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Lelstotheca Maheshwari, from the Barakar Formation of Raniganj Coalfield

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The genus *Lelstotheca*, known so far only from the Barakar Formation of Rajmahal Hills, Bihar is reported from the Barakar Formation of Raniganj Coalfield, West Bengal. The genus is represented by two species, viz., *L. robusta* (Feistmantel) Maheshwari and *L. striata* sp. nov. The new species is characterised by the presence of interconnecting striations running parallel to the median vein of the leaves. The taxonomic position of the genus and its records elsewhere are also discussed.

Key-words—*Lelstotheca*, Equisetales, Barakar Formation, Raniganj Coalfield (India).

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सारांश

रानीगंज कोयला-क्षेत्र के बराकर शैल-समूह से लेल्सटोथीका माहेश्वरी

हरिकृष्ण माहेश्वरी एवं अश्विनी कुमार श्रीवास्तव

लेल्सटोथीका प्रजाति, जो कि अभी तक केवल राजमहल पहाड़ियों के बराकार शैल-समूह से ही ज्ञात थी, पश्चिम बंगाल में रानीगंज कोयला-क्षेत्र के बराकार शैल-समूह से भी अभिलिखित की गई है। यह प्रजाति दो जातियों अर्थात् ले. रोबस्टा (फ़ाइस्टमॅन्टॅल) माहेश्वरी तथा ले. स्ट्रिएटा नव जाति से निरूपित है। प्रस्तावित नव जाति पत्तियों की मध्य शिरा के समानान्तर विद्यमान अन्तरसंयोजी धारीयों से अभिलक्षणित है। इस प्रजाति की वर्गीकर्णिक स्थिति तथा अन्य स्थानों से इसके पूर्व-अभिलेखों का भी वर्णन किया गया है।

SURANGE and Prakash (1962) instituted the genus *Stellotheca* to include *Phyllotheca robusta* Feistmantel (1880) which Arber (1905) believed did not belong under *Phyllotheca*. Maheshwari (1972) considered the generic name *Stellotheca* to be an orthographic variant of the earlier *Stellatheca* (Danzé, 1956, p. 283) proposed for an ?osmundaceous fertile frond from the Westphalian C of Pas-de-Calais, France. Therefore, in accordance with articles 64 and 75 of the International Code of Botanical Nomenclature he proposed the name *Lelstotheca* to accommodate all forms placed under *Stellotheca* by Surange and Prakash (1962). However, according to interpretation of ICBN by Maithy and Mandal (1978) there is no justification for rejecting the generic name *Stellotheca*.

Article 64 of ICBN clearly states—A name is illegitimate and must be rejected if it is a later homonym that is if it is spelled exactly like a name previously and validly published for a taxon of the same rank based on a different type. Article 64 further notes that orthographic variants of the same name are homonyms when they are based on different types (see Articles 73, 75). Thus the remark of Maithy and Mandal (1978) that "the name *Stellotheca* can not be rejected because it has a different spelling from *Stellatheca*. Moreover, the former genus has been proposed for arthrophytes and the latter genus for ?Osmundaceous fertile frond" does not hold good. Examples cited by Maithy and Mandal (1978), i.e. *Symphyostemon* and *Symphostemon*, no doubt, can not be taken as orthographic variants. More such examples are given in Article 75 (ICBN, 1978, p. 64), viz., *Rubia* and *Rubus*, *Monochaite* and *Monochaetum*, *Peponia* and *Peponium*, *Iria* and *Iris*, *Desmostachys* and *Desmostachya*, *Gerrardinia* and *Gerrardiina*, *Durvillea* and *Urvillea*, *Peltophorus* and *Peltophorum*, etc. At the same time *Astrostemma* and *Asterostemma*, *Pleuropetalum* and *Pleuripetalum*, *Eschweilera* and *Eschweileria*, *Skytanthus* and *Scytanthus* are recognized as orthographic variants. The names *Stellatheca* and *Stellotheca* also fall into this category and hence the

generic name *Stellotheca* was correctly replaced by *Lelstotheca*.

