

# *Sporae dispersae* and correlation of Gondwana sediments in Talcher Coalfield, Son-Mahandi Valley, Orissa

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Meena K.L. 2003. *Sporae dispersae* and correlation of Gondwana sediments in Talcher Coalfield, Son-Mahanadi Valley, Orissa. *Geophytology* 31(1&2): 105-109.

The sediments in bore holes TP-9 and TP-10 have been analysed palynologically for understanding palynological changes through Supra-Barakar, Barakar and Karharbari formations in Talcher Coalfield. The quantitative analysis of the palynoflora revealed the presence of three assemblage zones in TP9 and two in TP10. The youngest assemblage is marked by high frequencies of *Arcuatipollenites* and *Lundbladispora*. The other associated taxa are *Densoisporites*, *Playfordiaspora*, *Ringosporites*, *Goubinispora*, *Osmundacidites*, *Concavissimispores*, *Cyathidites* and *Alisporites* which represent Late Early-Triassic assemblage in Talcher Coalfield. The next older assemblage is dominated by *Striatopodocarpites* and *Faunipollenites*. The other important taxa recovered in this assemblage are *Crescentipollenites*, *Verticipollenites*, *Guttulapollenites*, *Cyclobaculisporites*, *Reticulatisporites*, *Potonietriradites*, *Horriditriletes*, *Navalesporites*, and *Weylandites*. The flora shows Late Permian affiliation. The oldest assemblage has dominance of *Faunipollenites* along with *Striatopodocarpites-Scheuringipollenites*. The assemblage reveals Late Barakar affinity.

**Key-words**—Palynology, Permian, Triassic, Talcher Coalfield.

## INTRODUCTION

THE Talcher Coalfield has been investigated intensively during the recent years in search of additional coal reserves in unexplored areas. Earlier the palynological investigations centered around the mining areas (Das 1958; Bharadwaj & Srivastava 1969; Navale & Srivastava 1971; Srivastava 1984). During the last decade this work has been extended to new areas in western part where prospecting continued by the coal exploration agencies (Tiwari *et al.* 1991; Tripathi 1993).

The palynological investigation carried out here relates to Patrapara block in the Talcher Coalfield where two bore cores TP-9 (715.20m deep) and TP-10 (839.00 m deep) were drilled by Mineral Exploration Corporation Ltd. (Map) which have lithologically intersected Supra-Barakar, Barakar and Karharbari formations (Fig.1). The contact between Barakar and Supra-Barakar is considered to be nonconformable. The latter is also often referred to Kamthi Formation, a time transgressive unit in Son-Mahanadi basin.

Tripathi (1996) studied the subsurface Supra-Barakar sequence in bore-hole TP-8 from the north-eastern region, near Tentuloi village in Chendipara Block and recorded Late Permian and Early Triassic palynoassemblages. The palynological data differed considerably from the lithologically identified horizons.

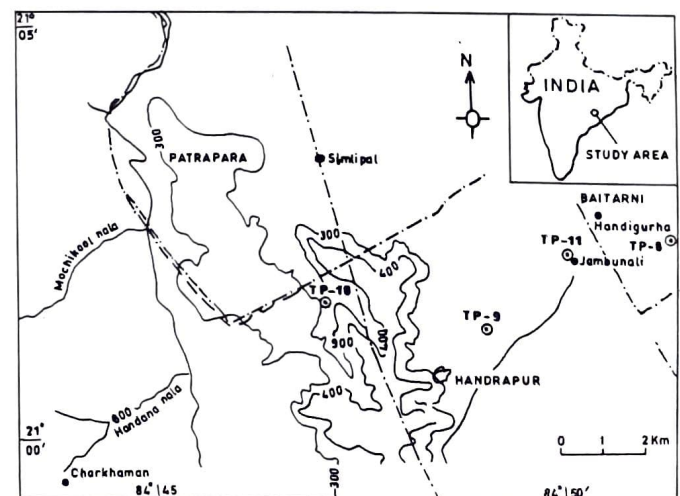
The depth of pollen yielding samples is given in

Tables-1 and 2. Out of 168 samples analysed, 24 have yielded palynomorphs.

