

A NEW SPECIES OF *ARBERIA* FROM THE LOWER GONDWANA OF SOUTH REWA GONDWANA BASIN, INDIA

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ABSTRACT

Arberia surangei sp. nov. has been described from the coal-bearing (Karharbari?) formation of Birsinghpur Pali, Madhya Pradesh. The species of *Arberia*, so far known from India, are also reviewed.

Key-words — *Arberia*, Lower Gondwana, Lower Permian (India).

सारांश

भारत में दक्षिण रीवा गोंडवाना बेसिन के अधर गोंडवाना से आरबेरिया की एक नई जाति — अनिल चन्दा एवं अश्विनी कुमार श्रीवास्तव

मध्य प्रदेश में बीरसिंहपुर पाली के कोयला-धारक शैल-समूह (? करहरबारी) से आरबेरिया सुरंगेयाई न० जा० वर्णित की गई है। अभी तक ज्ञात आरबेरिया की जातियों की समीक्षा भी की गई है।

INTRODUCTION

FEISTMANTEL (1879) reported an inflorescence from the Karharbari beds of Mohpani Coalfield. White (1908) instituted the genus *Arberia*, described *Arberia minasica* from the State of Santa Catarina of Brazil and proposed a new species *A. indica* to accommodate the above inflorescence of Feistmantel (1879, pl. 28, fig. 5). Surange and Lele (1956) described *Arberia umbellata* from the Talchir Stage of Goraia, Birsinghpur Pali, Madhya Pradesh. Maithy (1965) reported *Arberia* sp. cf. *A. umbellata* from the Karharbari Stage of Giridih Coalfield, Bihar. Rigby (1972) redefined the genus *Arberia* and considered it as "female pteridospermous fructification that bore large number of naked ovules on pinnate branches arranged laterally along a forked rachis".

A few species of *Arberia* are also known from the other Gondwana continents. *Arberia minasica* and *A. (?)brasiliensis* were described by White (1908) and Lundquist (1919) respectively. *Arberia minasica* was again reported by Rigby (1972) from Brazil and Australia. Plumstead (1962)

described *Arberia* sp. cf. *A. minasica* from Antarctica. However, there is no record of this genus from Africa.

The specimen of Feistmantel (1879, pl. 28, fig. 5) is without any description but he mentioned it as an inflorescence. While naming this specimen as *Arberia indica*, White (1908) has also not given any description. Such specimens, therefore, cannot be considered as a reliable record of *Arberia*. Surange and Lele (1956) have not designated the holotype of *Arberia umbellata*. We are, therefore, giving the diagnosis and the lectotype of *Arberia indica* as well as designating the lectotype of *A. umbellata*. In addition, two well-preserved specimens of *Arberia surangei* sp. nov. from the Karharbari Formation of Birsinghpur Pali are described in detail.

BRIEF GEOLOGY

Birsinghpur Pali (23°22': 81°2'30'') is about 29 km south-east of Umaria (23°81' 30'': 80°53'30'' Railway Station), Shahdol, Madhya Pradesh. The general succession of the different geological formations ex-

posed in this area (Hughes, 1884) is as follows:

Traps
Lametas
Supra-Barakars
Barakars
Talchirs
..... Unconformity.....
Metamorphics

In one of the traverses (Mangthar-Amurai Traverse, Birsinghpur Pali) undertaken by one of us (A.C.), the fertile organs were found from the following section exposed on the east bank of the river Johilla, about 400 m south of the village Mangthar (81°7': 23°18').

LITHOLOGY	THICKNESS	FIELD NOS
(vi) Yellowish white coarse grained sandstone	1.85 m	MA 25
(v) Coal	0.20 m	MA 24
(iv) Bluish carboniferous shale (fossiliferous)	1.85 m	MA 23
(iii) Carbonaceous shale (unfossiliferous)	0.45 m	MA 22
(ii) Bluish Carbonaceous shale (fossiliferous)	1.20 m	MA 21
(i) Whitish sandstone	1.55 m	MA 20
Total thickness		7.10 m

In the above section, beds (ii) and (iv) have been found to be richly fossiliferous. The flora from these two carbonaceous shale beds has been described in detail by Chandra and Srivastava (MS).

