

A Triassic palynoflora from Pali Formation, South Rewa Gondwana Basin, Madhya Pradesh, India

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ABSTRACT

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The palynofloral assemblage, comprising 33 genera with 45 species, is recorded from the Upper Member of Pali Formation, exposed along Son-Chundi River Section in Shahdol District, M.P. The significant palynotaxa identified are—*Densoisporites playfordii*, *Brachysaccus ovalis*, *Falcisporites stabilis*, *Krempipollenites vistitus*, *Tikisporites balnei*, *Lundbladispota brevicula*, *Chordasporites* sp., *Staurosaccites marginalis*, *Satsangisaccites nidpurensis*, *Samaropollenites speciosus* and *Goubinispota morondavensis*. In comparison with known Triassic palynoassemblages of Peninsular India, the Son-Chundi palynoassemblage is assigned an Early to Middle Triassic. Stratigraphic relationships between the Pali and Tiki formations are also discussed.

Key-words—Palynology, Triassic, Pali Formation, South Rewa Basin, Madhya Pradesh.

भारत के मध्य प्रदेश प्रान्त के दक्षिणी-रीवों गोण्डवाना द्रोणी के पाली शैलसमूह से प्राप्त एक
ट्रायसिक परागाणु वनस्पतिजात

राम अवतार

सारांश

मध्य प्रदेश के शहडोल जिले के सोन-चण्डी नदी परिच्छेद के आस-पास अनावरित पाली शैलसमूह के उपरि सदस्य से एक्रोस्टिकम 35 वंशों तथा 45 प्रजातियों से युक्त परागाणु समुच्चय अंकित किया गया है। अभिनिर्धारित किए गए प्रमुख परागाणु वर्गक हैं, - *डेन्सोइसपोराइटीज़ स्लेफोर्डई*, *ब्रेकीसैक्कस ओवेलिस*, *फाल्सिस्पोराइटीज़ स्टेबिलिस*, *क्रेम्पीपोलेनाइटीज़ विस्टाइटस*, *टीकीस्पोराइटीज़ बाल्मेइ*, *लुण्डब्लेडिस्पोरा ब्रीविक्यूला*, *कॉर्डेस्पोराइटीज़* प्रजाति, *स्टाउरोसैक्काइटीज़ मार्जिनैलिस*, *सत्संगीसैक्काइटीज़ निदपुरेन्सिस*, *समारोपोलेनाइटीज़ स्पीशियोसस* तथा *गेबिनीस्पोरा मोरोनडेवेन्सिस*। प्रायद्वीपीय भारत के ज्ञात ट्रायसिक परागाणु समुच्चयों से तुलना करने पर सोन-चण्डी परागाणु समुच्चय को प्रारंभिक से मध्य ट्रायसिक में सन्दर्भित किया गया है। इसके अतिरिक्त प्रस्तुत शोध पत्र में पाली तथा टीकी शैलसमूहों के मध्य स्तरिकीय सम्बन्धन की भी चर्चा की गयी है।

संकेत शब्द—परागाणु विज्ञान, पाली शैलसमूह, दक्षिणी रीवों द्रोणी, मध्य प्रदेश, भारत.

INTRODUCTION

HUGHES (1881, 1884) mapped the South Rewa Basin and used a comprehensive term, "Supra-Barakar", to accommodate all the unclassified sedimentary units lying above the Barakar Formation. Hughes (1881) designated the "Pali Bed" for the sequence of brick red shale and sandstone exposed along the Johilla River Section about 3 km West of Pali Village (23° 21' 40" : 80° 3' 15"), on Pali-Umaria Road, Shahdol District, M.P. Fox (1931) used the term "Tiki Bed", and Lele (1964), "Daigaon Stage", for the similar rock sequences, exposed around the villages of Tiki (23° 55' 0" : 81° 22' 12") and Chota Daigaon (23° 23' 32" : 81° 0' 10") respectively. Dutta and Ghosh (1993) united Pali and Tiki formations into a single lithostratigraphic unit due to lithological similarities of those formations and proposed a new term "Pali-Tiki Formation" in the basin.