The quantitative composition of the assemblage in bore holes TP-9 and TP-10 has been determined by counting 200 well preserved specimens each in sample (Plate 1).

## Bore hole TP-9

53 samples were taken for analysis from bore hole TP-9 of which 10 sample yielded palynomorphs. Three distinct palyno assemblages have been recognised on



Map. Showing location of bore holes TP-8, TP-9 and TP-10 in Talcher Coalfield (after Raja Rao 1982).

**Table 1. Details of pollen yielding samples in bore-core TP-9 from Talcher Coalfield showing lithological and palynological assignments.**

Sample No.	Depth (metres)	Lithology	Group/Formation	Palynological Zones
2	259.00	Sandy shale	Supra-Barakar (Kamthi)	Late Early Triassic
10	278.00	V. coarsesst	-do-	-do-
12	280.50	-do-	-do-	-do-
20	318.09	Coal	Barakar Formation	Raniganj
44	442.40	Carb. shale	-do-	-do-
49	446.40	Sandy shale	-do-	-do-
58	466.00	Coal	-do-	-do-
71	495.00	Carb. shale	-do-	-do-
92	649.63	Sandy shale	Karharbari Formation	-do-
93	715.20	Sandy shale	-do-	Upper Barakar

**Table 2. Details of pollen yielding samples in bore-core TP-10 from Talcher Coalfield showing lithological and palynological assignments.**

Sample No.	Depth (metres)	Lithology	Group/Formation	Palynological Zones
5	308.00	Grey shale	Supra-Barakar (Kamthl) Fm.	Late Early Triassic
6	338.00	Sand stone	-do-	-do-
7	352.80	Grey shale	-do-	-do-
14	383.50	Sandy shale	Barakar Fm.	Upper Barakar
17	386.53	Grey shale	-do-	-do-
20	440.70	Carb. shale	-do-	-do-
35	627.00	Coal	-do-	-do-
36	634.50	Grey shale	-do-	-do-
41	645.00	Sandy Shale	-do-	-do-
55	729.00	Sandstone	-do-	-do-
66	788.00	-do-	Karharbari Fm.	-do-
72	839.00	-do-	-do-	-do-
74	842.00	-do-	-do-	-do-
76	858.50	-do-	-do-	-do-

the basis of percentage frequency distribution.

*Assemblage I*: It is encountered at the depth of 715.20 metres and shows the prominence of striate disaccate *Faunipollenites*, *Striatopodocarpites* and subdominance of *Scheuringipollenites*. In totality the assemblage does not reveal Karharbari affiliation as demarcated lithologically, rather it is closely comparable with Barakar palynozone. (*Scheuringipollenites*