This assemblage, in general, is composed of *Glossopteris communis* Feistmantel, *G. indica* Schimper, *G. angustifolia* Brongniart, *G. decipiens* Feistmantel, *Gangamopteris cyclopteroides* Feistmantel, *G. major* Feistmantel, *Noeggerathiopsis hislopi* (Bunbury) Feistmantel and Equisetaceous stem. It has been observed (Chandra & Srivastava, MS) in the entire collection that *Noeggerathiopsis* and *Gangamopteris* dominate over the genus *Glossopteris*. This floral composition is typical of Karharbari age. Two well-preserved specimens of *Arberia* have been found from the carbonaceous shale bed (no. ii) and these form the main part of this paper.

DESCRIPTION

Genus — *Arberia* White, 1908

Arberia indica (Feistmantel) White, 1908

Lectotype — Specimen no. 5061, G.S.I. Museum, Calcutta (Feistmantel, 1879, pl. 28, fig. 5).

Locality — Mohpani Coalfield, M.P.

Horizon — Karharbari Stage, Lower Permian.

Diagnosis — Fructification 4.4 cm long, 1.9 cm wide; main rachis 5 mm thick, flattend, striated; form oppositely arranged short recurved lateral branches with broad and flattened tips which might bear ovule (observations were made from the photograph).

Arberia umbellata Surange & Lele, 1956

Lectotype — Specimen no. 5240, B.S.I.P. Museum, Lucknow (Surange & Lele, 1956, pl. 1, fig. 8).

Locality — North bank of Johilla River, north-west of Goraia Village.

Horizon — Talchir Stage, Lower Permian.

Diagnosis — See Surange & Lele, 1956, p. 86.

Arberia surangei sp. nov.

Pl. 1, figs 1-3; Text-fig. 1

Diagnosis — Female fructification, 2.5 cm long; main rachis flattened, 3 mm wide, longitudinally striated, form alternate lateral branches, each lateral branch dichotomizing only once to form two short branchlets; one rounded ovule attached on the apex of each branchlet.

Holotype — Specimen no. 31/938, B.S.I.P. Museum, Lucknow.

Locality — Mangthar, Birsinghpur Pali.

Horizon — Karharbari(?) Formation, Lower Permian.

Derivation of Name — The species is named after Dr K. R. Surange, Former-Director, Birbal Sahni Institute of Palaeobotany, Lucknow for his valuable and significant contribution towards the knowledge of *Glossopteris* fructification.

Observations — In the entire collection from Mangthar we found only two well-preserved specimens of *Arberia*. One is



TEXT-FIG. 1 — *Arberia surangei* sp. nov. line drawing of the holotype (No. 31/938). Note dichotomy of lateral branches and two ovules on right side $\times 4$.

2.5 cm in length and 1.5 cm in width. The apical portion of the specimen is broken. The surface of the rachis is expanded and coarsely and longitudinally striated. Four lateral branches are attached on the right side and three on the left side of rachis. The distance between the two lateral branches is 2 to 3 mm. Each branch dichotomizes only once to give rise two to daughter branches, 2 to 3 mm long and 1.0 to 1.5 mm wide. At the end of each branchlet there is a single rounded unwinged ovule. The ovule is finely striated and 1.5-5 mm long and 1.5-1.75 mm wide.