The plant megafossils—*Schizoneura gondwanensis*, *Glossopteris indica*, *G. communis*, *Vertebraria indica* and *Dictyopteridium* have been reported from the Pali Formation by Feistmantel (1882), Lele (1962, 1964) and Saksena (1961). The palynofloral assemblages recorded by Tiwari & Ram-Awatar (1986) and Ram-Awatar (1988, 1996, 1997) from the Pali

Formation are dominated by striate disaccate and monosaccate pollen (*Faunipollenites*, *Striatopodocarpites*, *Crescentipollenites* and *Densipollenites*). A Late Permian/Early-Middle Triassic age has been assigned to the Pali sediments on the basis of plant mega/microfossils. In this paper, a new palynofloral assemblage is recorded from Son River Section, Sohagpur Coalfield, M.P.

STRATIGRAPHIC SUCCESSION

The generalised lithological succession of the post-Barakar sequence, in the western part of the South Rewa Basin is given below (after Raja Rao, 1983; Mitra 1993; Tarafdar *et al.*, 1993; Bandhopadhyay, 1999) (Fig. 1).

MATERIALS

Nineteen outcrop samples were collected along the Son-River Section, near the confluence of Chundi River, about 2.8 km West of Nigal Village (Fig. 2). Sample details are given below (Fig. 3). Productive samples are asterisked *.

Age	Formation	Lithology
Late Cretaceous to Eocene	Deccan Trap	Basalt flow and dolerite dyke.
Late Cretaceous	Lameta Bed	White impure marl, pinkish to White sandstone.
Early to Middle Jurassic	Parsora	Coarse ferruginous sandstone, shale and lilac-coloured mudstone.
-----Unconformity-----		
Rhaetic	Tiki	Coarse grained sandstone, green sandstone, calcareous sandstone, grey feldspathic sandstone and lime pellet conglomerate.
Late Norian- Early Norian		
Middle Triassic Early Triassic	Upper Pali Member	Coarse to medium grained sandstone, green to yellow micaceous sandstone; grey siltstone to red-green mottled sandstone and carbonaceous shale.
Late Permian	Middle Pali Member	Greenish sandstone, grey shale, feldspathic sandstone, carbonaceous to coaly shale.
Middle Permian	Lower Pali Member	Medium grained ferruginous sandstone and red claystone.
Early Permian	Barakar	Feldspathic sandstone, shale and coal seams.

Fig. 1—Lithological succession of the Post-Barakar Sequence in western part of the South Rewa Basin (after Raja Rao, 1983; Mitra, 1993; Tarafdar *et al.*, 1993; Bandhopadhyay, 1999).

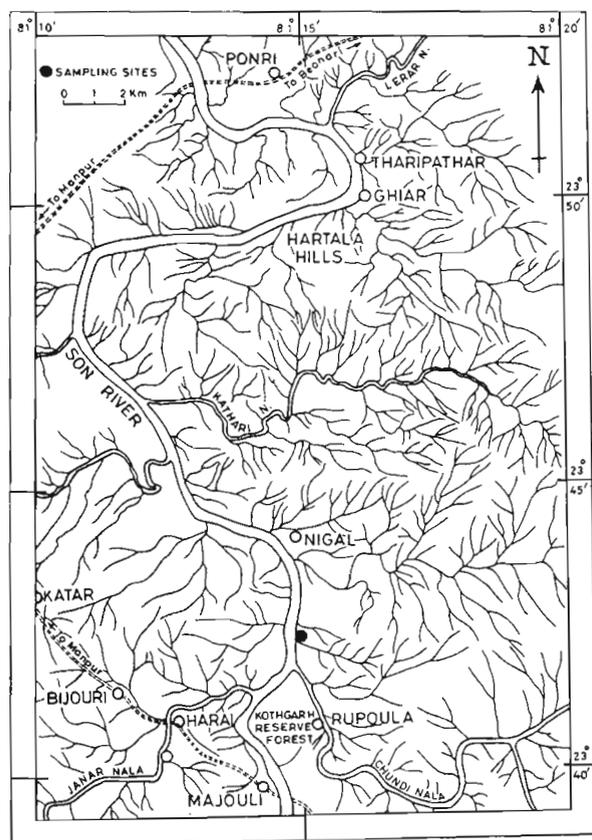


Fig. 2—Map of a part of Umariya Subdivision, Shahdol District, Madhya Pradesh, showing the sample site.

