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Glossopteris shailae, a new fossil leaf from Upper Permian (Raniganj Formation) of India

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A new species of *Glossopteris*, i.e. *G. Shailae* is reported from the Kumarpur Sandstone (Raniganj Formation), West Bengal. Morphologically the leaf is characterised by an evanescent midrib. The cuticular structure of the leaf is also different from those of known species of the genus *Glossopteris*.

Key-words—Morphology, Fossil leaf, *Glossopteris*, Upper Permian (India)

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सारांश

भारत के उपरि परमी कल्प (रानीगंज शैल-समूह) से एक नवीन अश्मित पत्ती, ग्लॉसॉप्टेरिस शैली

ऊषा बाजपेयी

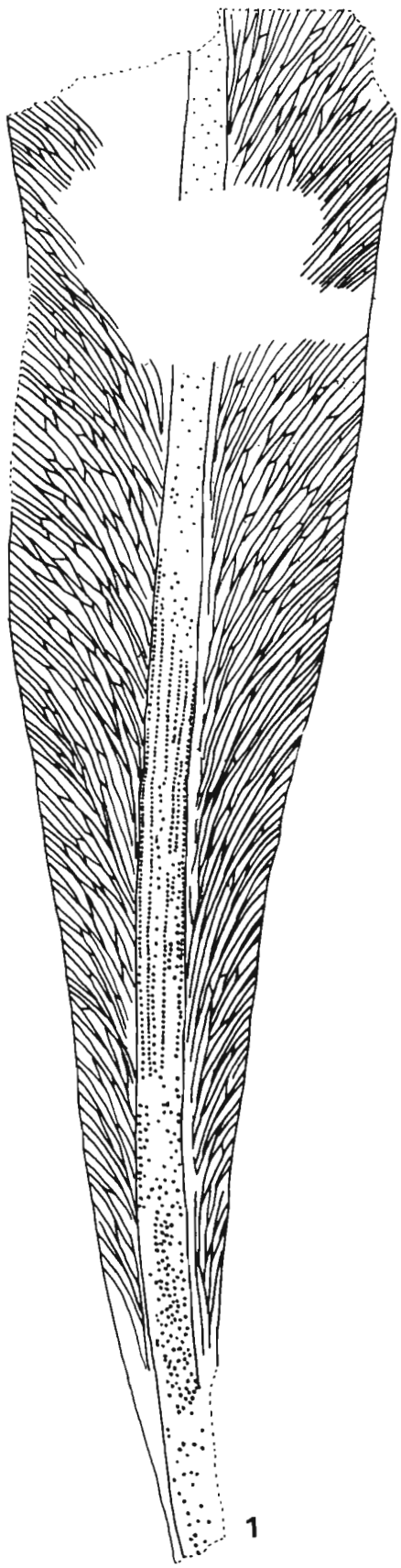
पश्चिम बंगाल में कुमारपुर बालुकाश्म (रानीगंज शैल-समूह) से ग्लॉसॉप्टेरिस की एक नव जाति, ग्लॉ० शैली वर्णित की गई है। आकारिकीय दृष्टि से यह पत्ती शीघ्रलोपी मध्यशिरा से अभिलक्षणित है। ग्लॉसॉप्टेरिस प्रजाति की अन्य ज्ञात जातियों से इस पत्ती की उपत्वचीय संरचना भी भिन्न पाई गई है।

THE Kumarpur Sandstone Member, the highest lithological unit of the Raniganj Formation, is very poor in shales and coal. Only one coal seam is reported from the base of this member. This seam outcrops in the Nonia Nala Section about 200 m upstream from the Technical College Bridge. A few pits have been dug here by local people to take out coal. The coal seam contains fragments of limonitic wood while the overlying grey shale contains an almost pure assemblage of leaves belonging to a *Glossopteris* species. Many of the specimens have a satisfactorily preserved carbonified crust. These leaves form the subject matter of this paper.

Material comprises more than 100 leaf compressions on a grey carbonaceous shale. The carbonified crust was processed by the usual nitric acid potassium hydroxide method for cuticles. For comparison and identification of the species, all available literature on *Glossopteris* leaves from the Raniganj Formation was consulted, particularly Feistmantel (1880), Arber (1905), Srivastava (1957), Maheshwari (1965), Pant and Gupta (1968, 1971) and Chandra and Surange (1971).

