PALYNOLOGICAL STUDIES OF JATRAJ SEAM, KORBA COALFIELD, M. P., INDIA

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ABSTRACT

Jatraj seam is one of the thickest coalseams in India. A palynological investigation of the upper major-portion of this seam has revealed the presence of 51 miospore genera and 113 species. Detailed quantitative analysis has demonstrated the pattern of distribution of various miospore genera through this huge coal deposit. An average frequency suggests the incidence of *Scheuringipollenites*, *Ibisporites*, *Striatopodocarpites* and *Faunipollenites* and other striate in order of prominence, which indicates a late Barakar (late Lower Permian) affinity for the seam. On the other hand, the occurrence of *Corisaccites*, *Hindisporis*, *Singraulipollenites*, *Verticipollenites*, *Guttulapollenistes*, *Schizopollis*, *Weylandites*, etc., although in rarity, might suggest an younger age. The pteridophytic influence is derived at the closing phase of the seam due to incoming and increase of trilete genera.

INTRODUCTION

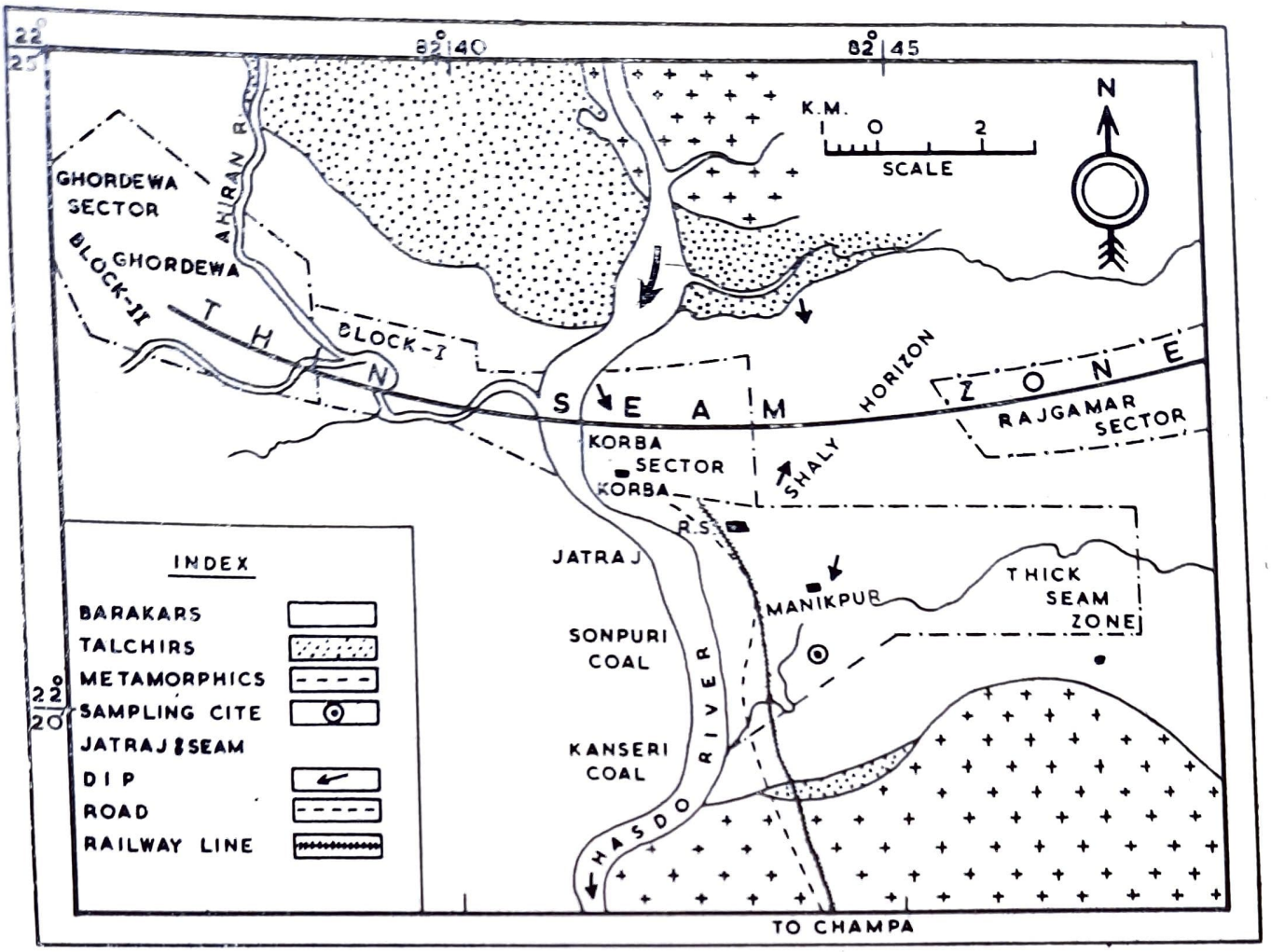
Palynological investigation of the coals in Korba Coalfield was first taken up by Bharadwaj and Tiwari in the year 1964, who established correlation of coalseams on the basis of bore-core study in three sectors of this coalfield. Later, Tiwari (1964, 1965), Bharadwaj and Tiwari (1970), Bharadwaj and Srivastava (1973), and Srivastava (1973) studied the morphotaxonomy of the miospores, megaspores and also their stratigraphic distribution in the Lower Permian sediments of this coalfield.