PALYNOLOGICAL COMPOSITION

Out of the 19 samples five samples yielded spore and pollen grains. The palynotaxa identified from the productive samples are given in Fig. 4.

Recovery of spore and pollen grains in all the productive samples is fair except in two samples (SCC-5 & 15). The percentage frequency of the productive samples is plotted in Fig. 5. All of the productive samples show a more or less similar pattern of spore/pollen frequencies; therefore, all are representing a single palynofloral assemblage (Assemblage-1). The assemblage is dominated by non-striate disaccate pollen—*Alisporites* (10.5%); *Falcisporites* (6.5%), *Krempipollenites* (6.5%)- in association with taeniate and striate bisaccate pollen taxa, viz., *Arcuatipollenites* (2.5%), *Striatopodocarpites* (1.5%) and *Faunipollenites* (1.5%). The other genera are : *Lundbladispora*, *Tikisporites*, *Densoisporites*, *Callumispora*, *Densipollenites*, *Hamiapollenites*, *Minutosaccus*, *Samaropollenites*, *Reticulatisporites*, *Chordasporites*, *Pretricolpipollenites*, *Convolutispora*, *Brachysaccus*, *Lycopodiumsporites*,

Satsangisaccites, *Nidipollenites* and *Goubinispora*; these comprise 0.5- 1% of the assemblage.

DISCUSSION AND CONCLUSIONS

The paucity of striate disaccates, taeniate and monosaccates (*Faunipollenites*, *Striatopodocarpites*, *Arcuatipollenites* and *Goubinispora*) and of cavate/cingulate trilete spore (*Densoisporites* and *Lundbladispora*) in Assemblage-I indicates that it belongs to the Panchet palynoflora of the Indian Peninsula. The Son-Chundi Confluence (SCC) palynoassemblage compares well with the Lower Triassic palynoflora described from the Sukri River Section, Auranga Coalfield (Maheshwari & Banerjee, 1975), with prominent *Falcisporites*, rare trilete spore and striate disaccate pollen grains. The Nidpur palynoflora (Bharadwaj & Srivastava, 1969; Tiwari & Ram-Awatar, 1990) is dominated by non-striate disaccate pollen (*Satsangisaccites*, *Falcisporites*, *Nidipollenites* and *Krempipollenites*) with sporadic occurrence of striate disaccate pollen viz., *Faunipollenites*, *Striatopodocarpites* and *Crescentipollenites*. It is comparable with SCC palynoassemblage to some extent; however, the occurrence of *Staurosaccites*, *Tikisporites*, *Brachysaccus*, *Samaropollenites* and *Minutosaccus* indicates that later assemblage is younger than the Nidpur palynoflora. The Late Triassic palynoassemblages recorded from the Denwa Formation, Satpura Basin (Nandi, 1996) and Tiki Formation (Tharipather and Ghiar and Janar Nala sections) South Rewa Basin (Maheshwari & Kumaran, 1979; Kumaran & Maheshwari,

Sample No.	Lithology	Thickness (m)
SCC-1	Fine grained sandstone	0.50
SCC-2*	Micaceous fine grained sandstone	0.50
SCC-3	Shale (grey)	0.25
SCC-4	Micaceous siltstone	0.50
SCC-5*	Micaceous siltstone	0.50
SCC-6*	Carbonaceous shale	0.50
SCC-7	Carbonaceous shale	0.50
SCC-8	Mudstone (grey)	0.75
SCC-9*	Mudstone (grey)	0.75
SCC-10	Mudstone (grey)	0.50
SCC-11	Shale	1.00
SCC-12	Mudstone	0.50
SCC-13*	Mudstone (grey)	1.00
SCC-14	Mudstone (chocolate colour)	1.00
SCC-15	Mudstone (chocolate colour)	1.50
SCC-16	Mudstone (chocolate colour)	0.50
SCC-17	Fine grained siltstone	1.00
SCC-18	Siltstone (green)	0.50
SCC-19	Siltstone (green)	1.50 section base

Fig. 3—List of samples.

