Palaeobotany and climate around Marhwas area, Sidhi District, South Rewa Gondwana Basin during Upper Permian

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Fossil plant asssemblages around Marhwas area in Sidhi District are represented by one species each of *Trizygia*, *Neomariopteris* and *Scutum*, a fern and 24 species of *Glossopteris*. Floristic composition indicates Raniganj-Kamthi affinities and a warm-temperate climate. High percentage of small-sized leaves and poor representation of pteridophytes in the flora suggest drier conditions and low humidity

Key-words—Megafossils, Palaeoclimate, Gondwana, Upper Permian (India)

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सारांश

उपरि परमी काल में दक्षिण रीवा गोंडवाना द्रोणी के सिधी जनपद में मड़वास क्षेत्र के आस-पास की पुरावनस्पति एवं जलवायु

शैला चन्द्रा, अश्विनी कुमार श्रीवास्तव एवं कमलजीत सिंह

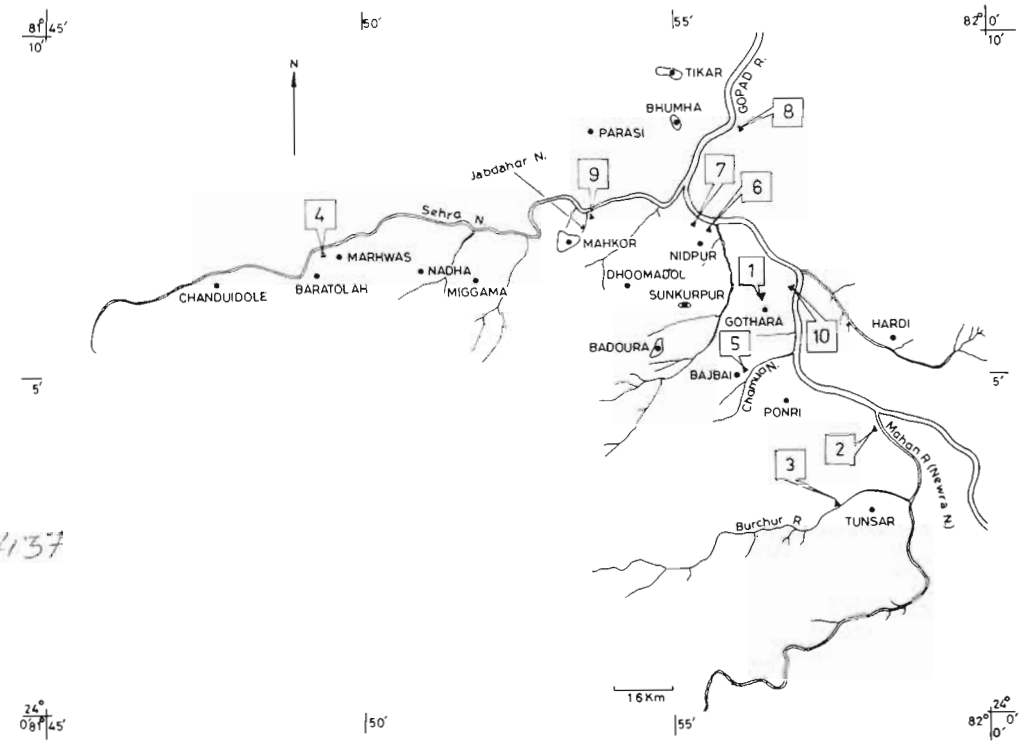
सीधी जनपद में मड़वास के आस-पास के अश्मित पादप समुच्चयों से **ट्राइजीजिया निओमेरिऑप्टेरिस** एवं **स्कूटम** में प्रत्येक की एक जाति, एक फर्न तथा **ग्लॉसाप्टेरिस** की 24 जातियाँ उपलब्ध हुई हैं। अश्मित वनस्पतिजात कुल मिलाकर रानीगंज-कामथी सजातीयता एवं उष्ण-शीतोष्ण जलवायु प्रदर्शित करता है। उक्त वनस्पतिजात में छोटे आकार की पत्तीयों की अधिकता तथा टेरीडोफाइटी पौधों की कम संख्या से शुष्क परिस्थितियों एवं कम आर्द्रता का होना इंगित होता है।

THE Sidhi District is the eastern part of the great South Rewa Gondwana Basin. The principal river Gopad (Gopat in topo-sheet) flows from south to north and is the tributary of the Son. The localities covered in this area are exposed mostly in the nala and river cuttings in the villages around Gopad River

Hughes (1881) mapped the area and collected plant fossils from Bajbai, Chanduidol, Parasi and few localities adjacent to Mahan (also spoken as Mohan) River Section. Feistmantel (1882) after making exhaustive studies assigned an Upper Permian age to these beds. Ahmad (1955) and Raja Rao (1983) also suggested the age equivalent to Raniganj to these beds on the basis of lithological features, which was further supported by palaeontological evidences (Tripathi, 1962).