Bharadwaj and Srivastava (1973) based their analysis on samples from a 689 metre bore-core in this coalfield, which also included one sample (over all sample: 33.48 m thick) of Jatraj seam—the seam which has been studied in the present work from an outcrop in an open quarry.

GEOLOGY

Korba Coalfield is situated in Bilaspur district of Madhya Pradesh (Map 1). It is 5 to 16 km wide, 64 km long, and spread over an area of nearly 520 sq km. The occurrence of coalseams in this area was first reported in 1870 by W. T. Blanford. Fox in 1934 surveyed this region and estimated the coal reserves. During nineteen-fifties, the Geological Survey of India did extensive exploratory work in this region which resulted in the present day development of the coalfield.

The archaeans form the basement for Gondwana deposits in this coalfield. The main formations are Talchir and Barakar (Lower Permian), the still younger horizon being absent. Barakar Formation consists mainly of sandstones, shales and coal seams, occurring over almost the entire area of the coalfield; it is considerably thick being about 900 to 950 m. The Barakar Formation is divided into three zones: Lower, Middle and the Upper. The coalseams occur only in the Lower and Upper Barakar which are separated by a thick sandstone with pebble-bed zone constituting the Middle Barakar. The Lower Barakar strata, about 350 m thick, contains nearly eight thin



Sketch Plan of a Part of Korba Coalfield.. Map 1

coalseams while the Upper Barakar, ca 450 m thick, contains as many as 12 seams including the thick Jatraj and Upper Jatraj seams. These zones of coal occurrence have been usually referred to as "Thin seam zone" and "Thick seam zone" respectively. The Lower Barakar sediments are exposed over the northern part while the Upper Barakars are mainly exposed over the southern part of the coalfield (Map 1; CFRI, 1956, 1961).

The Jatraj seam has been found to occur within shallow, quarriable depths with an average thickness of 25 to 30 metre in the Pilot Quarry and Manipur Area. The present palynological study is based on the coals of Jatraj seam from the quarry in Manikpur Block (Map 1). Fifty-five footwise overall channel samples, from top to 55th feet depth, exposed at the time of collection, were collected from the quarry. The coal was mainly low grade having dull coal at 7th and 8th foot level. and shale at 19th and 20th foot level. Out of fifty-five samples, fifty have yielded miospores.

SPORAE DISPERSAE

The following genera have been encountered in the section worked out, of which some of the important forms are illustrated in Plates 1 & 2. The identifications are made upto the specific level but the details shall be given elsewhere; how-

ever, most of the species are well known from the Barakar sediments. Following is the list of important genera :

Triletes

Laevigates

Leiotriletes (Naum.) Pot. & Kr., 1954; *Callumispora* Bharad. & Sriv., 1969; *Hennellysporites* Tiw., 1968.

