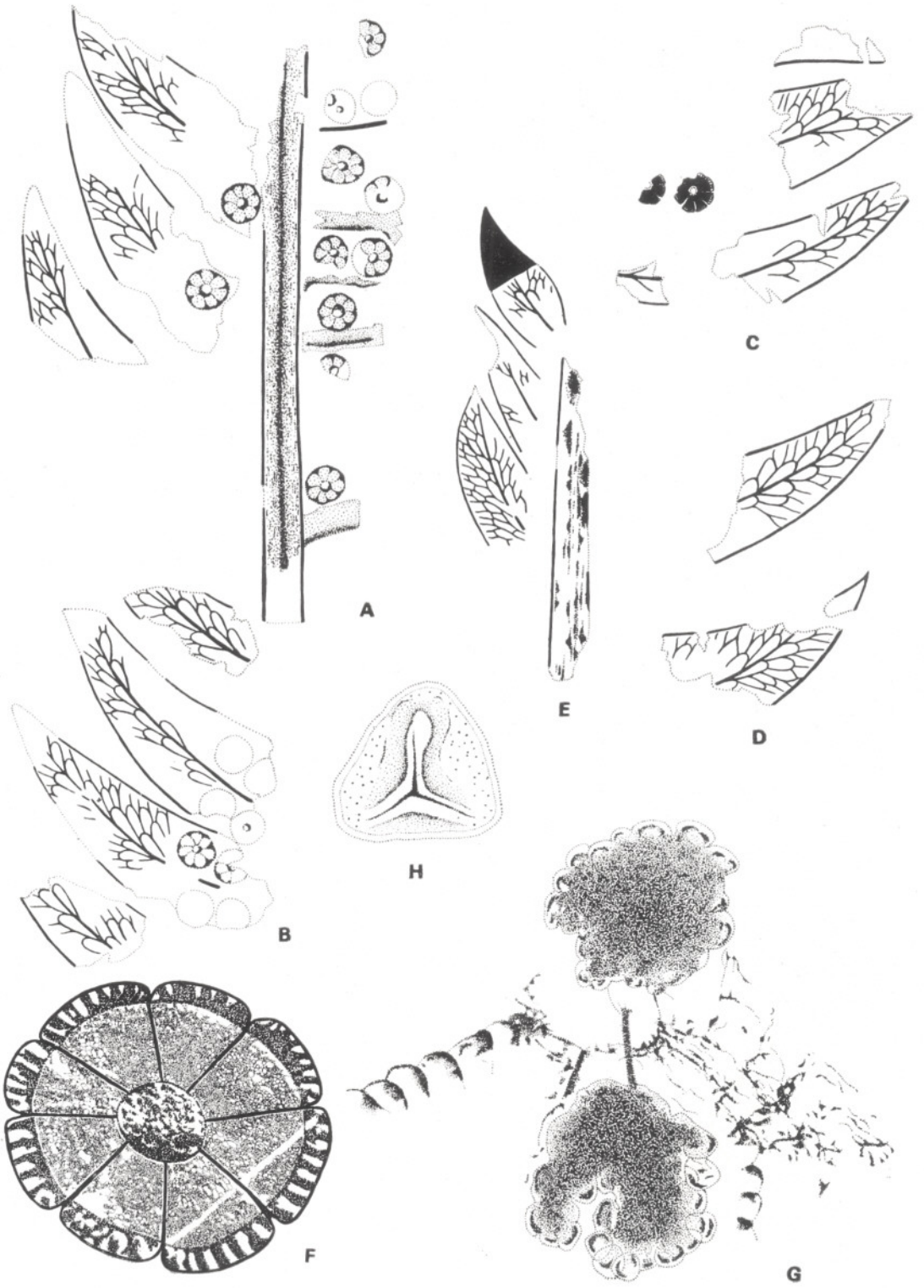
TEXT-FIG. 1 — Map showing the Walkamota locality in Kachchh.

Holotype — B.S.I.P. Specimen no. 35409.
Locality — Walkamota, Kachchh District, Gujarat.
Horizon & Age— Bhuj Formation (Biswas, 1977); Lower Cretaceous.
Description — The description is based on a few incomplete pinnae. Largest available specimen 2.3 cm long and 1.5 cm broad. Rachis 1 mm wide, marked with a distinct median groove. Pinnules sub-oppositely arranged, falcate, 5-7 × 2.5-3 mm in size, broader at base, gradually tapering to an acute or subacute apex, attached to rachis by entire base at an angle of about 45°-50°. Margin entire. Midrib prominent, extending up to apex, lateral veins arising at an angle of 30°-35°, usually at a distance of 1 mm, after emergence lateral veins bifurcating and anastomosing to form large elongated meshes along the midrib, veins from these meshes again branching and joining to form few more meshes towards margin, sometimes in the apical portion of pinnules veins merely forked, 3 or 4 veins per mm occurring at the margin.