DESCRIPTION

More than 100 specimens referable to this species were collected from the Kumarpur Sandstone Member. However, most of the specimens are incomplete, though almost all have a carbonified crust preserved. For detailed investigation, therefore, only a dozen complete or almost complete specimens were selected, both for morphographical and epidermal studies. The leaves are simple, lanceolate to broad-lanceolate in shape, being widest in the middle region and tapering both towards the base and the apex. The apices of the leaves are obtuse or broadly rounded and the bases are attenuate; there being no sign of a petiole. The leaf margins are entire. The complete leaves measure 7-15 cm in length and 2-4 cm in width at the widest. A flat, 0.1-0.4 cm wide midrib runs through the leaf for about 2/3rd of its length and gradually becomes evanescent in the upper 1/3rd part. The midrib is characterised by longitudinally running striations the space between which in the lower half is dotted with more or less circular depressions. The



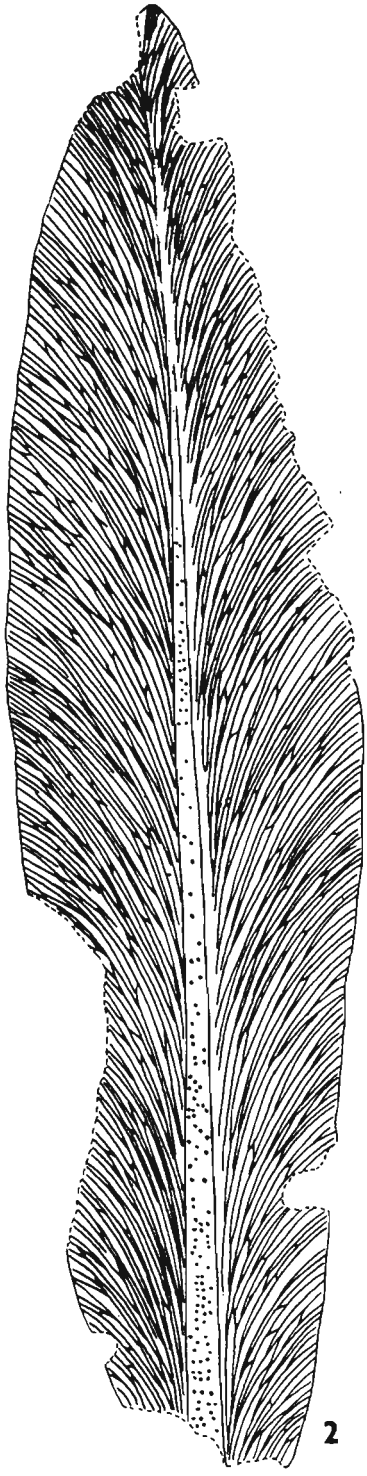
Text-fig. 1—Photo-tracing of the holotype showing venation. Specimen no. BSIP 35786. × ca 1.3.

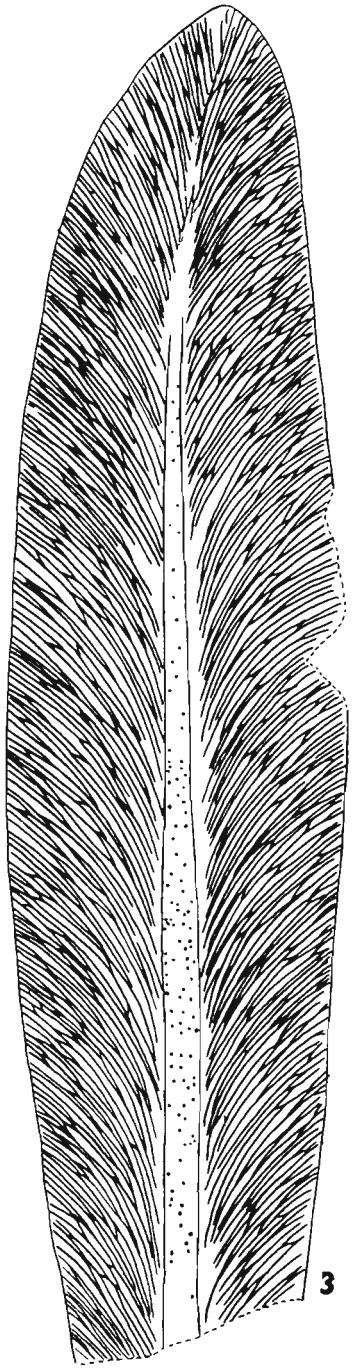
midrib gives rise to secondary veins which apparently originated in the longitudinal striations of the midrib. Angle of emergence of secondary veins varies between 20°-35° After emergence the veins run straight for a short distance and then take a graceful curve and run straight to the leaf margin meeting it at an angle of 50°-55° Vein density ranges 8-14 per centimeter near the midrib and 16-26 per centimeter near the margin. During their course to the margin the secondary veins dichotomise and anastomose a number of times forming narrow elongate meshes. The vein dichotomies are mostly of *gamma* (γ) type and the anastomoses are of *lambda* (λ) type.