Apiculates

Acanthotriletes (Naum.) Pot. 4 Kr; 1954; *Lophotriletes* (Naum.) Pot. & Kr., 1954; *Horriditriletes* Bharad. & Sal., 1964; *Cyclogranisporites* Pot. & Kr., 1954; *Brevitriletes* Bharad. & Sriv., 1969 emend. Tiw. & Rana, 1981; *Microbaculispora* Bharad., 1962; *Microfoveolatispora* Bharad., 1962; *Lacinitriletes* Venkatach. & Kar, 1965.

Zonate-Cingulates

Dentatispora Tiw., 1964; *Indotriradites* Tiw., 1964.

Aletes

Hemisphaeridum Hemer. & Nyg., *Hindisporis* Bharad. & Sinha, 1969; *Leiosphaeridia*, *Singraulipollenites* Sinha, 1969; *Pilasporites* Balme & Henn., 1956.

Monoletes

Laevigatosporites Pot. & Kr., 1954; *Tetraporina* Naum., 1950.

Monosaccates

Parasaccites Bharad. & Tiw., 1964; *Barakarites* Bharad. & Tiw., 1964; *Striamonosaccites* Bharad., 1962. *Divarisaccus*, Venkatach. & Kar, 1966; *Potonieisporites* Bhard. emend. Bharad. 1964.

Non-striated Disaccates

Scheuringipollenites Tiw., 1973; *Platysaccus* (Naum.) Pot. & Kl., 1954; *Cuneatisporites* Lesch., 1955; *Ibisporites*, Tiw., 1968; *Vesicaspora* Schem. emend. Wilson & Venkatach., 1963; *Tetrasaccus* Maithy, 1965; *Guttulapollenites* Goubin, 1965 emend. Venkatach., Goubin & Kar, 1967.

Striated Disaccates

Corisaccites Venkatach. & Kar, 1966; *Rhizomaspora* Wilson, 1962; *Primuspollenites* Tiw., 1964; *Striatites* Pant, 1955 emend. Bharad., 1962; *Striatopodocarpites*, (Soritsch. & Sed.) Bharad., 1962; *Faunipollenites* Bharad., 1962; *Lahirites* Bharad., 1962; *Hindipollenites* Bharad., 1962; *Verticipollenites* Bharad., 1962; *Circumstriatites* Lele & Makada, 1972; *Crescentipollenites* Bharad., Tiw. & Kar, 1974.

Colpates

Schizopollis Venkatach. & Kar, 1964 *Ginkgocycadophytus* Samoil., 1953; *Distriamonocolpites* Bharad. & Sinha, 1969; *Striapunctites* Venkatach. & Kar, 1962; *Weylandites* Bharad. & Sriv., 1969; *Ephedripites* Bolchowit., 1953

DISTRIBUTION PATTERN OF SPORAE DISPERSAE

The assemblage of the Jatraj seam studied here consists of 51 genera and 113 pecies. The generic percentage obtained by detailed, sample-wise, quantitative study of the succession have been categorised in to the following five groups :

1. *Very rare* : Present but not enountered in counting; 2. *rare:* 1% or less; 3. *common* : more than 1% upto 10%; 4. abundant : more than 10% upto 25%; 5. *dominant* : above 25%.

The frequency analysis suggests that the following genera are dominant in the overall assemblage (Fig. 1.) : *Scheuringipollenites, Ibisporites, Striatopodocarpites, Faunipollenites.*

Following genera are abundant, although restrictedly, towards the top of the seam—*Lophotriletes, Horriditriletes.* Rare and inconsistant genera are: *Gondisporites, Ephedripites, Weylandites,? Corisaccites, Distriomonocolpites, Barakarites, Hemisphaeridium;* and very rare forms are: *Potonieisporites, Tetrasaccus, Tetraporina, Leicsphaeridia, Singrauli-pollenites.* The remaining genera are recorded to be of common occurrence.