Epidermal cells of rachis rectangular, elongate, lateral walls straight or slightly wavy, end walls straight or oblique; surface smooth.

Fertile pinnules bearing a single row of two sori on either side of midrib. Sori circular, 1 mm in diameter, almost covering the entire basal portion of the lower surface of pinnules, attachment of sorus indistinct. Sporangia 7-8, radially arranged around a central receptacle, seem to be sessile, about 0.5 mm long and 0.3 mm broad with a distinct vertical annulus; receptacle in surface view, circular, 0.2 mm in diameter; indusium absent.

Each sorus on maceration released 8 spore-masses, conforming with the number of sporangia. Each sporangium has about 64 trilete spores. Spore-amb triangular to subtriangular, size 38-50 μm, trilete distinct, rays usually extending up to 3/4th of spore radius; exine laevigate, about 1 μm thick, nearer trilete rays slightly more thickened; folds also present in the interradial region.



TEXT-FIG. 2

Comparison — *Phlebopteris minutifolius* differs from all the known Indian species of the genus in having smaller pinnules, in its venation pattern and by the number of sporangia per sorus. *P. athgarhensis* Jain (1968) has falcate pinnules, but can be readily distinguished from *P. minutifolius* by its larger pinnules, narrow meshes and greater number of sori. Specimens of *P. polypodioides* Brongniart described by Harris (1961) and Sukh-Dev (1970) show similarity in falcate nature of pinnules but differ in their larger size, the presence of web connections between pinnules, the venation pattern and in having larger number of sori. The spores of *P. polypodioides* Brongniart described by Harris (1961) have laevigate exine with thickening along the trilete mark similar to *P. minutifolius*.

P. hirsuta and *P. indica* described from Salt Range by Sahni and Sitholey (1945) resemble *P. minutifolius* in size and falcate nature of the pinnules. However, *P. hirsuta* differs in having ramental hairs and spores with more thickened exine at the apices. In *P. indica*, in contrast to *P. minutifolius*, lateral veins are once forked, each sorus has fewer number of sporangia and spore wall is more thickened at the apices. *P. indica* seems to be rather closer to *Matonidium cingulatum* described by Zeba-Bano and Bose (1981) from Trambau, Kachchh District.

P. minutifolius somewhat resembles *P. woodwardi* Leckenby, described by Harris (1961), in the presence of meshes and number of sporangia per sorus, but pinnules in the former species are much smaller in size and have lesser number of sori. Spores of *P. minutifolius* resemble the dispersed spores of Matoniaceae recently described by Juhasz (1979) from Lower-Middle Cretaceous sediments of Hungary as *Phlebopterisporites equiexinus* (Couper, 1958) Juhasz and *P. harskutensis* Juhasz in having uniformly thickened laevigate exine and frequent occurrence of torus.

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REFERENCES

BISWAS, S. K. (1977). Mesozoic rock-stratigraphy of Kutch, Gujarat. *Q. Jl geol. Min. metall. Soc. India*, **49** (3-4): 1-52.

BOSE, M. N. & SAH, S. C. D. (1968). Some pteridophytic remains from the Rajmahal Hills, Bihar. *Palaeobotanist*, **16** (1): 12-28.

HARRIS, T. M. (1961). *The Yorkshire Jurassic flora I — Thallophyta-Pteridophyta*, Brit. Mus. (nat. Hist.), London.

JAIN, K. P. (1968). Some plant remains from the Upper Gondwana of East Coast, India. *Palaeobotanist*, **16** (2): 151-155.

JUHASZ, M. (1979). Dispersed Matoniaceae spores from the Hungarian Lower and Middle Cretaceous sediments. *Acta Biol., Szeged*, **25** (1-2): 33-47.

MAHESHWARI, H. K. & SINGH, N. P. (1976). On some plant fossils from the Pariwar Formation, Jaisalmer Basin, Rajasthan. *Palaeobotanist*, **23** (3): 116-123.

ROY, S. K. (1968). Pteridophytic remains from Kutch and Kathiawar, India. *Palaeobotanist*, **16** (2): 108-114.

SAHNI, B. & SITHOLEY, R. V. (1945). Some Mesozoic ferns from the Salt Range, Punjab. *Proc. natn. Acad. Sci. India*, **15** (3): 61-73.

SUKH-DEV (1970). Some ferns from the Lower Cretaceous of Madhya Pradesh. *Palaeobotanist*, **18** (2): 197-207.

