PALYNOLOGICAL CORRELATION OF COAL SEAMS IN TALCHER COALFIELD, ORISSA, INDIA

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ABSTRACT

19 bore hole coal samples representing the coal horizons in Talcher coalfield have been sporologically studied. The mioflora includes 39 genera and their quantitative distribution among these samples have distinguished two palynological assemblages 'A' and 'B'. Assemblage–A is characterized by the dominance of *Brevitriletes, Microbaculispora, Faunipollenites* and *Sulcatisporites* whereas Assemblage–B has an abundance of *Cyclogranisporites*. The two assemblages correspond to the two main coal seams in Talcher coalfield.

INTRODUCTION

THE Talcher coalfield, named after the state and town of Talcher in Dhenkannal district of Orissa, lies in the valley of Brahmani river which discharges into the delta of Mahanadi, north-east of Cuttack. It is bound by 85°28′ and 84°20′ north longitude and 20°15′ and 21°13′ east latitude. In all, 19 overall coal samples from 10 bore holes, as detailed in Table 1, have been palynologically studied and evaluated thereof for their correlation.

METHODS

All the coal samples were subjected to the usual method of maceration (BHARADWAJ, 1962; BHARADWAJ & SALUJHA, 1964) followed in this laboratory. About 500 miospores were counted from each sample at the generic level and their percentage representation in each sample was calculated.

PALYNOLOGICAL ASSEMBLAGE

The mioflora contained among the bore hole coal samples includes a number of

TABLE 1

Bore Hole No.	Overall Sample No.	Depth from surface in metres		Thickness in metres
		From	To	
NCTB — 113	A	10·6	49·4 (Full thickness)	38·8
NCTB — 119	A	10·3	44·5 (Full thickness)	34·2
NCTB — 133	A	10·2	13·6 (Top section)	3·4
		Parting		
NCTB — 133	B	16·1	61·5 (Bot. section)	45·4
NCTB — 138	I	22·8	42·0	13·2
NCTB — 138	II	46·5	81·8	35·3
NCTB — 145	A	14·3	44·8 (Full thickness)	30·5
NCTB — 146	I	9·6	17·4	7·8
NCTB — 146	II	26·1	47·4	21·3
NCTB — 146	III	52·3	86·6	34·3
NCTB — 147	I	15·8	29·8	14·0
NCTB — 147	II	59·2	93·9	34·7
NCTB — 174	A	19·8	31·6 (First section — top)	11·8
		Parting		
NCTB — 174	B	46·1	60·6 (Second section)	14·5
		Parting		
NCTB — 174	C	71·3	72·4 (Third section)	1·1
		Parting		
NCTB — 174	D	77·4	114·2 (Fourth section — Bot.)	36·8
NCTB — 178	I	24·2	34·6	10·4
NCTB — 181	A	22·6	25·2 (Top section)	2·6
		Parting		
NCTB — 181	B	27·0	38·4 (Bot. section)	11·4

trilete, monolete, monosaccate, disaccate and monocoplate miospore genera. The genera listed below are qualitatively important; either individually or by forming characteristic associations with other miospore genera in the assemblage.

Callumispora Bharad. & Sriv. (1969)
Retusotriletes Naum.
Cyclogranisporites Pot. & Kr.
Lophotriletes (Naum.) Pot. & Kr.
Brevitriletes Bharad. & Sriv. (1969)
Horriditriletes Bharad. & Sal.
Microbaculispora Bharad.
Indotriradites Tiw.
Parasaccites Bharad. & Tiw.
Potonieisporites (Bhard.) Bharad.
Striatites (Pant) Bharad.
Lahirites Bharad.
Striatopodocarpites (Soritch. & Sed.) Bharad.
Faunipollenites Bharad.
Sulcatisporites (Leschik) Bharad.
Ginkgocycadophytus Samoil.

In addition to these, the following genera are also present in the assemblage, but occur very rarely or irregularly.

Leiotriletes (Naum.) Pot. & Kr.
Verrucosisporites (Ibr.) Pot. & Kr.
Acanthotriletes (Naum.) Pot. & Kr.
Pseudoreticulatispora Bharad. & Sriv. (1969)
Indospora Bharad.
Microfoveolatispora Bharad.
Cyclobaculisporites Bhard.
Calamospora Schopf *et al.*
Latosporites Pot. & Kr.
Densipollenites Bharad.
Plicatipollenites Lele
Virkkipollenites Lele
Divarisaccus Venkat. & Kar
Caheniasaccites Bose & Kar
Crucisaccites Lele & Maithy
Platysaccus Pot. & Kl.
Lunatisporites (Lesch.) Bharad.
Stroteresporites Wils.
Verticipollenites Bharad.
Vesicaspora Schemel
Vittatina (Luber) Janson.

