SPOROLOGICAL ANALYSIS OF SOME COAL AND CARBONACEOUS SHALES FROM BARREN MEASURE STAGE (LOWER GONDWANA) OF INDIA

D. C. BHARADWAJ, S. C. D. SAH & R. S. TIWARI
Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

Sporological analysis of some coal and carbonaceous shales from Sibbabudih and Katri nalas in Jharia Coalfield has been done and the Sporae dispersae have been referred to 32 genera. A generic quantitative analysis has shown that the genus Striatopodocarpites is dominating while Lophotriietes, Densipollenites, Striatites, Faunipollenites and Sulcatisporites are fairly well represented. This miospore assemblage has been compared with those from the younger and the older beds in Damuda Series of Lower Gondwana of India.

INTRODUCTION

THE study of Sporae dispersae in the Lower Gondwana formations of India has received much attention during the last decade. The spore and pollen contents of various sediments pertaining to most of the different stages in Lower Gondwanas have been studied in detail. Thus the studies of Talchir Stage by Potonié & Lele (1961), Karharbari Stage by Maithy (1965), Barakar Stage by Bharadwaj & Tiwari (1964) and Tiwari (1965) and Raniganj Stage by Bharadwaj (1962) and Bharadwaj & Saluja (1964, 1965) have provided detailed sporological data for these stages. The mioflora of the Barren Measure (Ironstone Shales) Stage so far not known, is being given in the present preliminary study.

Geology — The Damuda Series in the Jharia Coalfield has been subdivided into three groups of strata —

- Raniganj Stage
- Barren Measures (Ironstone Shales)
- Barakar Stage

The material for the present study was collected from the carbonaceous shale outcrops exposed along the Katri and the Sibbabudih nalas in the Jharia coalfield. The Katri nala exposing east of Bhelataur village are composed of black shales alternating with medium-grained, highly ferruginous and micaceous sandstones. Far downwards along the nala the carbonaceous shales were found alternating with pebbly sandstones. The beds dip at about 18° towards South.

The Sibbabudih nala exposes a very good section of the Barren Measures. Here also, a number of carbonaceous shales as well as thin coalseams are seen alternating...
MATERIAL AND METHODS

The material for the present palynological study came from the surface exposures of thin coal seams in Sibbabudih nala and shales in Katri nala (Barren Measurre) of the Jharia Coalfield, Bihar, India, collected by D. C. Bharadwaj and S. C. D. Sah in 1957. The samples investigated are B. S. I. P. 354/31048-31050, 31052-31054 from Katri nala and B. S. I. P. 355/31055-31063 from Sibbabudih nala.

For maceration about 50 gms. of material was taken from each sample and treated with HNO₃ (Comm.) for 4 days. After washing with water, it was heated to 90° C. in 10 per cent KOH and then washed with water. Some samples required an initial treatment with Hydroflouric acid to remove the fine silt which otherwise interfered in the study of spores. The slides were prepared in Glycerine Jelly following the usual procedure and for all samples, one thousand specimens were counted from a number of slides.

MIOFLORA

The mioflora found in the coals and shales consists of diversified forms of spores and pollen grains. These miospores have been assigned to 32 genera (after BHARADWAJ, 1962, BHARADWAJ & TIWARI 1964 and TIWARI, 1964) out of which the following are significant ones:

- Lophotriletes
- Horriditriletes
- Microbaculispora
- Cyclobaculisporites
- Gondisporites
- Densipollenites
- Barakarites
- Striomonosaccites
- Striatis
- Rhizomaspora
- Lahirites
- Lunatisporites
- Striatoledencarpites
- Verticipollenites
- Hindipollenites
- Faunipollenites
- Vesticaspora
- Sulcatisporites

The following genera although rare are also found and are qualitatively significant:

- Punctatisporites
- Indolriradites
- Reticulatisporites
- Potomiesporites
- Parasaccites
- Iljinites

The remaining miospore genera given below are sporadic:

- Leiottretes
- Cyclogranisporites
- Verrucosisporites
- Apiculatisporites
- Latosporites
- Platysaccus
- Welwitschiapites
- Vittatina

Representatives of some of the important genera are illustrated on Plates 1-3.