The overall sequential quantitative representation of the miospore genera reveals that *Scheuringipollenites* and *Ibisporites* in spite of minor fluctuation in their incidences, are dominating in overall behaviour. *Striatopodocarpites* and *Faunipollenites* are interchangeable; however, the former genus remains more prominent than the latter in most of the samples studied here. However, group wise, the striated disaccate when considered combinedly equate or exceed the non-striated disaccates.

The trilete genera (non-Cavate) exhibit an interesting distributional pattern. From below, at the level of Sample No. 38 they appear for the first time but do not become consistant till about middle of the studied-run, i. e. Sample No. 38. Thereafter in the closing phase of the seam, the trilete genera gradually increase in kind and number till they become abundant in the top-most seven samples, i. e. Sample Nos. 7 to 1.

The alete spores do not show any constant and regular distribution pattern; however, relatively speaking, towards the closing phase of the seam they also appear to be more common.

It is, therefore, concluded that the prominence of nonstriate disaccate genera (*Scheuringipollenites* & *Ibisporites*) along with striate disaccate genera (*Striatopodocarpites-Faunipollenites*) is the main feature of Jatraj assemblage which is reflected in almost all the samples individually as well as in the overall average percentage (Fig. 1). The consistancy of similar group of genera is, however, qualified with the distribution of trilete spores which are absent in the lower half and abundant towards the top of the run.

AGE OF THE JATRAJ SEAM

The stratigraphical position of the seam as determined by the general sequence of strata in Korba Coalfield, is designated to be in the Barakar Formtation. The palynological evidence supports the permian age but conclusion for precise placement within the Permian is a matter of discussion. However, the data is being provided through the present study for such comparisons, as follows:

During the last two decades, a large amount of palynostratigraphic data has come to light, covering the Talchir, Karharbari, Barakar, Barren Measures and the Raniganj formations of the Lower Gondwana in India.

In the mioflora of Talchir Formation (lowermost Permian), the girdling monosaccate genera (*Plicatipollenites-Parasaccites* group) overdominate the miofloral scene, and, hence, the presently studied Jatraj mioflora has no resemblance whatsoever with it (LELE & KARIM, 1971; LELE, 1975; BHARADWAJ & SRIVASTAVA, 1973; SRIVASTAVA, 1973a, 1973b). Similarly, in the Karharbari (Lower Permian) mioflora the girdling monosaccate complex further diversifies and a new prominence is gained by the characteristic genus *Callumispora* (MAITHY, 1965; BHARADWAJ & SRIVASTAVA, 1973; SRIVASTAVA, 1973a, 1973b; TIWARI, 1973a; LELE & MAKADA, 1974). Both these groups of miospore are almost negligible in Jatraj Seam.

Regarding Barakar (late Lower Permian) miofloras, TIWARI (1974a) has given a comprehensive synthesis, recognising three palynological zones in this stage.

The Jatraj seam mioflora studied here corresponds with the upper portion of the middle zone and lower portion of the upper zone (TIWARI, 1974a) of Barakar succession of miofloras in having the prominence of *Scheuringipollenites*, *Striatopodocarpites* and *Faunipollenites*. By closer comparison with the Barakar assemblages (TIWARI, 1974a; Table 1) placement of Jatraj seam mioflora in late Barakar Stage is apparent. When we go into details, certain elements, viz. aletes (*Singraulipollerites*, *Peltacystia*, *Hemisphaeridium*, etc.), *Cori-Guttulapollenites* complex, and *Verticipollenites* complex, etc., tend to indicate its affinity with Jhingurdah seam which has been lately dated as Raniganj in age (TIWARI & SRIVASTAVA, 1984). On the otherhand, the late Permian assemblages (Barren Measures and Raniganj) differ in having certain genera, e. g. *Densipollenites*, *Indospora*, *Thymospora*, *Gondisporites*, etc., which are not on record from the Jatraj-seam-mioflora, presently studied. It may be mentioned that these genera are characteristic for the Damodar Basin and Korba Coalfield is in the Son-Valley Basin. Indications are coming now for a basinal variability regarding there taxa; *Densipollenites* and *Gondisporites* may be present in the still younger horizon in Central India deposits while the other two genera are probably absent. Thus, a probability of the Jatraj seam of being Raniganj equivalent is not ruled out. The barren zone between the 'thin seam zone' and 'thick seam zone' might represent the Barren Measures equivalent of this area.