Satsangi (1964) discovered a so-called *Dicroidium* bearing bed alongwith typical Permian assemblage bearing beds in the Gopad River Section near the village Nidhpuri The presence of *Dicroidium* like fronds lead him to postulate occurrence of a Triassic horizon in the area. This was further supported by Srivastava (1974). Banerji *et al.* (1976) collected plant megafossils from three exposures, in close vicinity to each other, along the Gopad River and hesitantly dated two of the exposures as Triassic while the third one was definitely dated as Upper Permian. Again the former dating was done merely on the basis of a few specimens of poorly-preserved indeterminate specimens of *Dicroidium* like leaves.

In recent years extensive collections of plant fossils have been made by us from a number of



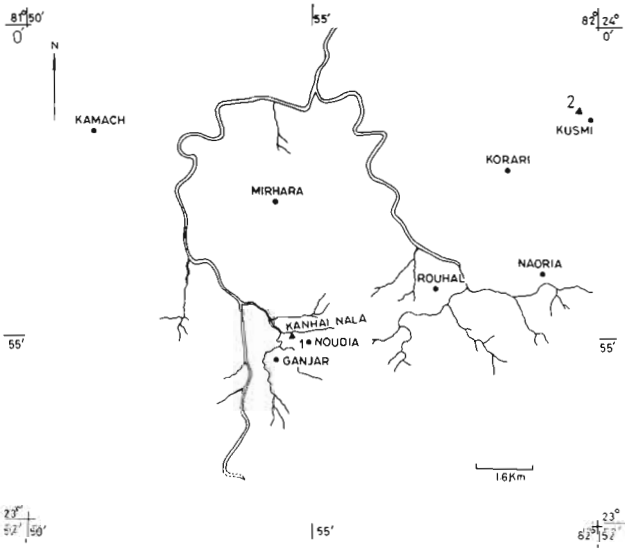
Map 1—Fossil locality map of Sidhi District, South Rewa Gondwana Basin. **1,** Gothara Hill; **2,** Mahan River Section near Gopad-Mahan confluence; **3,** Burchur River Section near Tunsar Village; **4,** Sehra Nala Section near Marhwas Village; **5,** Chamua Nala Section near Bajbai Village; **6, 7,** Gopad River Section near Nidhpuri Village; **8,** Gopad River Section near Bhumha Village; **9,** Jabdahar Nala Section near Mahkor Village; **10,** Gopad River Section near Gothara Village.

localities around Marhwas in Sidhi District (Map 1 and 2), Majority of the exposures are found in the vicinity of Gopad River. Few of them are exposed in the Mahan River and the nalas joining these two rivers from various villages. All the specimens have been deposited in the Birbal Sahni Institute of Palaeobotany Museum.

PALAEOBOTANY

The specimens are preserved as impressions on arenaceous and argillaceous shales. Carbonised crust is present over specimens from the Burchur River Section but has not yielded cuticle. Bulk maceration of the rock samples also did not yield identifiable organic matter. Plant fossils in general are fragmentary and rarely complete. The specimens are generally well preserved and hence could be identified up to the specific level.

The distribution of plant fossils, represented by pteridophytes and gymnosperms, in different



Map 2—Showing fossil locality. **1,** Kanhai Nala Section near Noudia Village, and **2,** Tilangana Ghat Section near Kusmi Village.

