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Palynodating of subsurface coal measures from Mahadoli area, Wardha Valley Coalfield, Maharashtra, India

A.P. BHATTACHARYYA AND O.S. SARATE

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 007, India.
Email: ossarate@hotmail.com & ananta_pb@yahoo.com

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ABSTRACT

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Two palynoassemblages have been recorded from the Permian Sequence of Mahadoli area (Borehole WM-14), Wardha Valley Coalfield, Maharashtra. The older palynoassemblage A is *Scheuringipollenites* dominant while the younger palynoassemblage B is characterized by *Parasaccites-Densipollenites* along with striate bisaccates, *Falcisporites* and *Satsangisaccites*. Correlation with palynoassemblages of other coaliferous basins of India and the age of subsurface sediments have been discussed.

Key-words—Palynoassemblage, Barakar, Permian, Wardha Valley Coalfield, India..

भारत के महाराष्ट्र प्रान्त के वर्धा कोयला क्षेत्र के महाडोली में अवस्थित कोयला क्षेत्र से प्राप्त उपपृष्ठीय कोयला संस्तर का परागाणविक आयु निर्धारण

अनन्त प्रसाद भट्टाचार्य एवं ओम प्रकाश शिवदास सराटे

सारांश

महाराष्ट्र के महाडोली क्षेत्र अवस्थित वर्धा घाटी कोयला क्षेत्र (वेध छिद्र डब्ल्यू.एम.-14) के परमियन अनुक्रम से दो परागाणु समुच्चय अंकित किए गए। अपेक्षाकृत प्राचीन परागाणु समुच्चय ए में *श्यूरिंगीपोलेनाइटीज़* की प्रमुखता है, जबकि अपेक्षाकृत नवीन परागाणु समुच्चय बी में स्तरी द्विसकोषियों, *फ़ाल्सिस्पोराइटीज़* तथा *सत्संगीसैक्काइटीज़* के साथ-साथ *पैरासैक्काइटीज़-डेन्सीपोलेनाइटीज़* की प्रचुरता है। भारत की अन्य कोयला धारी द्रोणियों के परागाणु समुच्चयों के साथ इसके सहसम्बन्धन तथा उपपृष्ठीय अवसादों की आयु के विषय में विस्तृत चर्चा की गयी है।

संकेत शब्द—परागाणु समुच्चय, बराकर, परमियन, वर्धा घाटी कोयला क्षेत्र, भारत।

INTRODUCTION

THE Wardha Valley Coalfield has recently emerged as one of the main resource for coal exploration through Open Cast Mining. The main coal centers are localized in Chandrapur and Yeotmal Districts of Maharashtra. The Directorate of Geology and Mining, Government of Maharashtra is presently engaged in coal exploration in Mahadoli area, (longitudes 78°54'15" and 20°21'45" latitudes) for the possibilities of coal reserves in the virgin tracts of the Coalfield through subsurface study. General stratigraphic succession of Wardha Valley Coalfield, Maharashtra is given below [after Raja Rao, 1982 (fig. 1)]

Age	Group/Formation	Lithology
Recent	----------	Alluvial gravel beds, black cotton soil
? Eocene	Deccan Trap	Basalt
Cretaceous	Lameta Formation	Limestones, cherts and silicified sandstones
		----------Unconformity--------
Upper Triassic	Maleri Formation (only in the south-eastern extremity)	Fine to medium-grained sandstones and red shales
Upper Permian-Lower Triassic	Kamthi Formation	Red, brown and variegated sandstones, reddish siltstones and variegated shales
		---------Unconformity---------
Lower Permian	Barakar Formation	Light grey to white sandstones, Shales and coal seams
? Upper-Carboniferous-Lower Permian	Talchir Formation	Tillites, turbidites, varves, needle shales and sandstones
		---------Unconformity---------
Precambrian	Sullavi Sandstones	White to light brown quartzitic sandstones, conglomerates
		----------Overlap----------
	Pakhal Limestones	Grey, bluish or pinkish limestones and cherts
		----------Unconformity--------
Archaean		Quartzites, granite gneises, etc.

Fig. 1—Generalised stratigraphic succession of Wardha Valley Coalfield.

The borehole passes through Deccan Traps, Lameta, Kamthi and Barakar formations. Grey shale, sandstone, clay and carbonaceous shale characterize the Barakar sediments. The present study has been carried out in order to establish palynological succession and its correlation with other Gondwana Basins of India.

The location of the borehole WM-14 is shown in Fig. 3 and the lithological succession present in the borehole is shown in Fig. 2.