ZEBA-BANO & BOSE, M. N. (1981). *Matonidium cingulatum* n. sp. from Kutch, India. *Palaeobotanist*, **27** (1): 227-231.

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TEXT-FIG. 2 — **A**, *Phlebopteris minutifolius* sp. nov., holotype showing venation pattern of pinnules and sori, B.S.I.P. specimen no. 35409, × 7. **B**, counter part of the holotype, B.S.I.P. specimen no. 35410, × 7. **C**, specimen showing venation pattern and sori with distinct annulus of sporangia, B.S.I.P. specimen no. 35411, × 7. **D**, pinnule showing apex and venation pattern, B.S.I.P. specimen no. 35412, × 7. **E**, sterile frond, B.S.I.P. specimen no. 35413, × 6. **F**, detached sorus from holotype, showing 8 sporangia attached to the central receptacle, × 50. **G**, spore masses released from sporangia on maceration, × 100. **H**, triangular trilete spore isolated from spore masses showing distinct interradial thickening, B.S.I.P. slide no. 6444, × 500.

EXPLANATION OF PLATE

Phlebopteris minutifolius sp. nov.

1, 2. 1, Holotype showing fertile frond, B.S.I.P. specimen no. 35409.× 2. 2, same specimen.× 6.

3, 4. 3, Sterile frond showing shape and venation pattern of pinnules, B.S.I.P. specimen no. 35414. × 1. 4, same specimen.× 4.

5. Pinnule showing basal sorus, B.S.I.P. specimen no. 35411.× 6.

6. Pinnule showing venation pattern, B.S.I.P. specimen no. 35412.× 6.

7. Single sorus showing 8 sporangia with distinct annulus.× 50.

8-11. Trilete spores showing laevigate exine, slide nos. 6444 and 6445.× 500.


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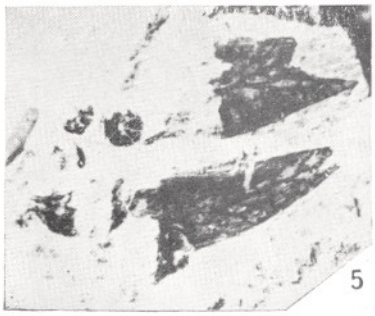
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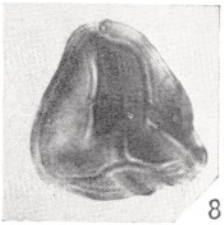
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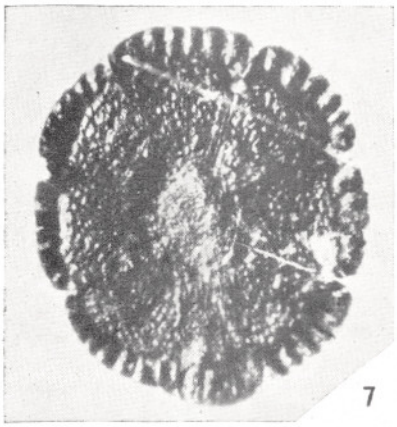
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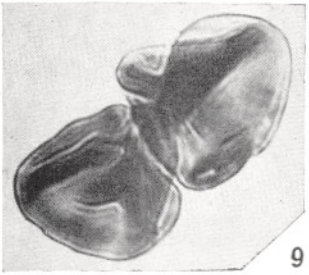
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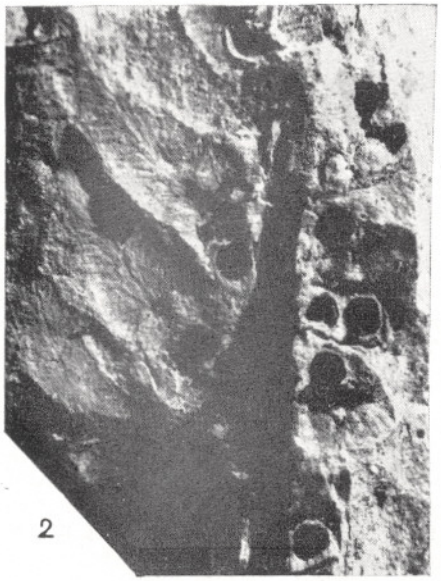
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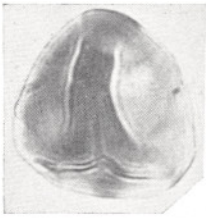
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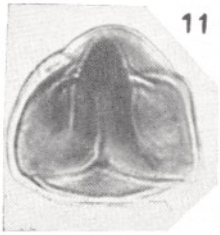
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PLATE 1