Comparison—The present species is distinct from *Arberia minasica* White in having a lateral branch which dichotomizes only once, while in the latter the dichotomy is more than once. *Arberia indica* (Feistmantel) White (Feistmantel, 1879, pl. 28, fig. 5) shows short recurved processes which

are not seen in *Arberia surangei*. Similarly, *Arberia* (?) *brasiliensis* Lundqvist (1919, pl. 1, figs 25-29) is quite distinct from *Arberia surangei* sp. nov. in having an axis with a number of recurved branches. *Cordaicarpus* like seeds were found in organic connection on these branches. *Arberia umbellata* Surange & Lele (1956, pl. 7, fig. 8) has a short umbrella-like head bearing a number of recurved processes.

DISCUSSION

The flora of the Talchir Series (which includes the Talchir and Karharbari stages) is distinct from the flora of the younger Damuda Series. *Gangamopteris*, and to some extent, *Noeggerathiopsis* dominate the flora of the Talchir and Karharbari stages whereas *Glossopteris* is dominant in the Barakar and Raniganj stages. A number of fructifications (Banerjee, 1969; Surange & Maheshwari, 1970; Surange & Chandra, 1973a, b, c, 1974a, b, c, d, 1975, Chandra & Surange, 1976, 1977a, b, c), both male and female, have been described recently from the Raniganj Stage. However, only two female fructifications are known from the Karharbari Stage and one from the Talchir Stage. *Ottokaria bengalensis* is attached on the leaf of *Glossopteris communis* (Surange & Chandra, 1978) and so *Ottokaria* is obviously the fructification of *Glossopteris*. *Arberia* could be the female fructification of some species of *Gangamopteris* or *Noeggerathiopsis*. This has not been found so far from the younger Barakar and the Raniganj stages which are devoid of *Gangamopteris* or *Noeggerathiopsis*. On the other hand, *Arberia umbellata* is known from the Talchir Stage (Surange & Lele, 1956). Although *Gangamopteris* dominates the flora of this stage, *Noeggerathiopsis* is also represented here. *Arberia* thus could be the female fructification of *Gangamopteris* or *Noeggerathiopsis* and the truth can be revealed by an attached specimen.

Rigby (1972) considers that *Arberia* is the fructification of *Noeggerathiopsis*. But it is still a guess. *Arberia* has not yet been found attached to any leaf-*Gangamopteris* or *Noeggerathiopsis*. Rigby (1972) considers it as a female pteridospermous fructification that bore large number of ovules on pinnate branches, arranged laterally along a forked rachis. *Arberia* could as

well be a modified frond, such as the megasporophyll of *Cycas*, bearing ovules on the outgrowths at the margin. It could also be a branch system, the ovules being attached to the ultimate branches. *Arberia* could again be interpreted as a cupulate organ, such as *Rigbya arberioides* Lacey *et al.* (1975), where the branches come out at the margin of a flattened cupule, each branch carrying an ovule at its apex. However, the morphology of *Arberia* is still far from clear. A well-preserved and attached specimen of *Arberia* will be able to solve this problem.

Arberia umbellata Surange & Lele (1956, pl. 1, fig. 8; specimen no. 5240) is a well-preserved specimen and, no doubt, belongs to the genus *Arberia*. It is recorded from the Talchir stage. Feistmantel's specimen described as *Arberia indica* (Feistmantel) White belongs to the Karharbari Stage. However, Maithy's specimen (1965, specimen no. 32806/499) of *Arberia* cf. *Arberia umbellata* from the Karharbari Stage is not *Arberia* as it does not show any character of this fertile organ. Beside these stages, *Arberia* has not been reported so far from any other horizon of India.

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EXPLANATION OF PLATE

PLATE 1

1. *Arberia surangei* sp. nov. Holotype, B.S.I.P. specimen no. 31/938. $\times 4$.
2. *A. surangei* sp. nov. enlargement of the holotype to show the dichotomy of lateral branches and the position of ovule at the tip of lateral branches. $\times 8$.
3. *A. surangei* sp. nov. another fragmentary specimen showing the dichotomy of lateral branches specimen no. 10/938. $\times 4$.