Two palynoassemblages have been recorded from borehole WM - 14. The distribution and frequency of spores and pollen of stratigraphic importance have been plotted (see Fig. 4) to show their relative abundance through the entire depth of the borehole. Some important spores and pollen have been illustrated in Pl. 1.

Palynoassemblage—A

Occurrence—Borehole WM –14 (at 106-118 m depth).

Lithology—Grey shale, Carbonaceous shale, Fine-grained sandstone.

Scheuringipollenites (32%-26%) is dominant in this assemblage (see Fig. 4) followed by *Ibisporites* (10%). The taxa *Rhizomaspora* (8%) and *Primuspollenites* (8%-3%) are frequently met within this assemblage. Monosaccate genera are represented by *Parasaccites* with maximum occurrence of 18 per cent along with *Caheniasaccites*, (11%). Other monosaccates are *Virkkipollenites*, *Crucisaccites* and *Potonieisporites*. Trilete spores are represented only by *Verrucosisporites*. *Tiwariasporis* is present up to 118 m depth. Amongst striate bisaccate pollen, *Striatites* and *Striatopodocarpites* are subdominant forms. *Weylandites* and *Ginkgocycadophytus* are found to be 3% each.

The occurrence of spores and pollen at 125 m is meager, hence the percentage frequency could not be estimated. However, on the basis of taxa present, this level is considered to represent a part of the palynoassemblage A.

Palynoassemblage—B

Occurrence—Borehole WM-14 (at 66·25-76·00 m depth).

Lithology—Micaceous sandstone, Carbonaceous shale.

The palynoassemblage is characterized by the dominant presence of *Parasaccites* (21%) along with striate bisaccate genera *Striatopodocarpites* and *Faunipollenites* (15%, each). *Falcisporites* (5%) and *Satsangisaccites* (6%) have also been recorded, along with other nonstriate genera, such as *Alisporites* (2%) and *Platysaccus* (3%). Other monosaccate genera, viz., *Potonieisporites* (3%) and *Densipollenites* (9%) also record their fair occurrence in this assemblage.

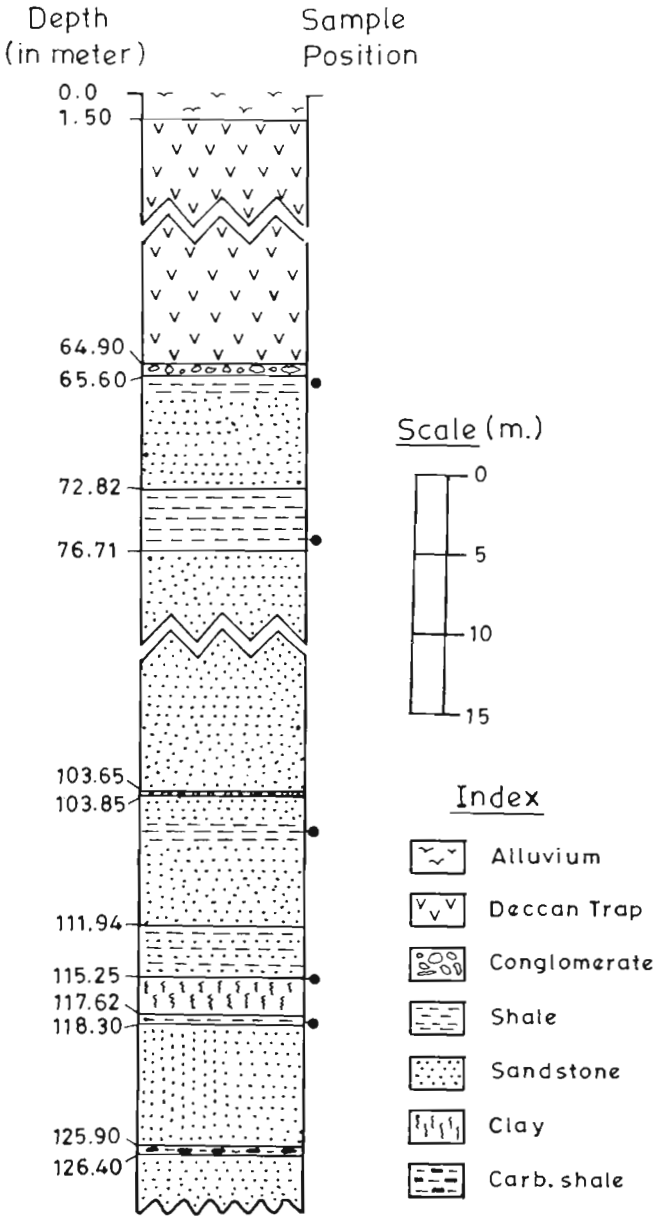

Fig. 2—Showing the levels of yielding samples in the lithological succession

The shale at 76·00 m depth contains lesser frequency of spores and pollen grains but since it contains *D. magnicorpus* (2%), it is preferred to retain it in Palynoassemblage B.