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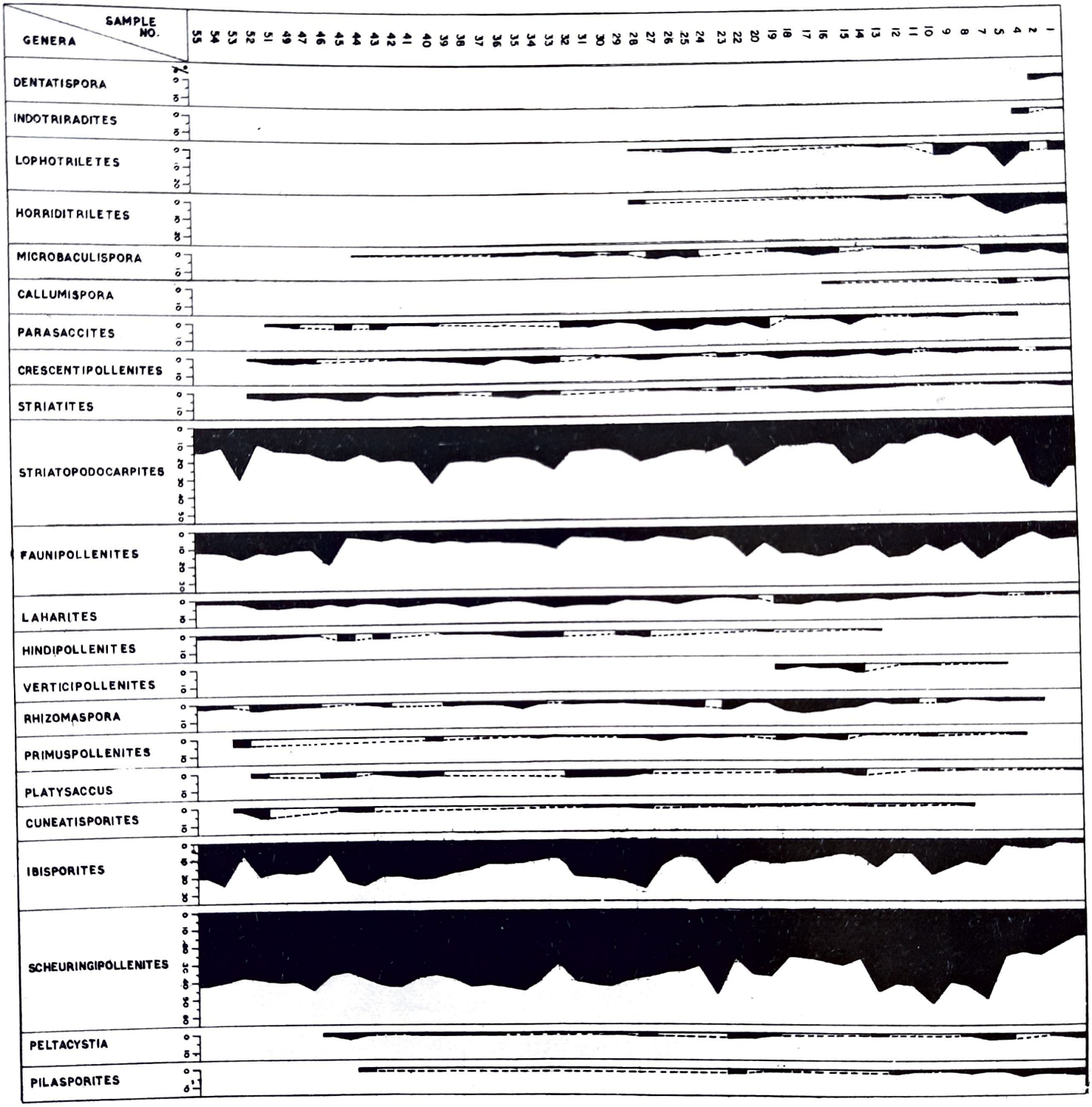
FIG. 1.