QUANTITATIVE SPOROLOGICAL CONSTITUTION OF THE COAL SEAMS

A critical appraisal of the vertical distribution of spore genera in the representative bore hole samples of Talcher coalfield has revealed the following spores as the dynamic components.

Retusotriletes, Cyclogranisporites, Brevitriletes, Horriditriletes, Microbaculispora, Indotriradites, Parasaccites, Potonieisporites, Striatopodocarpites, Faunipollenites, Sulcatisporites.

These genera constitute the association of dominants and subdominants and have made it possible to recognize two distinct assemblages 'A' and 'B' which are distributed in various samples.

ASSEMBLAGE-A

(Histogram-I)

Assemblage A is represented in 3 bore hole samples NCTB — 181 A, 181 B and 178 (Histogram I). The dominant components of the assemblage are:

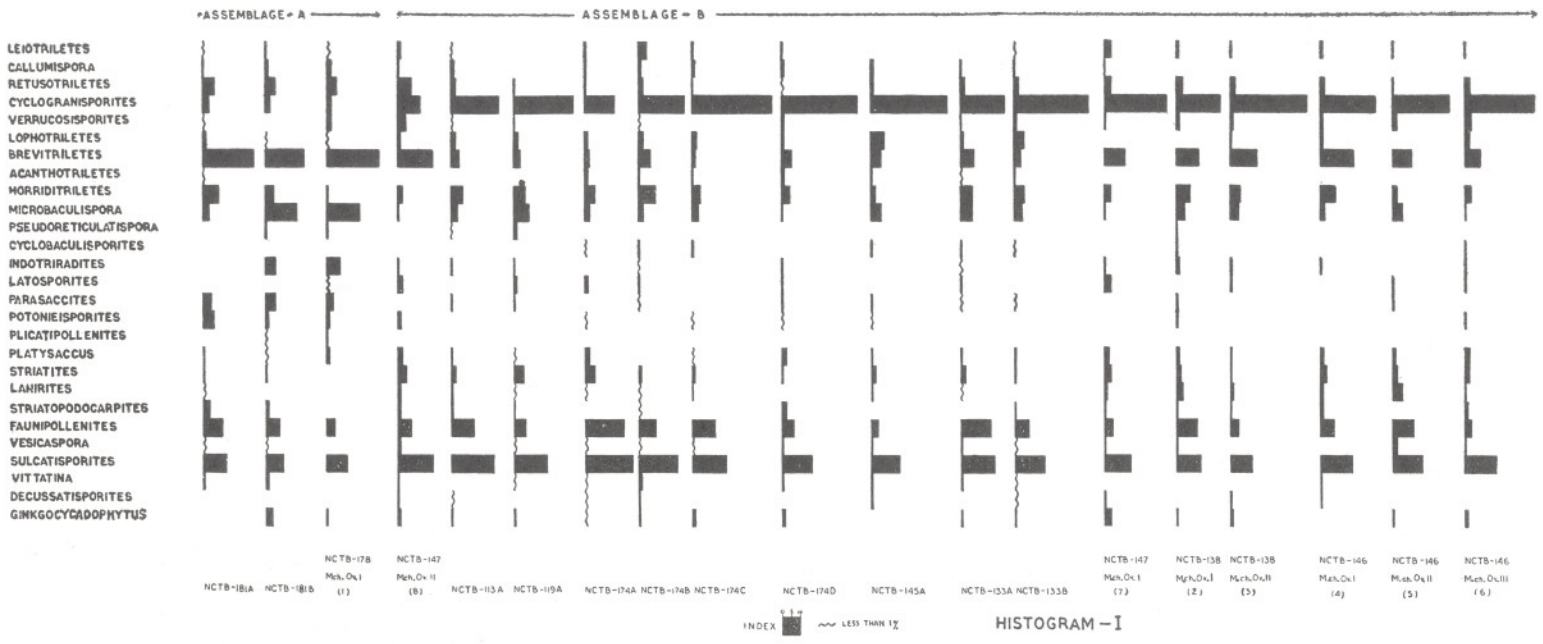
Brevitriletes	27·00%
Microbaculispora	13·72%
Faunipollenites	8·09%
Sulcatisporites	11·66%

The following genera constitute the subdominant elements with rather low percentage representation.