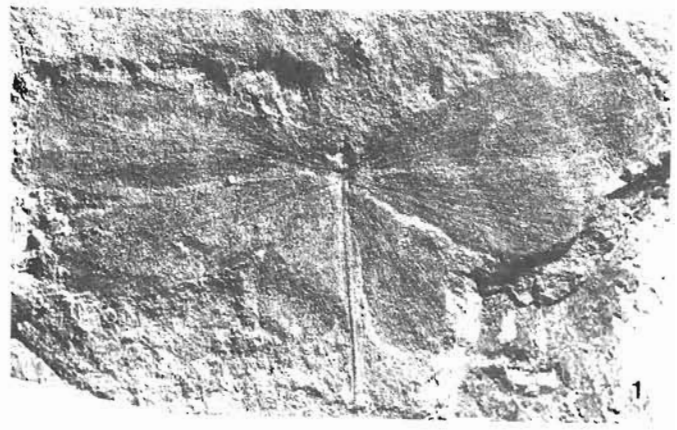
Table 1—Distribution of plant fossils in different localities of Sidhi District, Madhya Pradesh

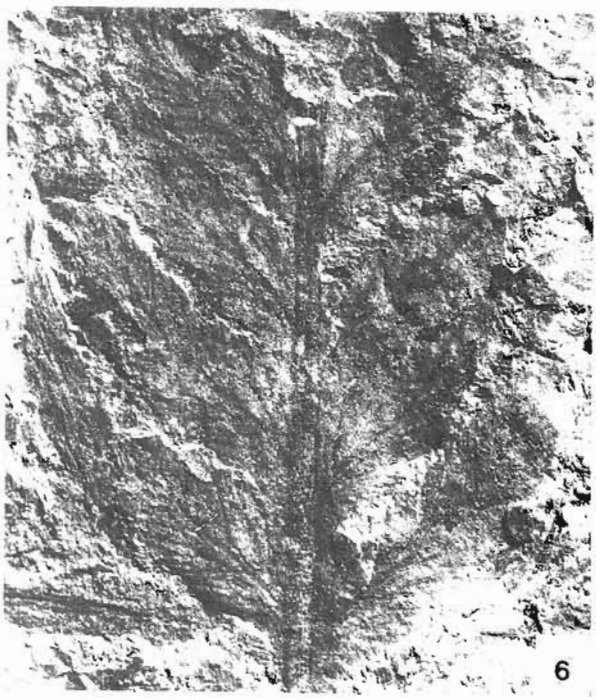
Name of the fossils	Gothara Hill	Mahan River section near Gopad-Mahan confluence	Burchur River section near Tunsar Village	Sehra Nala section near Marhwas Village	Chamua Nala section near Bajbai Village	Gopad River section near Nidhpuri Village (A)	Gopad River section near Nidhpuri Village (B)	Gopad River section near Bhumha Village	Jabdahar Nala section near Mahkor Village	Gopad River section near Gothara Village	Kanhai Nala section near Noudia Village	Tilangana Ghat section near Kusmi Village
Trizygia speciosa			+									
Scutum sahnii			+									
Neomariopteris hughesii				+	+		+				+	+
Fern sp.				+								
Glossopteris communis	+	+	+	+	+	+	+	+	+	+	+	
G. indica	+		+	+	+	+		+	+	+	+	+
G. pandurata		+									+	
G. emarginata										+		
G. browniana	+		+				+				+	
G. angustifolia	+	+		+	+			+	+	+		
G. stricta				+				+	+			
G. tenuifolia				+					+			
G. retifera			+		+		+	+				
G. taeniensis							+					
G. damudica	+		+				+					
G. conspicua			+				+				+	
G. stenoneura							+					
G. nimishea			+					+				
G. formosa			+									
G. intermedia			+				+				+	
G. linearis					+							
G. gigas					+			+				
G. leptoneura										+		
G. cf. *sear solensis*			+									
G. gondwanensis			+								+	
G. spatulata			+									
G. varia					+							
G. zeilleri				+								
Vertebraria indica								+		+		
Stem axis		+	+	+	+			+	+	+	+	+
Equisetalean axis			+		+		+	+	+		+	

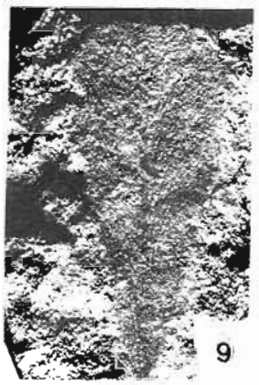
localities of Sidhi District is shown in Table 1. Qualitatively the plant types are fairly well-represented.