Distribution pattern of important miospore genera in the upper major portion of Jatraj seam, Korba Coalfield.


GENERA
SAMPLE NO.
55 54 53 52 51 49 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 20 19 18 17 16 15 14 13 12 11 10 9 8 7 5 4 2 1
%
DENTATISPORA
INDOTRIRADITES
LOPHOTRILETES
HORRIDITRILETES
MICROBACULISPORA
CALLUMISPORA
PARASACCITES
CRESCENTIPOLLENITES
STRIATITES
STRIATOPODOCARPITES
FAUNIPOLLENITES
LAHARITES
HINDIPOLLENITES
VERTICIPOLLENITES
RHIZOMASPORA
PRIMUSPOLLENITES
PLATYSACCUS
CUNEATISPORITES
IBISPORITES
SCHEURINGIPOLLENITES
PELTACYSTIA
PILASPORITES

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EXPLANATION OF PLATES

(All figures are ×500)

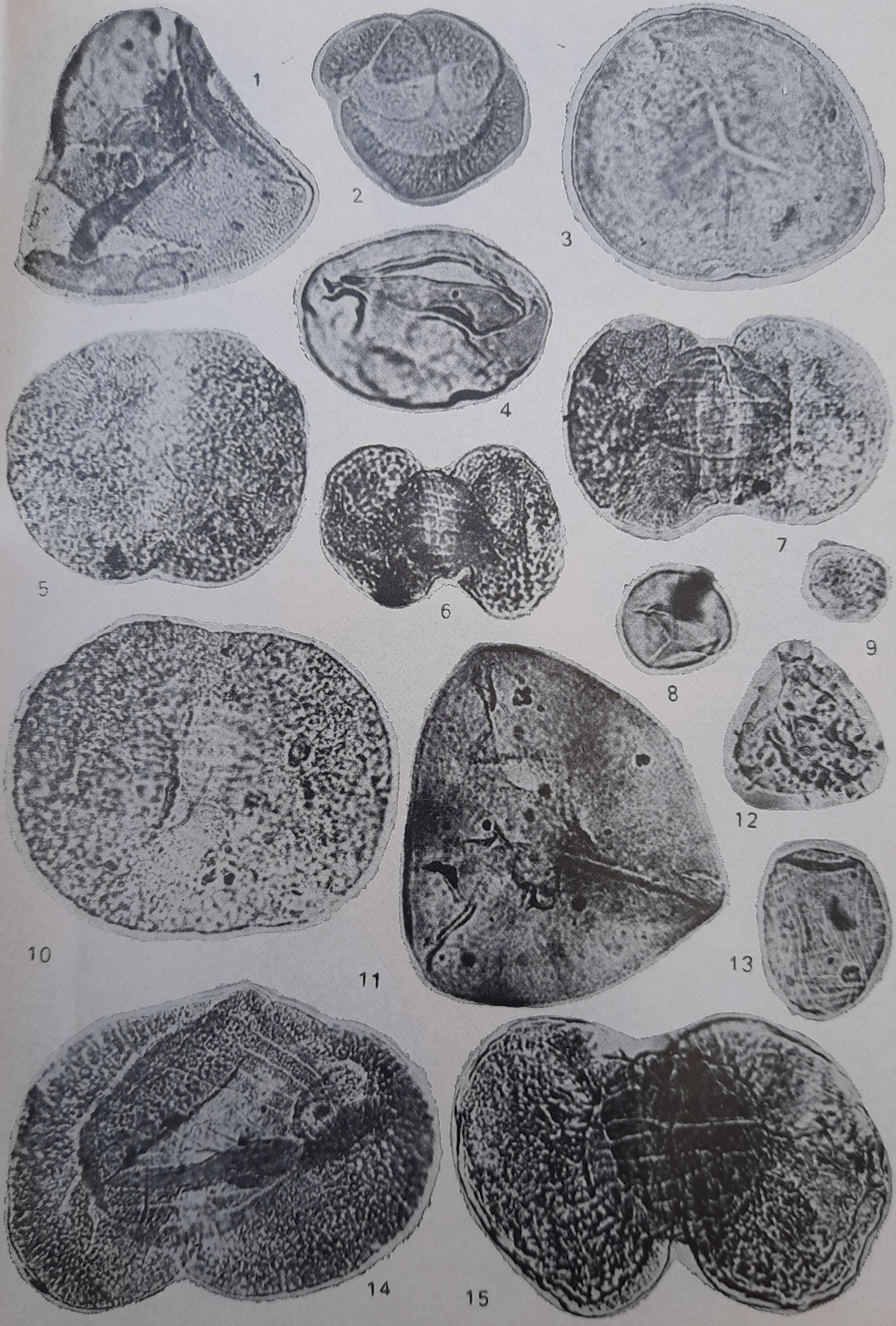
Plate 1

1. *Microbaculispora gondwanensis* Bharad., Ph. no. 35/5.
2. *Guttulapollenites hannonicus* Goubin emend. Venkatch., Goubin & Kar., Ph. no. 31/32.
3. *Callumispora tenuis* Bharad. & Sviv., Ph. no. 38/3.
4. *Laevigatosporites colliensis* Balme & Henn. Ph. no. 28/18.
5. *Vesicaspora distincta* Tiw., Ph. no. 6/19.
6. *Striatites subtilis* Bharad. & Sal. ; Ph. no. 29/1.
7. *Crescentipollenites fuscus* (Bharad.) Bharad., Tiw. & Kar; Ph.no. 2/7.
8. *Hennellysporites diversiformis* (Balme & Henn.) Tiw. ; Ph. no. 30/22.
9. *Brevitriletes levis* (Balme & Henn.) Bharad. & Sriv, ; Ph. no. 37/21.

10. *Faunipollenites varius* Bharad., Ph. no. 35/35.
11. *Microfoveolatispora bokaroensis* Tiw., Ph. no. 30/2.
12. *Horriditriletes novus* Tiw.; Ph. no. 36/34.
13. *Weylandites indicus* Bharad. & Sriv., Ph. no. 36/31.
14. *Striatopodocarpites magnificus* Bharad. & Sal. ; Ph. no. 35/22.
15. *Lahtrites* sp. *cf L. rarus* Bharad. & Sal., Ph. no. 28/6.