The carbonified crust, on acid-alkali processing, yields rather fragile hypostomatic cuticles. The upper cuticle is relatively thick; the vein and mesh areas are clearly decipherable. The cells over the veins are longish-rectangular, arranged end to end in 2-4 linear rows and measure 62-120 μm long × 25-43 μm wide. Cells in between the veins are polygonal, isodiametric or aniso-diametric in shape and measure 55-107 × 24-49 μm in diameter. Very rarely the cells are squarish. The cells over the lower surface are also similar in shape and arrangement. The cell walls, lateral-as well as end-walls, are relatively thin. Stomata are anomocytic, sunken, irregularly distributed and oriented in the mesh areas and are completely absent over the veins. The sunken thin-walled guard cells enclose a linear slit and measure 43 × 19 μm. The subsidiary cells are unspecialized, 5 (rarely 4 or 6) in number and form a definite ring demarcating the stomatal apparatus from the ordinary epidermal cells.

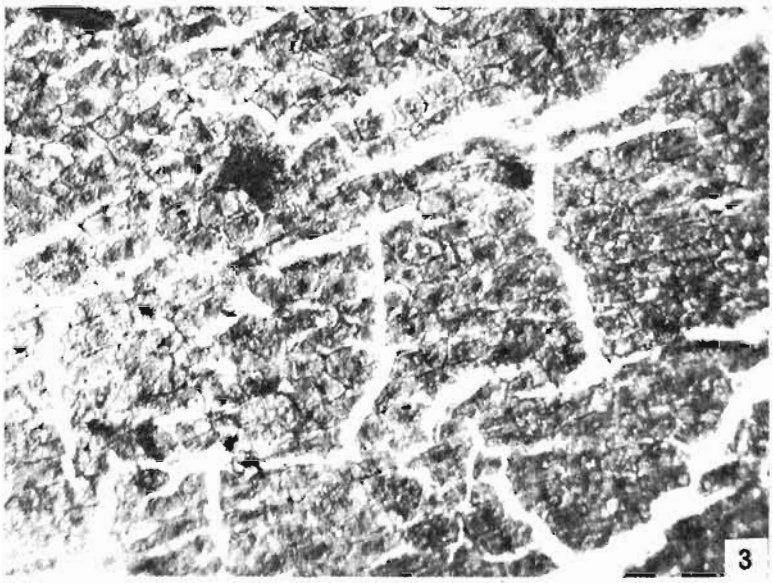
COMPARISON AND REMARKS

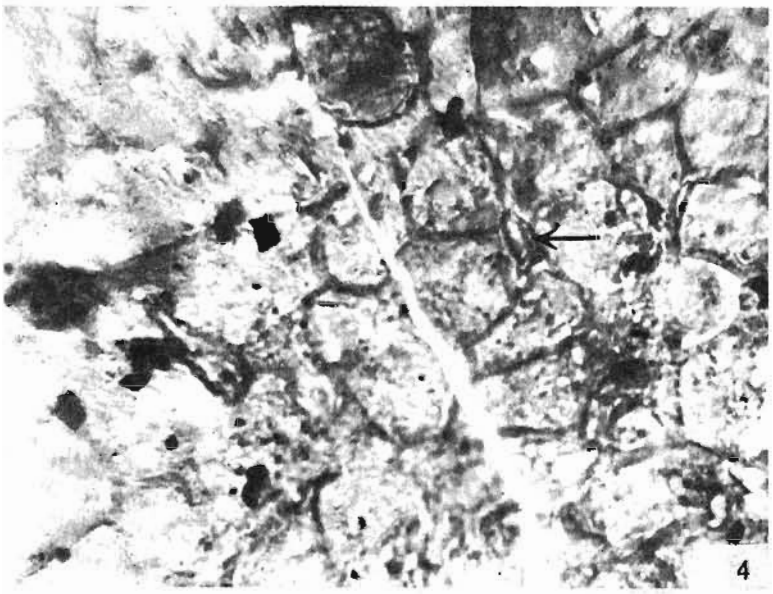