Floristic comparison—All the localities show the dominance of *Glossopteris*. Pteridophytes have been recovered from Burchur River, Kanhai Nala, Chamua Nala, Sehra Nala, Tilangana Ghat and Gopad River near Nidhpuri B sections, but they are poorly represented. Total absence of *Gangamopteris* and *Noeggerathiopsis* in all the localities exclude the possibility of its being Lower Permian in age. Comparison with the known floristic data from the Raniganj Coalfield (Srivastava, 1956; Maheshwari, 1965; Pant & Gupta, 1968, 1971; Pant & Singh, 1971), Rajmahal Hills (Maheshwari & Prakash, 1965) and Auranga Coalfield (Srivastava, 1979) indicates a close similarity with the Raniganj flora.

The specific analysis of various *Glossopteris* species in the Sidhi assemblages also indicates Raniganj affinities (Chandra & Surange, 1979). *Glossopteris* species which are frequently found in the Raniganj strata, e.g., *G. retifera, G. conspicua, G. formosa, G. intermedia, G. angustifolia* and *G. linearis* are also dominant elements in Sidhi







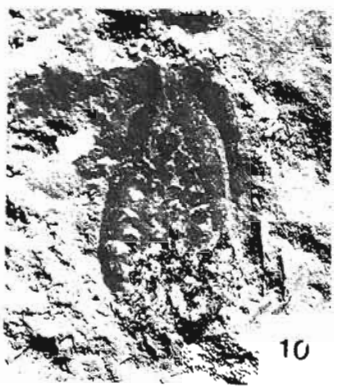


PLATE 1

assemblages. These are also well-represented in the Raniganj Coalfield, Rajmahal Hills and Auranga Coalfield

The distribution of *Glossopteris* species in the Kamthi flora has been analysed by Chandra and Prasad (1987). It was observed that in general the *Glossopteris* species are same as are found in Raniganj flora Some species, however, are characteristic to the Kamthi flora. The significant species of the Kamthi flora are *G. stricta, G. musaefolia* and *G. leptoneura* (Bunbury, 1861, Chandra & Prasad, 1987) The presence of *G. stricta* and *G. leptoneura* alongwith other typical Raniganj species indicates that the Sidhi assemblages could as well represent a transitional flora. The smaller size of the leaves and narrow elongate shapes of the leaves in general in Sidhi assemblages also point towards Kamthi affinities. A typical form, which we have provisionally identified as a fern because of lack of specimens, may turn out to be the same plant earlier identified as *Dicroidium*-complex by Srivastava (1974) and Banerji *et al.* (1976) Collective evidence and analysis of the Sidhi flora suggest affinities both with Raniganj and Kamthi floras and an uppermost Permian age

PALAEOCLIMATE

Plant fossils recovered from the Upper Permian sediments of Marhwas area indicate the presence of lush-green forests dominated by *Glossopteris* plants of varying habits associated with a few pteridophytes. The climatic conditions were favourable for the development of plant communities but were not suitable for coal formation. Low percentage of pteridophytes also suggests that the conditions were drier as compared to the conditions prevailing during the same period in the Raniganj Basin. Preservation of leaves in different thin sediments also suggests that the plants were deciduous. The leaves in general are broken indicating disturbed conditions during their deposition.

Thus it can be inferred from the available data that the Permian forests around Marhwas were growing under warm temperate conditions with low humidity.

REMARKS

The record of a *Glossopteris* dominated flora in the Marhwas area of Sidhi District, from exposures almost juxtaposed to the well-known Nidhpuri Section and often presumed to be of Triassic age, mediates a reassessment of the age of the fossil flora from the latter locality There is enough evidence to indicate that the Nidhpuri flora, too, may be of Upper Permian age (Chandra & Maheshwari, 1988).

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PLATE 1

1. *Trizygia speciosa*, Specimen no. BSIP 36397. × 2.
2. *Neomariopteris hughesii*, Specimen no. BSIP 36398. × 2.
3. *Glossopteris nimishea*, Specimen no. BSIP 36399. × 1.
4. *G. gondwanensis*, Specimen no. BSIP 36400. × 1.
5. *G. spatulata*, Specimen no. BSIP 36401. × 1.
6. Fern sp. Specimen no. BSIP 36402. × 4.
7. *Glossopteris conspicua*, Specimen no. BSIP 36403. × 2.
8. *G. indica*. Specimen no. 36404. × 1.
9. *G. pandurata*, Specimen no. BSIP 36405. × 1.
10. *Scutum sahnii*, Specimen no. BSIP 36406. × 2.

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