COMPARISON

A *Scheuringipollenites* dominant mioflora has been reported from the lower part of the Barakar Formation in Damodar Basin, Son Mahanadi Basin, Satpura Basin and Godavari Valley coalfields but in the present assemblage it is associated with *Parasaccites* (18%) along with *Caheniasaccites* (11%) and *Primuspollenites,* thus having a close affinity with Lower Barakar mioflora reported from Godavari Valley coalfields by Srivastava and Jha (1989, 1998). *Scheuringipollenites* dominant zone has also been recorded from Pathakhera Coalfield, Satpura Basin, Sarate (1986). Agashe and Chitnis (1972) reported Lower Barakar palynoflora from Hindustan-Lalpet Colliery containing dominance of *Brevitriletes* and *Scheuringipollenites*. Similar palynoflora has been recorded by Agashe and Geetha (1979) from Kamptee Coalfield with dominant *Scheuringipollenites* and striate bisaccate taxa but the present assemblage differs in the presence of monosaccate taxa *Parasaccites* and *Caheniasaccites* in high percentage. The present assemblage is comparable to the palynozone –V of Tiwari and Tripathi (1992).

The Palynoassemblage - B is characterized by the presence of *Striatopodocarpites* and *Faunipollenites* (15% each) along with *Scheuringipollenites* in low percentage. However, *Parasaccites* (21%) and *Densipollenites* (9%), the monosaccate genera are prevalent. The occurrence of *Densipollenites magnicorpus* along with striate bisaccates is well established in Late Permian mioflora of Damodar Basin. However, *Falcisporites* and *Satsangisaccites* suggest younger aspect of the palynoassemblage. The recurrence of *Parasaccites* with striate bisaccate has been reported from Godavari Valley and Supra Barakar Formation in the Son Mahanadi Valley also. The Palynoassemblage – B is closely comparable to Palynozone – 9 of Middle member of Kamthi Formation in Godavari Valley (Srivastava, 1992). Similar palynoassemblages have also been recorded from Jaipuram area (Assemblage in the borehole GJP-1; Srivastava & Jha, 1992), Ramakrishnapuram area (in borehole GJRK- 25), Bhopalpalli area (Palynoassemblage – III, Srivastava & Jha, 1998), Johilla Coalfield, Son Valley (Tiwari & Ram-Awatar 1989), and from Supra Barakar sediments in Son Valley (Assemblage – 5; Tiwari & Ram-Awatar, 1987). The occurrence of

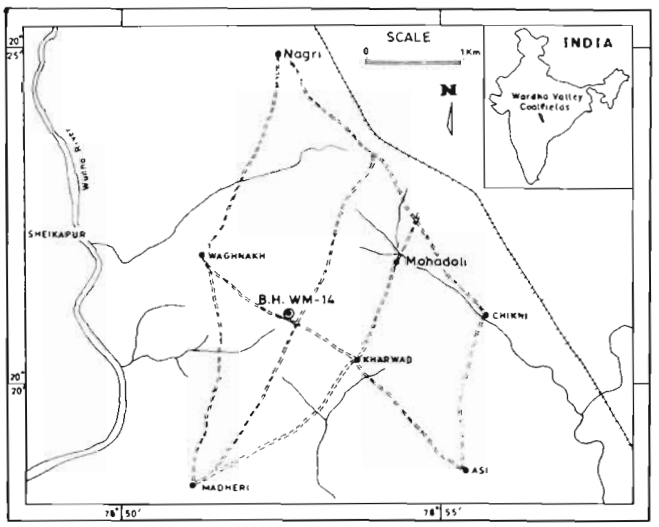

Fig. 3—Showing the location of Borehole WM- 14 (DGM, Nagpur)