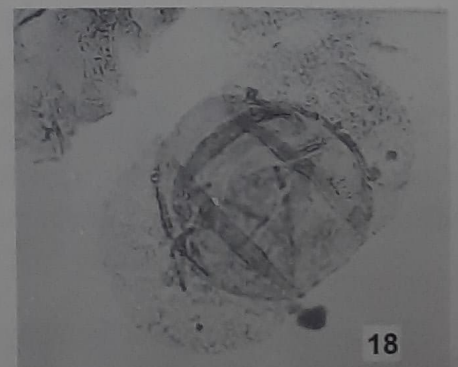
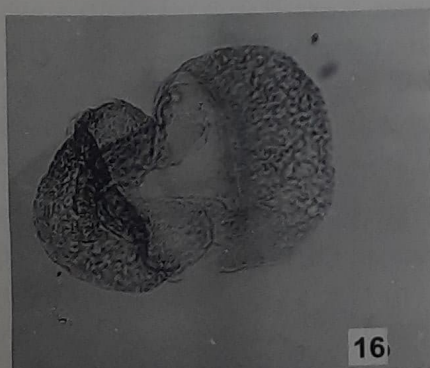
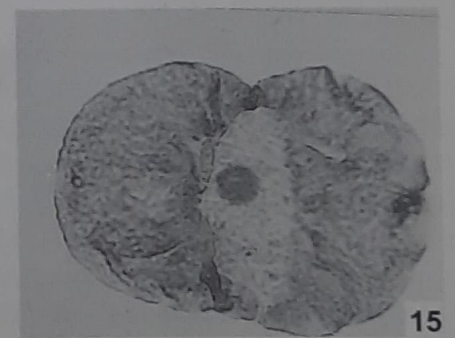
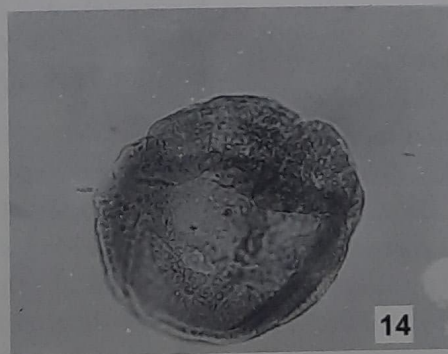
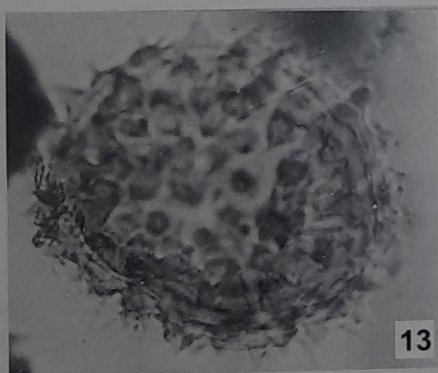
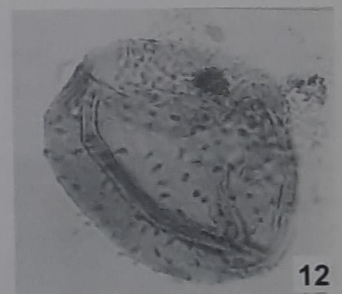
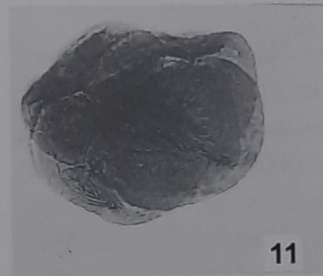
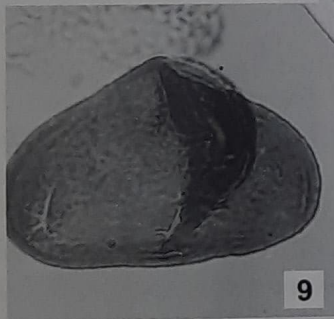
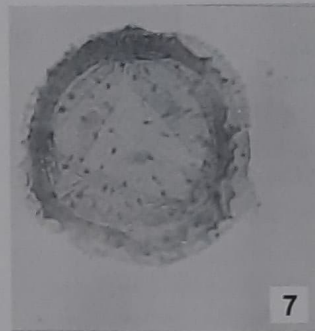
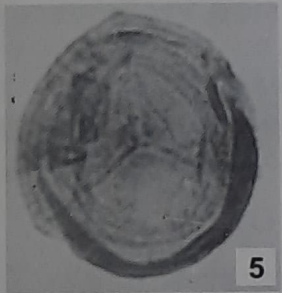
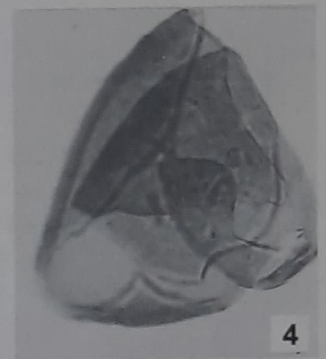
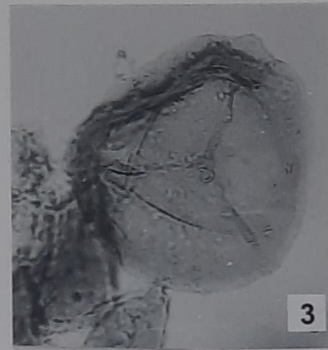
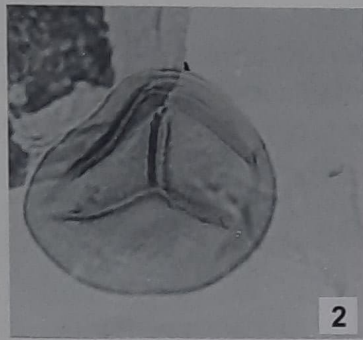
*barakarensis* Assemblage Zone-Tiwari & Tripathi 1992).