Quantitative Analysis — The quantitative analysis of this assemblage reveals that Striatopodocarpites is the most dominating genus of all, being 29.4 per cent in the samples from Sibbabudih nala and 35.3 per cent in those from Katri nala. Other miospore genera characteristically prominent in their average frequency (Histogram I) are:

<table>
<thead>
<tr>
<th></th>
<th>Sibbabudih Nala (SBB)</th>
<th>Katri Nala (KTR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lophotriletes</td>
<td>6.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Densipollenites</td>
<td>4.1</td>
<td>12.0</td>
</tr>
<tr>
<td>Striatis</td>
<td>3.3</td>
<td>4.7</td>
</tr>
<tr>
<td>Faunipollenites</td>
<td>27.0</td>
<td>23.6</td>
</tr>
<tr>
<td>Sulcatisporites</td>
<td>14.1</td>
<td>12.7</td>
</tr>
</tbody>
</table>

The following genera are mostly rarely represented as revealed by their average frequency:

- Punetatisporites
- Horriditriletes
- Microbaculispora
- Cyclobaculisporites
- Gondisporites
- Barakarites
- Striomonosaccites
- Rhizomaspora
- Lahirites
- Lunatisporites
- Vesticaspora
- Verticipollenites
- Hindipollenites

Some of the qualitatively significant rare genera show the following percentage frequency:
The remaining genera show more or less similar incidences in the samples from both the localities, and the overall pattern of the miospore distribution is very similar.

MIOFLORISTIC COMPARISONS

The miospore flora of the Raniganj Stage is well understood from the works of Bharadwaj (1962), Bharadwaj & Salujha (1964, 1965) and Salujha (1965).

Most of the genera found in the present assemblage are reported from the Raniganj Stage. However, the following genera though only rarely present in these samples from Barren Measures are significant in so
far as they are not known from the Raniganj Stage:

- *Indotriradites*
- *Potonieisporites*
- *Illinites*
- *Rhizomaspora*

The meagre occurrence of these genera in the Barren Measures (the present assemblage), their absence in the overlying Raniganj beds but their prominence in one or all of the underlying strata, i.e. in Barakar, Karharbari and Talchir sediments, suggest that in the Barren Measures, these particular genera reach their end-points.

The following genera though found in the Raniganj Stage (although rarely) are absent from the present assemblage.

- *Eupunctisporites*
- *Anapiculatisporites*
- *Lycopodiumsporites*
- *Gravisporites*
- *Punctatosporites*
- *Verrucososporites*
- *Distriomonosaccites*

The sediments of Barakar Stage have been sporologically worked out by many workers. However, the studies by Bharadwaj & Tiwari (1964) and Tiwari (1964, 1965) provide detailed information for comparison.

Between the miofloras of Barren Measures and Barakar Stage, most of the spore genera are common, excepting the genus *Gondisporites* which is present in the assemblage of the former but has so far not been reported from the assemblages of the latter. On the other hand there are also some Barakar genera, such as *Primuspollenites*, *Korbapollenites*, *Maculatasporites*, *Dentatispora* and few others which are absent from the present assemblage. Within the Barakar Stage, the mioflora of Upper Barakar (Tiwari 1965) with the genus *Barakarites*, shows greater resemblance with that of Barren Measures than the mioflora of Lower Barakar.

**CONCLUSIONS**

Comparisons of the present miospore assemblage with those from the Raniganj and Barakar Stages of Lower Gondwana of India have revealed that the former resembles the both up to a certain extent yet has its own identity. Some of the important genera show a very interesting range of distribution in these three assemblages. Thus the genera *Indotriradites*, *Potonieisporites*, *Illinites* and *Rhizomaspora*, whose prominent presence in Barakars (Bharadwaj & Tiwari, 1964, Tiwari, 1965) is of significance, are found only in traces in the assemblage from Barren Measure Stage, and are practically absent in Raniganj Stage. The genus *Barakarites* is quite characteristically present in the West Bokaro Coals of Upper Barakar age as well as in the present assemblage and its extreme rarity in the Raniganj Coals is also noteworthy. *Gondisporites* appears for the first time in the Barren Measures and is well represented in Raniganj Stage.

It is concluded that the mioflora in the Barren Measures is characterized by the association of the following prominent genera:

- *Striatopodoearpites*
- *Faunipollenites*
- *Sulcatisporites*
- *Densipollenites*
- *Striatisites*
- *Lophotriletes*

Along with this the following genera are qualitatively characteristic:

- *Gondisporites*
- *Barakarites*
- *Rhizomaspora*

**ACKNOWLEDGEMENTS**

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**REFERENCES**


**EXPLANATION OF PLATES**

*(All figures are magnified 500 x)*

**PLATE 1**

**PLATE 2**

**PLATE 3**