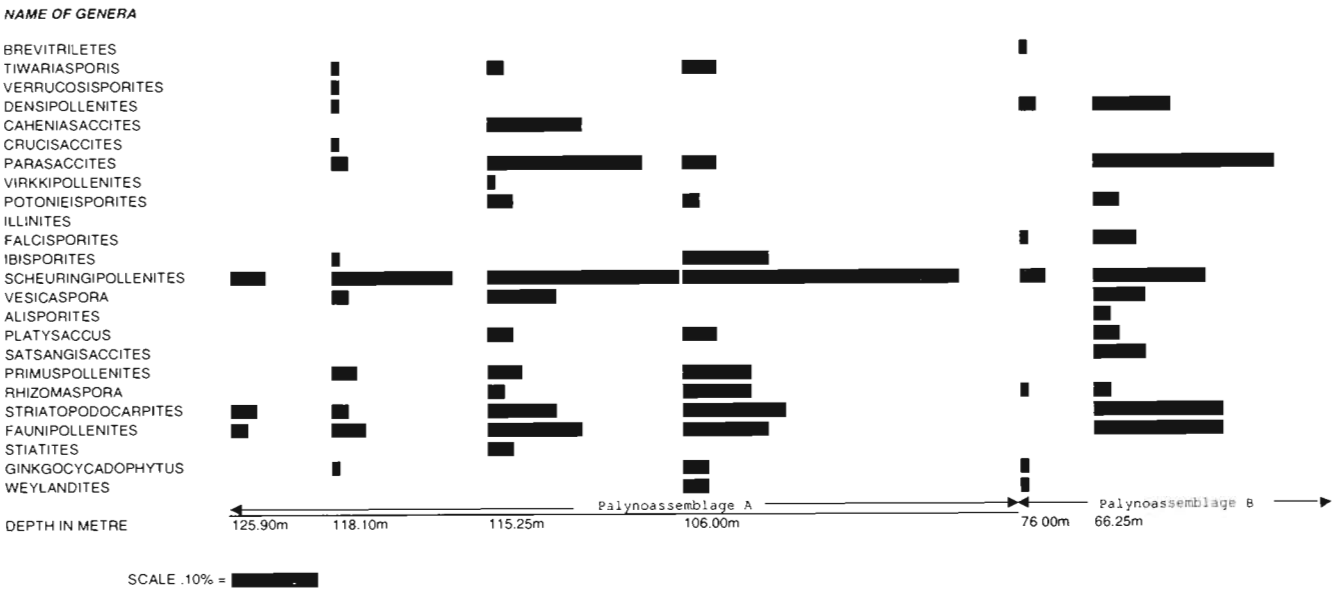

Fig. 4—Frequency distribution of important spores and pollen in the Borehole WM – 14, Mahanadi area, Wardha Valley Coalfield, Maharashtra

Parasaccites in high percentage is known from Talchir Formation. Hence, it is possible that Wardha Valley Coalfield experienced a prolonged cooler climate. A cool climate has also been suggested during Upper Permian and Lower Panchet by Tiwari and Tripathi (1988). However, *Callumispora* has not been observed in the present assemblage. A Permo-Triassic plant microfossil assemblage from sediments of glacial origin have also been reported from Sri Lanka (Dahanayaka *et al.*, 1989).

CONCLUSION

In Mahadoli area, two palynoassemblages have been recorded (Palynoassemblage A & B) below the Deccan Traps, which represent Lower Barakar and Lower Panchet palynofloras, respectively. The absence of intervening palynoassemblages of the Upper Permian could be explained envisaging a break in sedimentation after Lower Barakar. The presence of a Boulder Conglomerate bed at 103·65-103·85 m depth substantiates this observation. The presence of Barakar palynoflora is an indication for the occurrence of Lower Gondwana coals in Mahadoli area, Maharashtra.

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PLATE 1

(All magnifications x ca 500, unless otherwise mentioned. All photomicrographs have been taken in DIC). Coordinates have been stated with respect to England Finder Readings.

1. *Psilalacinites* sp. Slide No. BSIP 12581 (0 43/3).
2. *Anapiculatisporites* sp. Slide No. BSIP 12582 (R 3/1).
3. *Leiotriletes* sp. Slide No. BSIP 12581 (U 24/4).
4. *Scheuringipollenites tentulus* Slide No. BSIP 12581 (P 33/2).
5. *Rhizomaspora indica* Slide No. BSIP 12584 (J 36).
6. *Cuneatisporites majus* Slide No. BSIP 12586 (N 3/32).
7. *Alisporites* sp. Slide No. BSIP 12587 (P 58/3).
8. *Satsangisaccites* sp. Slide No. BSIP 12587 (P 58/3).
9. *Distriatites bilateralis* Slide No. BSIP 12582 (W 41).
10. *Arcuatipollenites* sp. Slide No. BSIP 12584 (J /44).
11. *Illinites disectus* Slide No. BSIP 12583 (J 47/2).
12. *Falcisporites stabilis* Slide No. BSIP 12586 (N /32).
13. *Plicatipollenites indicus* Slide No. BSIP 12583 (K 39/4).
14. *Primuspollenites singrauliensis* Slide No. BSIP 12586 (R /61).
15. *Tiwariasporis flavatus* Slide No. BSIP 12585 (L 53/2).
16. *Brevitriletes unicus* Slide No. BSIP 12583 (U /56).