*Assemblage II*: The sediments between 649.63 to 300.09 m have yielded rich striate disaccate *Striatopodocarpites* in association with *Faunipollenites*. The genus *Densipollenites* is present in appreciable quantity. The other important taxa recorded are *Crescentipollenites*, *Guttulapollenites*,

### PLATE-1

(All photomicrographs magnified x 500)

- |            |  |     |  |
|------------|--|-----|--|
| 1.         | <i>Leiotriletes conspicuus</i> , slide no. BSIP 12056      | 9.  | <i>Novisporites magnus</i> , slide no. BSIP 12056          |
| 2.         | <i>Verrucosporites protumulusus</i> , slide no. BSIP 12056 | 11. | <i>Guttulapollenites hannonicus</i> , slide no. BSIP 12059 |
| 3.         | <i>Lundbladispora brevicula</i> , slide no. BSIP 12057     | 13. | <i>Osmundacidites pilatus</i> , slide no. BSIP 12060       |
| 4.         | <i>Foveosporites triassicus</i> , slide no. BSIP 12057     | 14. | <i>Osmundacidites panchetensis</i> , slide no. BSIP 12060  |
| 5,7,10,12. | <i>Lundbladispora microconata</i> , slide no. BSIP 12058   | 15. | <i>Striatites notus</i> , slide no. BSIP 12056             |
| 6.         | <i>Densoisporites playfordii</i> , slide no. BSIP 12058    | 16. | <i>Arcuatipollenites</i> , slide no. BSIP 12057            |
| 8.         | <i>Densoisporites playfordii</i> , slide no. BSIP 12058    | 17. | <i>Parasaccites obscurus</i> , slide no. BSIP 12058        |
|            |  | 18. | <i>Arcuatipollenites rhombicus</i> , slide no. BSIP 12059  |



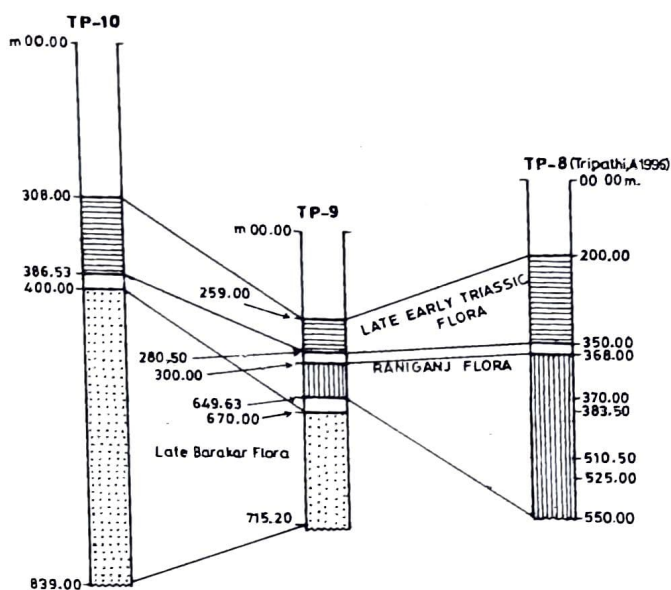


Fig. 1 : Composite diagram to show palynological correlation at the passage of Supra Barakar - Barakar - Karharbari Formations

*Cyclobaculisporites*, *Verticypollenites*, *Reticulatisporites*, *Potonieitiradites*, *Horriditriletes*, *Navalesporites*, and *Weylandites*. The dominance of striat bisaccates and the qualitative composition of the assemblage is indicative of Raniganj (Late Permian) affiliation rather than Barakar assemblages (*Densipollenites magnicarpus* Assemblage Zone-Tiwari & Tripathi 1992).