The midrib of the leaves, though flat and rather low, is easily identifiable through its longitudinally running striations and nonstomatiferous, thick-walled, squarish, end-to-end arranged cells. This fact along with the formation of meshes by the veins places the leaves in the genus *Glossopteris*. In having narrow elongate meshes the species compares favourably with *Glossopteris communis*, *G. decipiens*, *G. indica*; the closest resemblance being with *G. decipiens* in the evanescent nature of the midrib. Pant and Gupta (1968) have described morphologically more or less similar leaves under a number of specific epithets based on variations in the characters of the epidermis. Of the 8 species recorded by Pant and Gupta (1968), *G. waltonii*, *G. harissii*, *G. tenuifolia* and *G. zeilleri* differ in having wavy epidermal cells. The leaf of *G. petiolata* has a distinct petiole and the cells over the veins and the subsidiary cells have papillae. Some of the epidermal cells in *G. brongniartii* and *G. varia* are also papillate. *G. vulgaris* though morphologically very close, differs in being amphistomatic. *G. communis* differs in being almost spathulate in shape and in having a very





Text-figs 2,3—Photo-tracing of leaves showing the evanescent midrib in the upper region. Specimen no. BSIP 35788 and 35789. × ca 1.3.





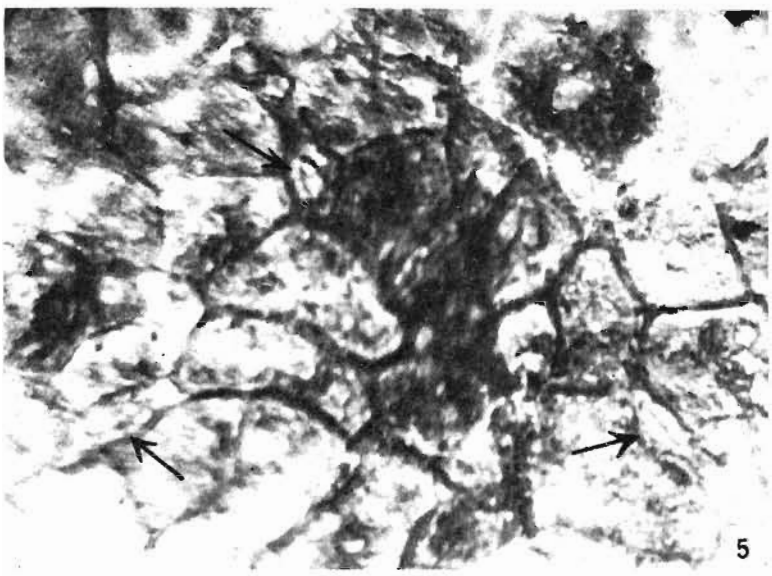
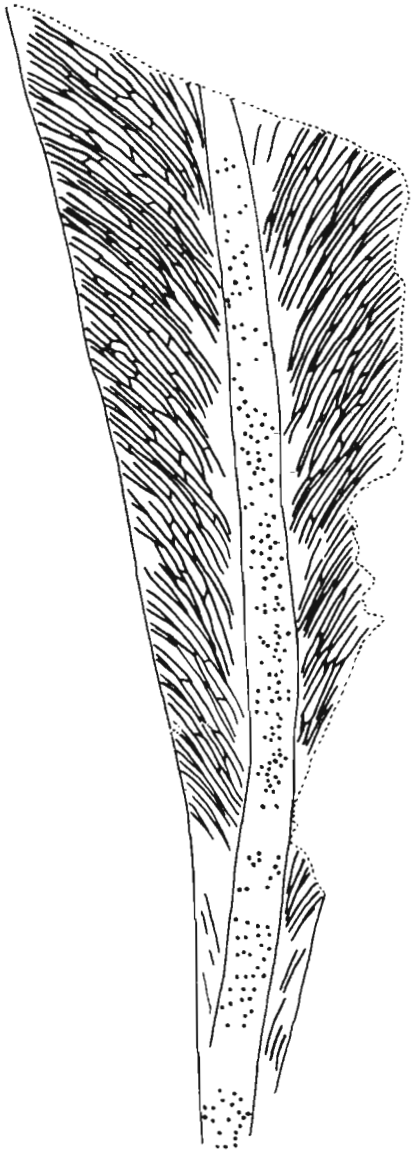