Outside India, the genus is known by *Stellotheca schtschurowskii* (= *Phyllotheca stschurowskii* Schmalhausen, 1879) Boureau (1964). However, the age of Zalessky's (1918, pl. 24, fig. 1) material collected from Kuznetsk Basin and included by Boureau is a matter of controversy. The material has been reinvestigated by Elias (1931), Neuberg (1948) and Radczenko (1956), who are of the opinion that the collection comprises Upper Palaeozoic and Lower Mesozoic forms. The specimens assigned to *Phyllotheca stschurowskii* by Zalessky have been found to be different from the type of the species illustrated and described by Schmalhausen (1879). In fact, one of the specimens (Zalessky, 1918, pl. 53, fig. 1, 1a) has been designated as holotype of *Annularia zalesskyii* Elias, 1931. Another specimen (Zalessky, 1918, pl. 38, fig. 2) has been transferred to *Pityophyllum noerdenskioldii* by Elias (1931, pl. 16, fig. 2). Zalessky (1933) himself transferred his *P. stschurowskii* specimens to the genus *Lobatannularia*. Neuberg (1948) transferred some of the specimens to *Schizoneura sibirica* and others to *Niazonaria*. *S. sibirica* was later transferred to a new genus *Paraschizoneura* by Radczenko (1956).

It would thus appear that *Phyllotheca stschurowskii* of Zalessky (1918) includes morphographically different forms and hence Boureau's (1964) transfer of these forms to the genus *Stellotheca* (*Lelstotheca*) needs to be examined afresh. Maithy and Mandal (1978) remarked that Arber (1905) and Elias (1931) wrongly spelled *stschurowskii*. The fact is that it is the original spelling as given by Schmalhausen (1879); it was later changed to *schtschurowskii* by Zalessky (1918).

The specimens for the present study were collected from the sandy carbonaceous shales associated with coals of Barakar Formation (Lower Permian) open cast projects of the Sangramgarh and Dalmia collieries in the West Raniganj Coalfield. None of the specimens is complete; these are preserved as compressions which have lost almost all their carbonified crust. Cellulose acetate pulls do not show cellular details, except for some faint impressions of longitudinal striations on the leaf surface. The specimens described by Surange and Prakash (1962) and Maithy and Mandal (1978) were also critically examined. All the figured specimens of the present study are deposited with the Museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

Genus—*Lelstotheca* Maheshwari, 1972

1962 *Stellotheca* Surange & Prakash, *Palaeobotanist* 9(1), p. 50, pl. 1, figs 1-7, text-figs 1, 2.
1964 *Stellotheca* Boureau, *Traité de Paléobotanique 3*, p. 287, figs 354, 355.
1966 *Stellotheca* Rigby, *Symp. Florist. & Strat. Gond.*, p. 51.
1966 *Stellotheca* Surange, *Indian Fossil Pteridophytes*, p. 49.
1978 *Stellotheca* Maithy & Mandal, *Palaeobotanist 25*, p. 279.

***Lelstotheca robusta* (Feistmantel) Maheshwari, 1972**

Pl. 1, figs 1, 2

1962 *Stellotheca robusta*, Surange & Prakash, *Palaeobotanist 9*, p. 50, pl. 1, figs 1-7, text-figs 1, 2.
1964 *Stellotheca robusta*, Boureau, *Traité de Paléobotanique 3*, p. 387, fig. 354.
1966 *Stellotheca robusta*, Surange, *Indian Fossil Pteridophytes*, p. 49, figs 27, 28.
1966 *Stellotheca robusta*, Rigby, *Symp. Florist. & Strat. Gond.*, p. 51, pl. 1, figs 1-3.
1978 *Stellotheca robusta*, Maithy & Mandal, *Palaeobotanist 25*, p. 279, pl. 1, figs 1-4, pl. 2, figs 5-9.
1981 *Stellotheca robusta*, Chandra & Rigby, *Geophytology 11*(2), p. 215, pl. 1, fig. 2.

The specimens are comparable in all respects with *Lelstotheca robusta* (Feistmantel) Maheshwari described by Feistmantel (1880), Surange and Prakash (1962) and Maithy and Mandal (1978).

Remarks—Feistmantel (1880) and Surange and Prakash (1962) considered that the leaves of a whorl of *L. robusta* are attached near the base in the form of a small cup or sheath. Maithy and Mandal (1978) observed the abaxially and adaxially preserved leaf whorls and found that the false union of leaves is visible in the adaxially preserved leaf whorl. However, our observation suggests that the false union as suggested by Maithy and Mandal (1978) is due to the swollen nature of node. The fine sediments deposited during the preservation give an impression of surrounding the cup-like depression (see pl. 1, fig. 2). Such depositional set up of the sediments around leaf whorl and axis has also been discussed by Walton (1936), while describing the factors which influence the external form of fossil plants with particular reference to *Annularia*, a comparative equisetale from the Northern Hemisphere.