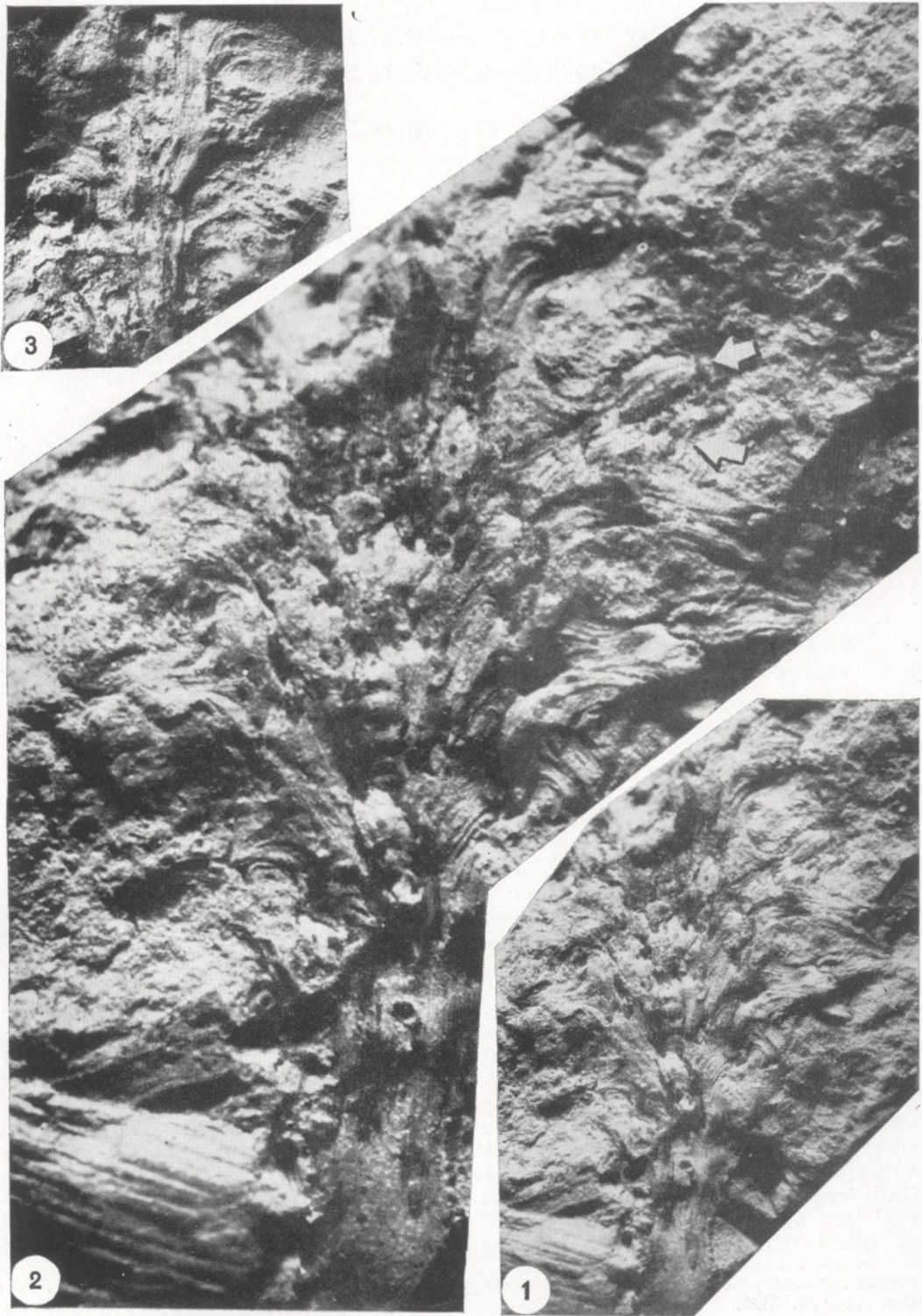


PLATE 1