Alisporites Daugherty emend. Jansonius, 1971**
Arcuatipollenites (partim *Lunatisporites*) Tiwari & Vijaya, 1995
Brachysaccus Madler, 1964*
Callumispora Bharadwaj & Srivastava emend. Tiwari *et al.*, 1989
Chordasporites Klaus, 1960*
Convolutispora Hoffmeister *et al.*, 1955
Cyclogranisporites Potonie & Kremp, 1954*
Crescentipollenites Bharadwaj *et al.*, 1974
Densipollenites Bharadwaj, 1962
Densoisporites (Weyland & Krisege) Dettmann, 1963*
Distriatites Bharadwaj, 1962*
Falcisporites Leschik emend. Klaus, 1963*
Faunipollenites Bharadwaj emend. Tiwari *et al.*, 1989
Goubinispora Tiwari & Rana, 1980*
Hamiapollenites Wilson emend. Tschudy & Kosanke, 1966
Horridiriletes Bharadwaj & Salujha, 1964
Krempipollenites Jansonius emend. Tiwari & Vijaya, 1994
Lundbladispota (Blame) Playford, 1965*
Lycopodiacidites Couper emend. Potonié, 1956*
Minutosaccus Mädler, 1964
Nidipollenites Bharadwaj & Srivastava, 1969*
Osmundacidites Couper, 1953
Playfordiaspora Maheshwari & Banerji emend. Vijaya, 1995
Pretricolpipollenites Bharadwaj, 1962
Reticulatisporites Ibrahim emend. Potonié & Kremp, 1954
Rhizomaspora Wilson, 1962
Samaropollenites Goubin, 1965*
Satsangisaccites Bharadwaj & Srivastava, 1969*
Staurosaccites Dolby in Dolby & Balme, 1976*
Striatopodocarpites Bharadwaj & Salujha, 1964**
Tikisporites Kumaran in Kumaran & Maheshwari, 1980*
Todisporites Couper, 1958
Weylandites Bharadwaj & Srivastava, 1969*

(* Are those Genera and Species which are given in Plate 1)

Fig. 4—Checklist of palynotaxa.

1980) contained non-striate disaccates in association with *Brachysaccus*, *Staurosaccites*, *Densoisporites*, *Tikisporites*, and *Samaropollenites*; it is therefore, broadly comparable with the present assemblage. However, the former assemblages contain taxa—*Camarzonosporites*, *Dictyophyllidites*, *Ringospora*, *Enzonalsporites* and *Aratrisporites*; these are indicative of a younger age than SCC palynoassemblage. The

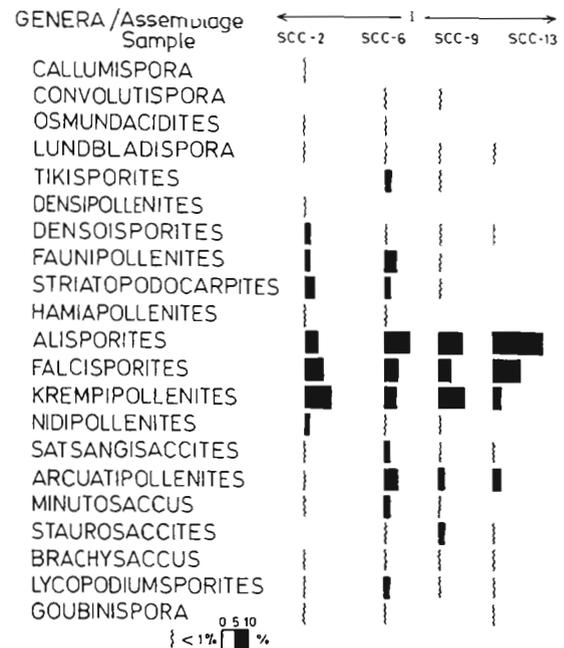


Fig. 5—Percentage frequency of significant spore-pollen taxa recovered from the Son River Section, district Shahdol, M.P.