Rigby (1966) described this species from New South Wales, Australia and included under it some of the forms earlier described under ?*Asterophyllites* (Clark, 1866), *Annularia australis* (Feistmantel, 1878; Wood, 1883; Feistmantel, 1890; Etheridge, 1891; Arber, 1905), *Annularia stellata* (Walkom, 1916) and *Phyllotheca robusta* (Walkom, 1922). *Stellotheca* sp. of Rigby (1966) and *Annularia* sp. (?*Stellotheca* sp.) of Lacey and Huard-Moine (1966) are not sufficiently well-preserved as to be properly identified and/or compared with known taxa.

Occurrence—Barakar Formation, grey shale above Seam no. B4, Dalmia Colliery, West Raniganj Coalfield, West Bengal.

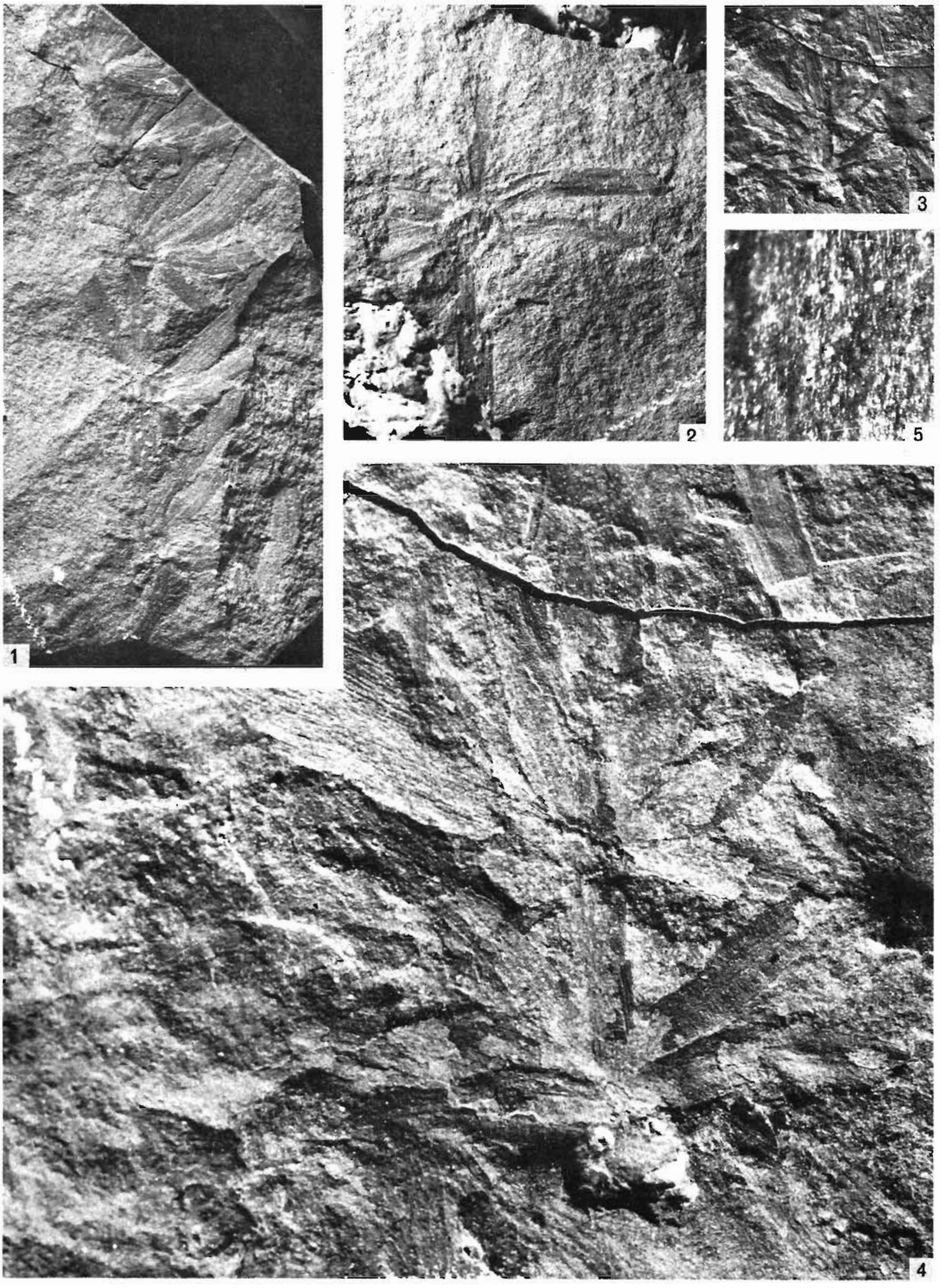

PLATE 1

Lelstotheca striata sp. nov.
Pl. 1, figs 3-5

Diagnosis—Axis articulate, ribbed, leaves 8-12 in number, borne at nodes in a whorl, free up to base, linear-lanceolate in shape, apex sharply acute, base constricted, a single striated midvein entering each leaf and continuing up to apex; leaf surface showing fine interconnecting longitudinal striations; sometimes transverse thickenings present over leaf surface.

Holotype—BSIP Specimen no. 35850; Lower Permian, Barakar Formation, Coal Seam no. B4, Sangramgarh Open Cast Project, West Raniganj Coalfield, West Bengal.

Description—Of the three specimens in the collection, one specimen (no. 35850) shows two whorls of leaves attached to a slender axis. Preserved length of the axis is 11 mm which is 1.75 mm broad, articulate, with 8-12, fine, parallel, longitudinally running ribs in each internode; distance between two nodes is 10 mm, node smooth. At each node 8-12 leaves are arranged in a whorl, free up to base; leaves measure 5-8 mm in length and 1-1.5 mm in width at the widest, margin smooth, apex acute, base slightly constricted. A single, striated midvein enters each leaf at base and continues up to apex. Surface of each leaf shows 10-15, fine interconnecting longitudinal striations parallel to the midvein. The striae arise from the base of leaf and converge at the apex. Some of the leaves also show transverse thickenings/striations.