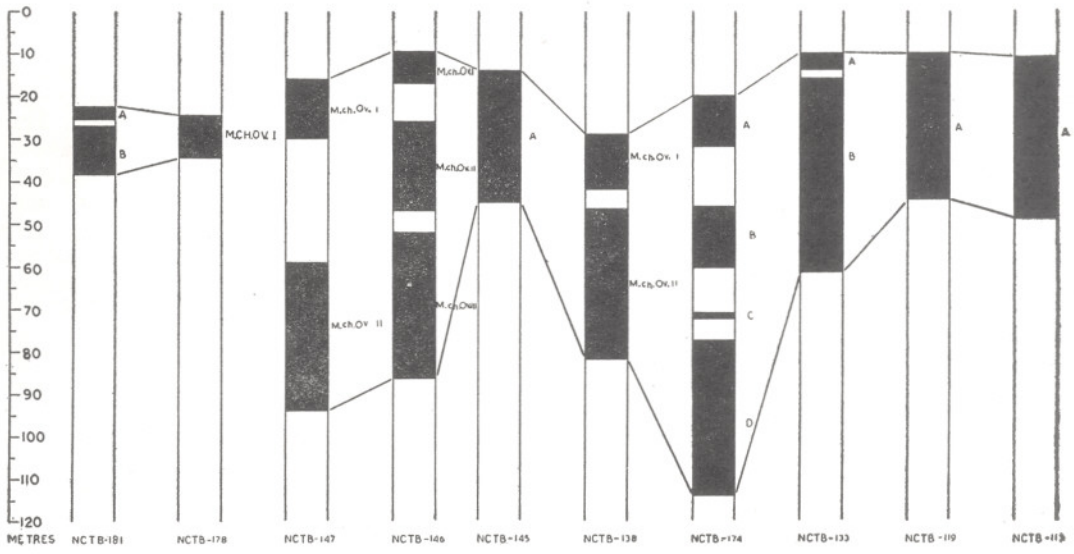
Retusotriletes	6·37%
Cyclogranisporites	3·39%
Horriditriletes	4·86%
Indotriradites	4·37%
Parasaccites	4·75%
Potonieisporites	3·66%
Striatopodocarpites	1·84%

The cryptogamic spores total, on an average, upto 65 per cent. Monosaccate pollen genera, viz., *Parasaccites, Plicatipollenites, Virkkipollenites, Crucisaccites* and *Potonieisporites*, which are so characteristic of Karharbari Stage (*sensu* BHARADWAJ, 1966; MAITHY, 1965), are well represented in the present assemblage also and together constitute up to 9 per cent of the total assemblage. Striated and nonstriated gymnospermic pollen grains total 24 per cent. Monocolpate forms are also worthy of mention, being present up to 3 per cent.

The percentage of miospores in different samples shows close likeness and hence all the three samples are considered to be representing one deposition. The reduction in the amount of *Microbaculispora* in NCTB–181A is of minor significance in view of the overall similarity with the other two samples.


ASSEMBLAGE – A
ASSEMBLAGE – B
LEIOTRILETES
CALLUMISPORA
RETUSOTRILETES
CYCLOGRANISPORITES
VERRUCOSISPORITES
LOPHOTRILETES
BREVITRILETES
ACANTHOTRILETES
HORRIDITRILETES
MICROBACULISPORA
PSEUDORETICULATISPORA
CYCLOBACULISPORITES
INDOTRIRADITES
LATOSPORITES
PARASACCITES
POTONIEISPORITES
PLICATIPOLLENITES
PLATYSACCUS
STRIATITES
LAHIRITES
STRIATOPODOCARPITES
FAUNIPOLLENITES
VESICASPORA
SULCATISPORITES
VITTATINA
DECUSSATISPORITES
GINKGOCYCADOPHYTUS
NCTB-181A
NCTB-181B
NCTB-178 Mch.Ok.I (1)
NCTB-147 Mch.Ok.II (8)
NCTB-113A
NCTB-119A
NCTB-174A
NCTB-174B
NCTB-174C
NCTB-174D
NCTB-145A
NCTB-153A
NCTB-153B
NCTB-147 Mch.Ok.I (7)
NCTB-138 Mch.Ok.I (2)
NCTB-138 Mch.Ok.II (3)
NCTB-146 Mch.Ok.I (4)
NCTB-146 Mch.Ok.II (5)
NCTB-146 Mch.Ok.III (6)
INDEX
LESS THAN 1%

HISTOGRAM – I



HISTOGRAM - II

Assemblage–B

(Histogram–I)

Sixteen bore hole samples, NCTB-174A, 174B, 174C, 174D, 145A, 133A, 133B, 119A and 138 (2 samples), 146 (3 samples) and 147 (I & II) contain Assemblage–B. The most characteristic feature of this assemblage is the high percentage representation of:

Cyclogranisporites	32·24%
Faunipollenites	10·90%
Sulcatisporites	18·15%

Brevitriletes, which is the most dominant component of Assemblage–A, is strikingly low in amount, i.e. 8·58 per cent. *Indotriradites* is fairly well represented in Assemblage–A, but is comparatively very low in Assemblage–B (0·55 %).

The following miospore genera fall next to the above mentioned ones:

Lophotriletes	2·52%
Horriditriletes	5·73%
Microbaculispora	4·00%

Rest of the trilete, monosaccate and disaccate spores are poorly present or are very rare in occurrence (Histogram-I).