Rajmahal palynoassemblage (Tiwari *et al.*, 1984; Assemblage Zone-A) and Krishna-Godavari palynozones (Prasad, 1997; Zone-IV) are partially comparable with the present assemblage, in view of being dominated by non-striate disaccate pollen and in their sporadic occurrence of *Brachysaccus*, *Densoisporites*, *Lundbladispota* and *Staurosaccites*. However, the presence of *Dubrajisporites*, *Rajmahalispota*, *Voltziacesporites* and *Enzonalsporites* makes the former assemblages younger than the Son-Chundi palynoassemblage.

There are differences of opinion regarding the age and order of super-position of the Pali and Tiki formations in the South Rewa Basin. Dutta and Ghosh (1993) considered that rock exposed around villages Pali, Bara Daigaon and Salaia in the south and between Kelhari and Tiki have similar lithological characteristics and association. Therefore, both

PLATE 1

(Photomicrographs are taken on Olympus Microscope, BH-2 Model, all the figures are enlarged ca x 500)

1. *Alisporites asansolensis* Maheshwari & Banerjee, 1975
2. *Falcisporites minutosaccus* Kumaran & Maheshwari, 1980
3. *Satsangisaccites nidpurensis* Bharadwaj & Srivastava, 1969
4. *Cyclogranisporites distinctus* Kumaran & Maheshwari, 1980
5. *Distriatites insculptus* Bharadwaj & Srivastava, 1969
6. *Alisporites indicus* Bharadwaj & Srivastava, 1969
7. *Goubinispora morondavensis* (Goubin) Tiwari & Rana, 1980
8. *Staurosaccites marginalisin* Maheshwari & Kumaran, 1979
9. *Brachysaccus ovalis* Mädler, 1964
10. *Falcisporites* sp. Klaus, 1963
11. *Densoisporites* cf. *D. playfordii* (Balme) Dettmann, 1963
12. *Nidipollenites monoletus* Bharadwaj & Srivastava, 1969
13. cf. *Lycopodiumsporites* sp. in Kumaran & Maheshwari, 1980
14. *Tikisporites balmei* Kumaran in Kumaran & Maheshwari, 1980
15. *Lundbladispota brevicula* Balme, 1963
16. *Chordasporites* sp. Klaus, 1960
17. *Striatopodocarpites ovatus* (Maheshwari) Tiwari & Rana, 1980
18. *Striatopodocarpites magnificus* Bose & Maheshwari, 1968
19. *Samaropollenites speciosus* Goubin, 1965