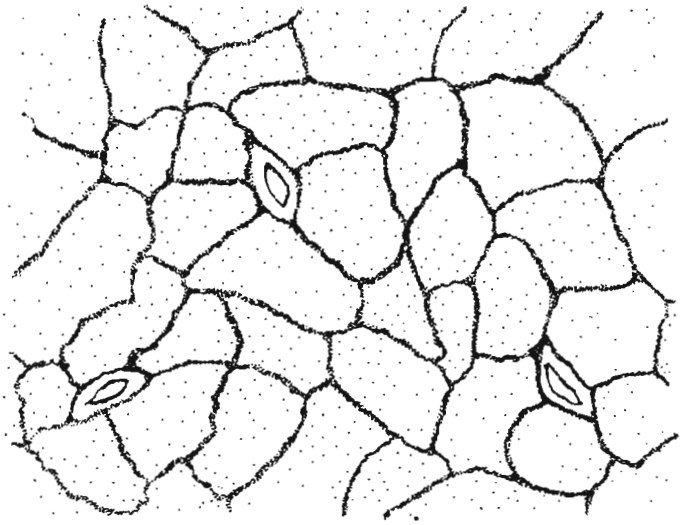
PLATE 1



Text-fig. 4—Photo-tracing of basal part of a leaf. Specimen no. BSIP 35790. × ca 1.3.

delicate stomatiferous cuticle. None of the species reported by Pant and Gupta (1971) are comparable.

In view of the characteristic features of the investigated specimens and the differences from the known comparable forms as enumerated above, the Kumarpur leaves have been given a new specific epithet, viz., *Glossopteris shailae* in honour of Dr Mrs Shaila Chandra, co-author of a monograph on the genus *Glossopteris*.



Text-fig. 5—Lower cuticle from the holotype. Slide no. BSIP 35786-1. × 425.

It is interesting to note that virtually all the leaf specimens collected from the Kumarpur Sandstone Member belong to a single species *G. shailae* as do the wood (*Araucarioxylon kumarpurensis* Bajpai & Singh, 1986) and megaspores (*Noniasporites harissii* Maheshwari & Bajpai, 1984). *Arberiella* type of sporangia (with striate-bisaccate pollen) have also been observed in the bulk macerates.

Glossopteris shailae sp. nov.

Diagnosis—Leaf simple; lanceolate to broad-lanceolate, apex obtuse or broadly rounded, base attenuate, margin entire. Length 7-15 cm, width 2-4 cm, midrib 0.1-0.4 cm wide, evanescent in upper part, with number of circular depressions allover, angle of emergence of secondary veins 20°-35°, vein dichotomies gamma type, anastomoses lambda type. Epidermis hypostomatic, upper cuticle relatively thick, stomata irregularly distributed and oriented.

←

PLATE 1

Glossopteris shailae sp. nov.

1. Holotype. Specimen no. BSIP 35786. × 1.
2. Leaf specimen no. BSIP 35787. × 1.5.
3. Upper cuticle of the leaf from the holotype showing epidermal cells. Slide no. BSIP 35786-1. × 100.
4. Lower cuticle of leaf from the holotype showing a stomata surrounded by 5 subsidiary cells. Slide no. BSIP 35786-1. × 425.
5. Lower cuticle of leaf showing irregularly distributed and oriented stomata. Slide no. BSIP 35786-1. × 425.

Holotype—Specimen no. BSIP 35786, Museum of Birbal Sahni Institute of Palaeobotany; Upper Permian, Raniganj Formation, Kumarpur Sandstone Member, Nonia Nala Section near Asansol, West Bengal.

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