PLATE 2

16. *Rhizomaspora* sp. Ph. no. 30/5.
17. *Scheuringipollenites maximus* (Hart) Tiw.; Ph. no. 1/6.
18. *Cuneatisporites exiguus* Salujha; Ph. no. 1/10.
19. *Striasulcites* sp. Ph. no. 35/14.
20. *Tetraporina* sp. cf. *T. superba* Maheshw. & Bose; Ph. no. 30/33.
21. *Schizopollis distinctus* Sinha; Ph. no. 32/10.
22. *Leiosphaeridia simplex* Sinha; Ph. no. 26/21.
23. *Singraulipollenites* sp. cf. *S. indicus* Sinha; Ph. no. 30/1 J
24. *Tetrasaccus karharbarensis* Maithy, Ph. no. 33/24.
25. *Peltacystia venosa* Balme & Segroves, Ph. no. 32/28.
26. *Circumstriatites* sp. Ph. no. 22/35.
27. *Barakarites indicus* Bharad. & Tiw.; Ph. no.7/27.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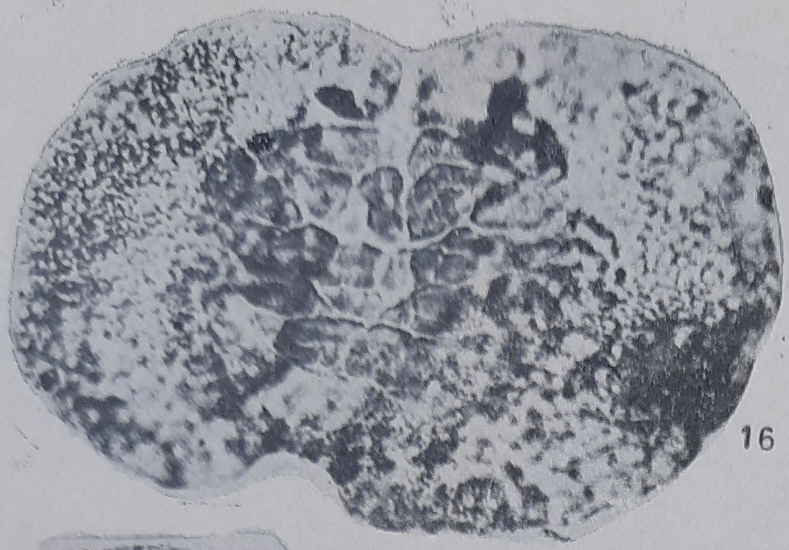
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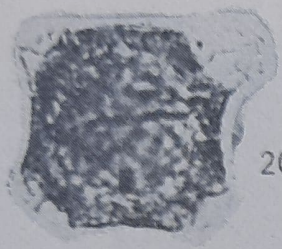
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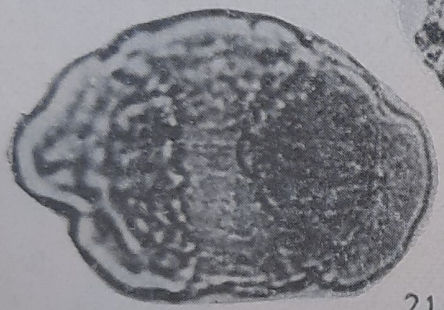
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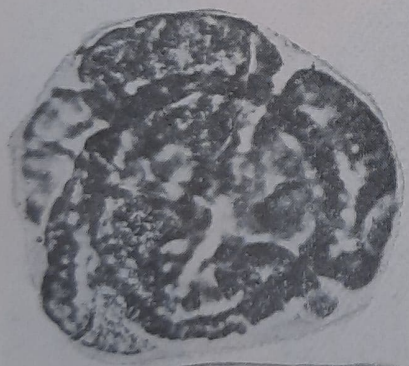
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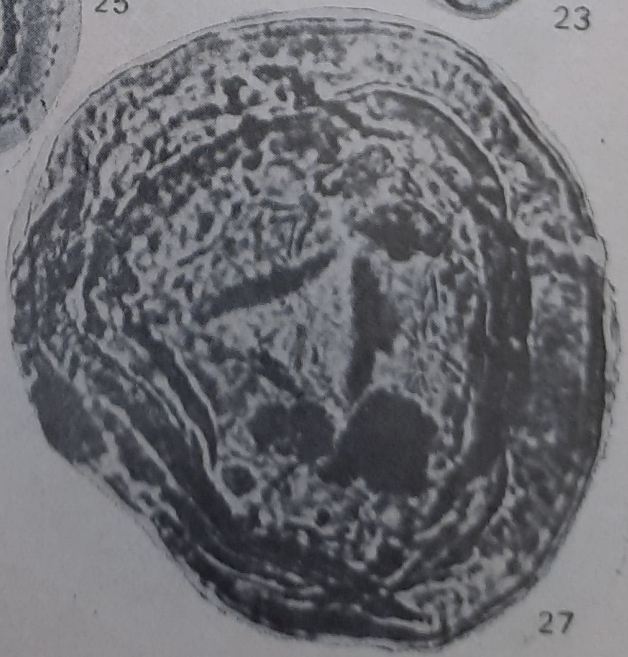
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