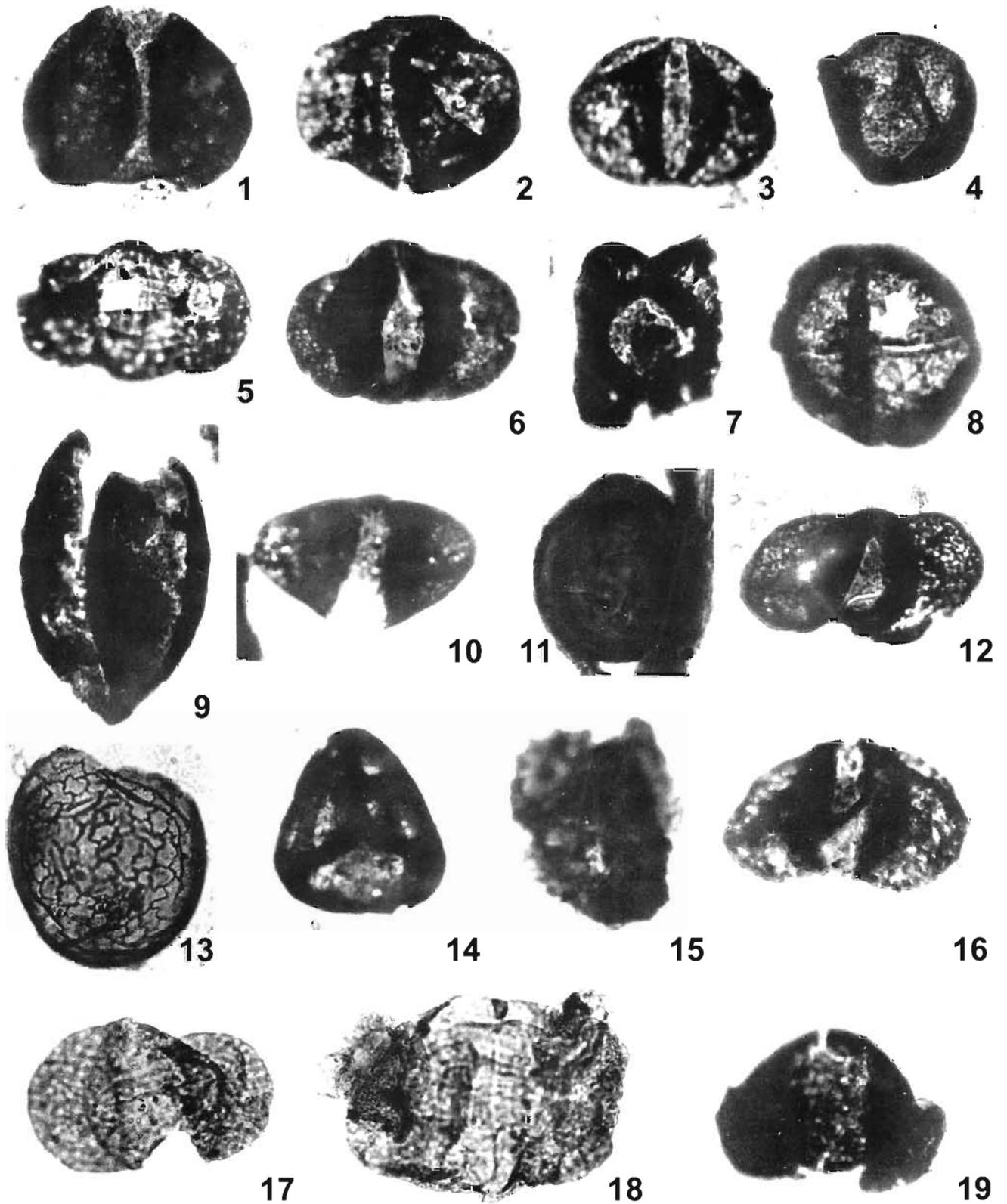


PLATE 1

formations may be coeval, spanning the latest Permian to Early-Middle Triassic. Bandhopadhyay (1999) did not favour grouping the Pali and Tiki formations, due to the presence of feldspathic sandstone and coal/carbonaceous shale in the former formation but not in the latter unit.

The palynoflora described from Tharipathar and Ghiar (Kumaran & Maheshwari, 1980) and the Janar Nala Section (Maheshwari & Kumaran, 1979) and vertebrate remains (*Metaposaurus malariensis*, *Paradapedon huxleyi*, *Phytosaurus malariensis*: Chatterjee & Roychowdhury, 1974) reveal the Carnian-Norian age of the Tiki Formation. Moreover, palynotaxa recorded from the Chundi River Section and the tract between Kelhari and Tiki areas (Ram-Awatar, 1997) have been dated as Late Permian/Early-Middle Triassic, showing these sediments to be equivalent to the Upper Member of the Pali Formation. The present palynological data from the Upper Pali Member (Son-Chundi confluence), also suggest similarities between the Pali and Tiki formations. However, it is premature to predict that the Pali and Tiki formations are age equivalents, as more palynological and other evidences are required. Therefore, it is concluded that the strata hosting the SCC palynoflora were deposited during Early to Middle Triassic and may represent the lower part of the Tiki Formation, as recognised from the western part of the South Rewa Basin, M.P.

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