On the whole, the assemblage is sufficiently rich in cryptogamic spores totalling about 61 per cent on an average. Next group to follow the dominants, are gymnospermic pollen grains including non-striated and striated disaccates with an average representation of 37 per cent. Monosaccate pollen grains are reduced in this assemblage and along with monocolpates are poorly represented.

A critical appraisal of the distribution of miospores in Assemblage–B reveals certain very interesting features. It is noteworthy to mention here that the average total percentage of trilete miospore genera as compared to Assemblage–A, remains almost the same, but the qualitative representation of its sporological constituents, exhibits considerable change. *Brevitriletes* as mentioned above, declines considerably and so is the case with *Microbaculispora* and *Indotriradites*, which are present in Assemblage–A in fair amounts, but are represented by very small amounts in Assemblage–B. On the contrary, *Cyclogranisporites*, which is present in very low numbers in Assemblage–A, increases to high percentage in Assemblage–B and thus distinguishes itself as the most dominant component. Such a high representation of this genus has been noticed for the first time in the Lower Gondwana coals. Striated and non-striated pollen grains also increase as compared to Assemblage–A. However, within Assemblage–B, the behaviour of the dynamic components depicts minor variation from sample to sample. Sample No. NCTB-174D, which represents the bottom portion of the coal seam possesses very high percentage

of *Cyclogranisporites* with *Faunipollenites* and *Sulcatisporites* falling next to it. As we ascend up this from sample NCTB-174C, NCTB-174B and NCTB-174A (the last represents the topmost section of the coal seam), a gradual decrease in the amount of *Cyclogranisporites* and a corresponding increase in *Faunipollenites* and *Sulcatisporites* is noticeable. Similar feature is also seen in sample Nos. NCTB-133A and NCTB-133B which represent the top and bottom portions respectively. Sample Nos. NCTB-145A, NCTB-119A and NCTB-113A represent the overall picture from different parts of the same coal seam in different locations. Among these, NCTB-145A corresponds very closely to the bottom portion of the seam as represented by NCTB-174D and NCTB-133B (Histogram-I); NCTB-119A presents a palynological picture midway between those of NCTB-174B and C, and NCTB-113A is palynologically very much similar to NCTB-174B. In NCTB-138, two samples (I & II), which probably represent the top and bottom portions of the seam, show significant differences. These variations are similar to those noticeable in NCTB-133A & B. However, NCTB-138-II resembles very closely to NCTB-174D, NCTB-133B and NCTB-147-I. On the other hand, three samples of bore hole No. NCTB-146 do not show any practical difference. In NCTB-147-II, the miofloral composition with medium *Brevitriletes* and *Sulcatisporites* but low *Cyclogranisporites* represents an intermediate condition between the top part of Lower Seam (NCTB-181 A), which has high *Brevitriletes* but low *Microbaculispora* and *Sulcatisporites*, and Assemblage-B which has high *Cyclogranisporites*, medium *Sulcatisporites* and low *Brevitriletes*. In view of the miofloral change having already proceeded beyond the top part of Lower Seam, NCTB-147-II is placed in Assemblage-B.

CORRELATION

The coal samples constituting the different assemblages are stratigraphically correlated on the evidence of sporology (Histogram-II). The two palynological assemblages represent two different depositions. Thus, the coal samples NCTB-181 A, NCTB-181 B and NCTB-178 I are correlated together. In all the three samples *Brevitriletes* characterises the assemblage with its high percentage, while *Microbaculispora*, *Faunipollenites* and *Sulcatisporites* are present as subdominant groups. Four samples of bore hole NCTB-174, 3 samples of NCTB-146, 2 samples each of NCTB-133, NCTB-138 and NCTB-147 and one sample each of NCTB-113, NCTB-119 and NCTB-145 are marked by dominance of *Cyclogranisporites* followed by *Faunipollenites* and *Sulcatisporites*. These samples together represent a different seam. It is noticeable that the samples contained in bore holes NCTB-174, 133, 138, 146 and 147, though parted, represent only one seam.

Brevitriletes is a new component recovered in the mioflora of Talcher coalfield and its dominance in assemblage-A is recorded for the first time, hence its comparison with other coalfileds is not possible. *Microbaculispora* is consistently present throughout the whole succession of Talcher coalfield and unlike Chirmiri coalfield, it does not attain dominance in any sample. In Chirmiri coalfield *Microbaculispora* gradually increases from assemblages A-C (BHARADWAJ & SRIVASTAVA, 1969) while in Korba coalfield (BHARADWAJ & TIWARI, 1964) it occurs insignificantly. The dominance of *Cyclogranisporites* is another notable feature observed in Assemblage-B of Talcher coalfield whereas in the corresponding miospore assemblages of Chirmiri, Korba and North Karanpura (BHARADWAJ & TIWARI, 1966) coalfields it occurs inconsistently.

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