**Assemblage III:** The assemblage between 259.00 to 280.50 m shows high frequency of *Arcuatipollenites* and *Lundbladispora*. The other associated taxa are *Densoisporites*, *Playfordiaspora*, *Ringosporites*, *Goubinispora*, *Osmundacidites*, *Concavissimisporites*, *Cyathidites*, and *Alisporites*. The monosaccate genus *Parasaccites* together with *Plicatipollenites* shows high frequency at 278.00 and 280.50 m depth. The presence of acritarchs in appreciable frequency is noteworthy.

The palynosemblage III correlates with *Playfordiaspora cancellosa* Assemblage zone defined by Tiwari and Tripathi (1992); and Assemblage P-IIIB of Tiwari and Singh (1986) from Raniganj Coalfield indicating early Triassic miofloral assemblage.

### Bore hole TP-10

75 samples were taken for analysis from bore hole TP-10, of which 14 samples yielded palynomorphs.

**Assemblage I-** The assemblage between 839.00 to 400.00 m and shows dominance of *Faunipollenites* together with *Striatopodocarpites*. The other taxa present are *Scheuringipollenites*, *Distriatites*, *Crescentipollenites*, *Striamonosaccites*, *Densipollenites*, *Horriditriletes*, and *Latosporites*. This assemblage reveals Upper Barakar affinity when compared with Assemblage-I of TP-9.

**Assemblage II-** The assemblage at 385 m and above shows dominance of *Arcuatipollenites* and *Lundbladispora* along with *Densoisporites*, *Playfordiaspora*, *Ringosporites*, *Goubinispora*, and *Alisporites*. The assemblage is similar to Assemblage III of bore hole TP-9, representing early Triassic.

## DISCUSSION

The sediments drilled in bore-cores TP-9 and TP-10 were differentiated into Karharbari, Barakar and Supra-Barakar based on lithological attributes, the Barakar being the principal coal-bearing horizon. However, the palynofloral composition indicates the presence of Barakar (715.2 m), Raniganj (649.6 - 300.09 m) and Panchet (280.5 - 259.00 m) equivalent palynozones in bore-hole TP-9. In bore-hole TP-10 Barakar palynozone continues from 839 to 400 m while Panchet equivalent palynozone occurs above 385 m. Thus the correlation between already known lithological parameters and palynofloral composition does not exist altogether (Tables 1 & 2). Barren Measures palynozone has not been observed in any of the two bore cores.

In bore core TP-9 the transition from Barakar to Raniganj occurs at 649.63 m, the Barren Measures being absent. The strata between 649.63 to 670.28 m represent period of non-deposition. The discordance at this level appears to be disconformable. The Raniganj sediments continue above up to 285.50 m and further up Supra Barakar (Panchet) sediments occur up to the surface. The transition from Raniganj to Panchet is conformable. The strata between 670.28 and 715 m belonging to Barakar contain no coal, but the strata between 670.28 and 280.50 m belonging to Raniganj Formation contain 11 coal seams of workable thickness.

In bore core TP-10 the entire sequence from 839.0 to 400.0 m corresponds to Barakar sediments while the sediments above 385 m have yielded Panchet equivalent palynoflora. Thus there is a total absence of Barren Measures and Raniganj palynozones in between. The

lithological change at 366.82 m may be considered true in the above context but there is no indication of any break in sedimentation.

The sequence of bore hole TP-9 correlates to some extent with bore hole TP-8 drilled in the adjoining Chendipara block but all the three bore holes, i.e. TP-8, TP-9 and TP-10 (Fig.1) from east to west do not contain similar sequence. The discordance in strata may be attributed to already known faults between them.

### ACKNOWLEDGEMENT

I am grateful to Prof. A.K. Sinha, Director, Birbal Sahni Institute of Palaeobotany, Lucknow for granting permission to publish the paper. I am also grateful to Dr. S.C. Srivastava and Dr. A.K. Srivastava of Birbal Sahni Institute of Palaeobotany, Lucknow for their valuable suggestions. I am thankful to the authorities of Geological Survey of India, Kolkata, for help in collection of material.

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