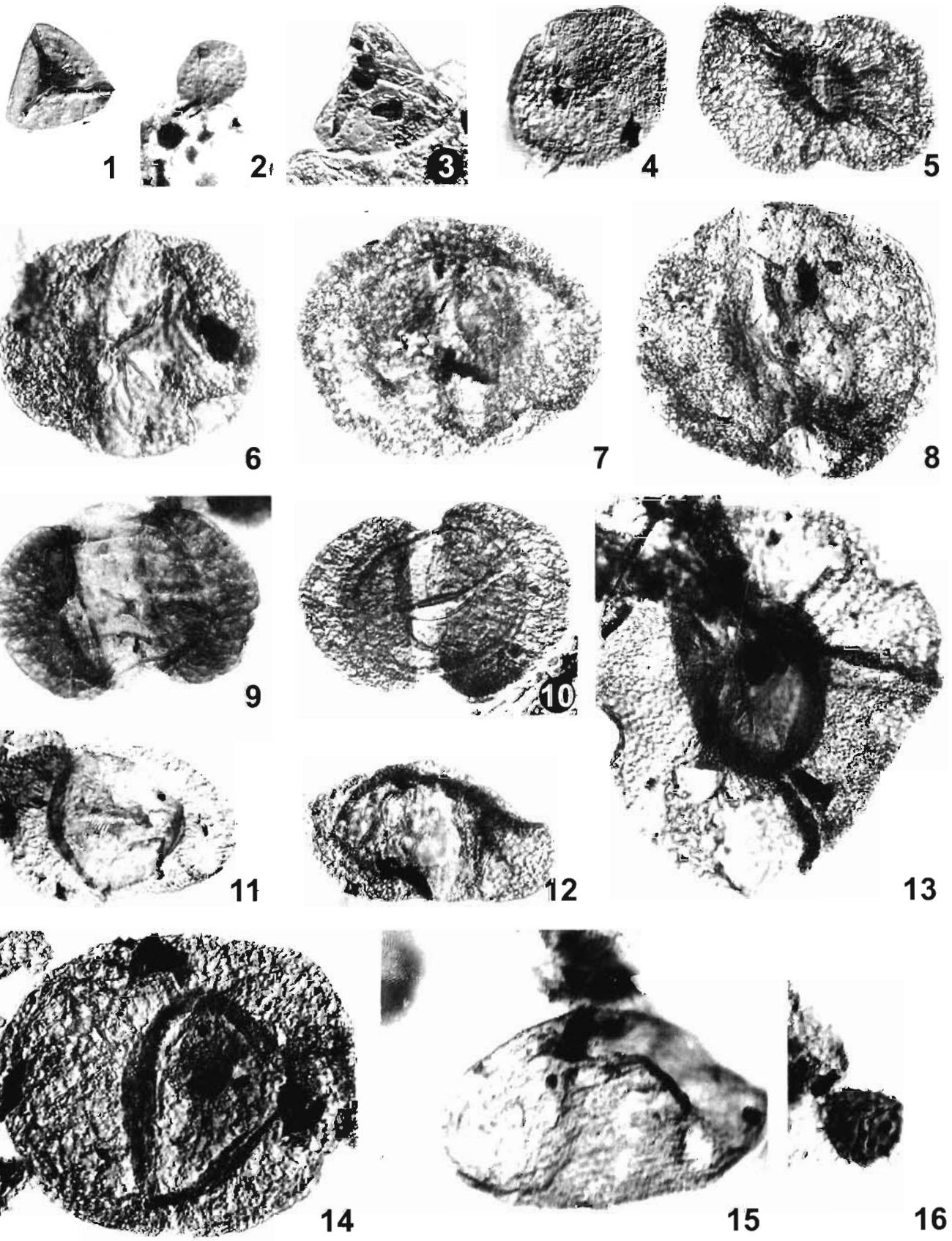

PLATE 1

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