Comparison and discussion—The new species is comparable with the type species, *Lelstotheca robusta* in gross morphography. It can, however, be distinguished by the presence of fine, interconnecting longitudinal striations, over the surface of leaves. Transverse thickenings have also been observed in some of the leaves. Longitudinal striations over the leaf surface also occur in *Phyllotheca stschurowskii* (Schmalhausen, 1879, pp. 16-17, pl. 3, fig. 2b; pl. 4, fig. 4b; pl. 6, figs 2, 3) and *Annularia stellata* (Elias, 1931).

Striation/fibre/hair-like structures are quite common in the articulates. The leaves of *Phyllotheca sahnii, Raniganjia bengalensis, Lelstotheca robusta* and *Barakaria* (Meyen, 1969) show transverse striations. Walton (1936) reported some hair-like growth over the leaf surface in *Annularia sphenophylloides* Zenker, *A. galioides* Lindley & Hutton and *A. jongmansii* Walton. Transverse striations/fibres/hair have been observed over the leaf surface in *Annularia westphalica* Stür, *Carpannularia americana* Elias and *Annularia zalesskii* (Elias, 1931). Walton (1936, pl. 31, figs 16, 17) illustrated a specimen of *Annularia radiata* showing longitudinal striations oriented at right angles to the axis.

Many authors (Schmalhausen, 1879; Stür, 1887; Walkom, 1916; Zalessky, 1918; Thomas, 1911; Elias, 1931; Walton, 1936; Neuberg, 1964; Surange & Prakash, 1962; Pant & Kidwai, 1968; Rigby, 1966; Pant & Nautiyal, 1967; Maithy & Mandal, 1978) have expressed divergent views regarding the nature and importance of the striations. Some find them as mere lithological characters, though definite and regular presence of these structures over the leaf surface is indicative of an adaptive character.

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PLATE 1

1. *Lelstotheca robusta* (Feistmantel) Maheshwari, showing the nature of leaves and stem. BSIP Specimen no. 35848. × 1.5.
2. *L. robusta* leaf whorl showing false impression of cup-like depression formed due to fine sediments deposited during preservation. BSIP Specimen no. 35849. × 1.5.
3. *L. striata* sp. nov. Holotype, showing arrangement and attachment of leaves. BSIP Specimen no. 35850 × 1.5.
4. *L. striata* holotype enlarged to show the longitudinal and transverse striations over the surface of leaves. BSIP Specimen no. 35850. × 8.
5. *L. striata* leaf surface enlarged to show the fine parallel interconnecting longitudinal striations. BSIP Specimen no. 35850. × 30.

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