CORRELATION OF COAL SEAMS IN CHIRIMIRI COALFIELD, M.P., ON THE BASIS OF SPORAE DISPERSAE*

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ABSTRACT

Fifteen samples of coal collected from different parts of Chirimiri Coalfield, M.P., have been sporologically investigated. The qualitative and quantitative composition of the samples at generic level indicates that the general dominance is constituted by *Lophotriletes, Microbaculispora, Indotriradites* and *Sulcatisporites*. In addition to these, *Horriditriletes, Retusotriletes, Potonieisporites, Faunipollenites* and *Ginkgocycadophytus* are characteristically associated with the dominants. The association of these genera has enabled segregation of the samples into three assemblages. *Assemblage A* is dominated by *Microbaculispora*. *Assemblage B* is dominated by *Microbaculispora* in association with *Indotriradites* and *Assemblage C* has the dominance of *Microbaculispora* associated with *Retusotriletes* and *Potonieisporites*. It is suggested that the samples represent three coal seams corresponding to Assemblages A, B & C.

The succession of mioflora in Chirimiri coalfield has been found to show general similarity with the succession of the three older coal seams in the northern part of Korba coalfield. The age of Chirimiri coal deposits is suggested as Lower Barakar.

INTRODUCTION

CHIRIMIRI coalfield has an area of about 50 sq. miles which lies as a detached Barakar block south of the more extensive Sonhat coalfield. Chirimiri coalfield is bounded by latitudes 23°15′ and 23°8′ N and by longitudes 82°17′ and 82°25′ E.

The topography of Chirimiri coalfield is very rough. The whole area is broken by hilly blocks of Barakars with steep sides and escarpments. The general height of the area is between 2300 and 2200 ft. above mean sea level. There are a few peaks.

The coal deposit of Chirimiri is entirely of Barakar stage. These Barakars are completely isolated being entirely surrounded by Talchirs which lie almost horizontally. There are two little outliers of Supra-Barakars on the high ground in the eastern part of the area.

MATERIAL AND METHODS

15 samples of coal in 72 B.S. mesh size from all over the area were studied (Table 1). These samples were subjected to similar maceration procedure in each case. Five gms. of material from each sample was treated with HNO_3 (comm.) for 3 days followed by digestion with 10 per cent KOH after thorough washing with water as detailed by Bharadwaj (1962) and Bharadwaj and Salujha (1964). The macerates were mounted on slides in glycerine jelly. 500 miospores were counted from each sample at the generic level.

From Table 1 it is apparent that samples CACI — (129), (126), (143)E, (145)E and (141)E are representatives of only parts of seams while others represent overalls of full seams.

The interpretation of data for correlation of the samples has been based on the qualitative association of spore genera and its quantitative dominance in the spore assemblage of any sample. At the same time the trend of quantitative variation exhibited by individual genera vertically among all the samples has been kept in mind. To determine the dominance, a group of numerically most represented genera with their combined percentages totalling near about 70 per cent of the mioflora have been taken for each sample. This method of determining the dominance is based on Chaney's (1924, 1925) method employed by him for the Tertiary floras and this has been modified here to overcome the limitations of our knowledge about such old miofloras as those of the Barakars. The basic idea made use of is the reliance on the similarity of overall dominance of a group or association of genera rather than a single genus. This is supposed to overcome any difference in the sporological composition of seams due to

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TABLE 1 – DETAILS OF SAMPLES FROM SOME COLLIERIES IN CHIRIMIRI COALFIELD

NAME OF COLLIERY	SAMPLE NO.	
Chirimiri Colliery	CACI/(130)E	(No. 1 seam)
do	CACI/(127)	(No. 2 seam)
do	CACI/(128)E	(No. 3 bottom seam)
do	CACI/(129)	(No. 4 seam top portion only)
West Chirimiri Colliery	CACI/(124)	Main seam
Korea Colliery	CACI/(125)E	(Bijora seam)
Duman Hill Colliery	CACI/(131)	(Kaparti seam Bottom section)
do	CACI/(131)	(Kaparti seam Top Section)
do	CACI/(126)	(Working Section Gorghela seam)
Kurasia Colliery	CACI-(143)E	(Seam No. 2, Bottom portion only)
do	CACI-(144)E	(Seam No. 3)
do	CACI-(145)E	(Seam No. 3A, Bottom portion only)
Sonawani Colliery	CACI-(147)	(Sonawani Seam)
North Chirimiri Colliery	CACI-(136)/ Seam Overall	(Bijora seam)
New Chirimiri (Ponri Hill) Colliery	CACI-(141)E	(Main Seam Bottom ten feet only)

lateral variation within the basin. It is stipulated that even when the major, dynamic components of a vegetation within a small area tend to vary from place to place, the sum total of their representation tends to remain the same. A dynamic component is one which shows significant change in its representation in time as against a static component whose representation remains more or less at the same level throughout the succession. Thus, the samples possessing nearly similar total dominance percentage (T.D.P.) together with comparable representations of individual genera have been grouped together as correlated.

RESULTS

The mioflora consists of the miospore genera (*sensu* BHARADWAJ 1962, BHARADWAJ & TIWARI 1964b, TIWARI 1964) listed below together with their average overall percentages taking the averages of full seams in the succession.

Leiotriletes	1%
Punctatisporites	2%
Retusotriletes	7%
Cyclogranisporites	4%
Verrucosisporites	1%
Lophotriletes	9%
Acanthotriletes	+
Horriditriletes	4%
cf. *Microreticulatisporites*	+
Microbaculispora	22%
Cyclobaculisporites	1%
Indotriradites	7%
Dentatispora	+
Calamospora	2%
Latosporites	1%
Punctatosporites	1%
Thymospora	2%
Parasaccites	2%
Potonieisporites	5%
Plicatipollenites	1%
Cuneatisporites	1%
Platysaccus	1%
Striatites	1%
Rhizomaspora	+
Lahirites	+
Lunatisporites	1%
Striatopodocarpites	1%
Verticipollenites	+
Faunipollenites	4%
Vesicaspora	3%
Sulcatisporites	10%
Welwitschiapites	+
Vittatina	+
Ginkgocycadophytus	2%
Maculatasporites	1%
Monosulcate spore	2%

A critical appraisal of the vertical distribution of spore genera in the geological succession occurring in Chirimiri coalfield has revealed the following spore genera as dynamic components:

Microbaculispora
Indotriradites
Lophotriletes
Horriditriletes
Retusotriletes
Potonieisporites
Faunipollenites + Striated saccates
Sulcatisporites + non-striated saccates

These genera constitute the association of dominants and their combined percentage is the total dominance percentage (T.D.P.).

Miospore Assemblages

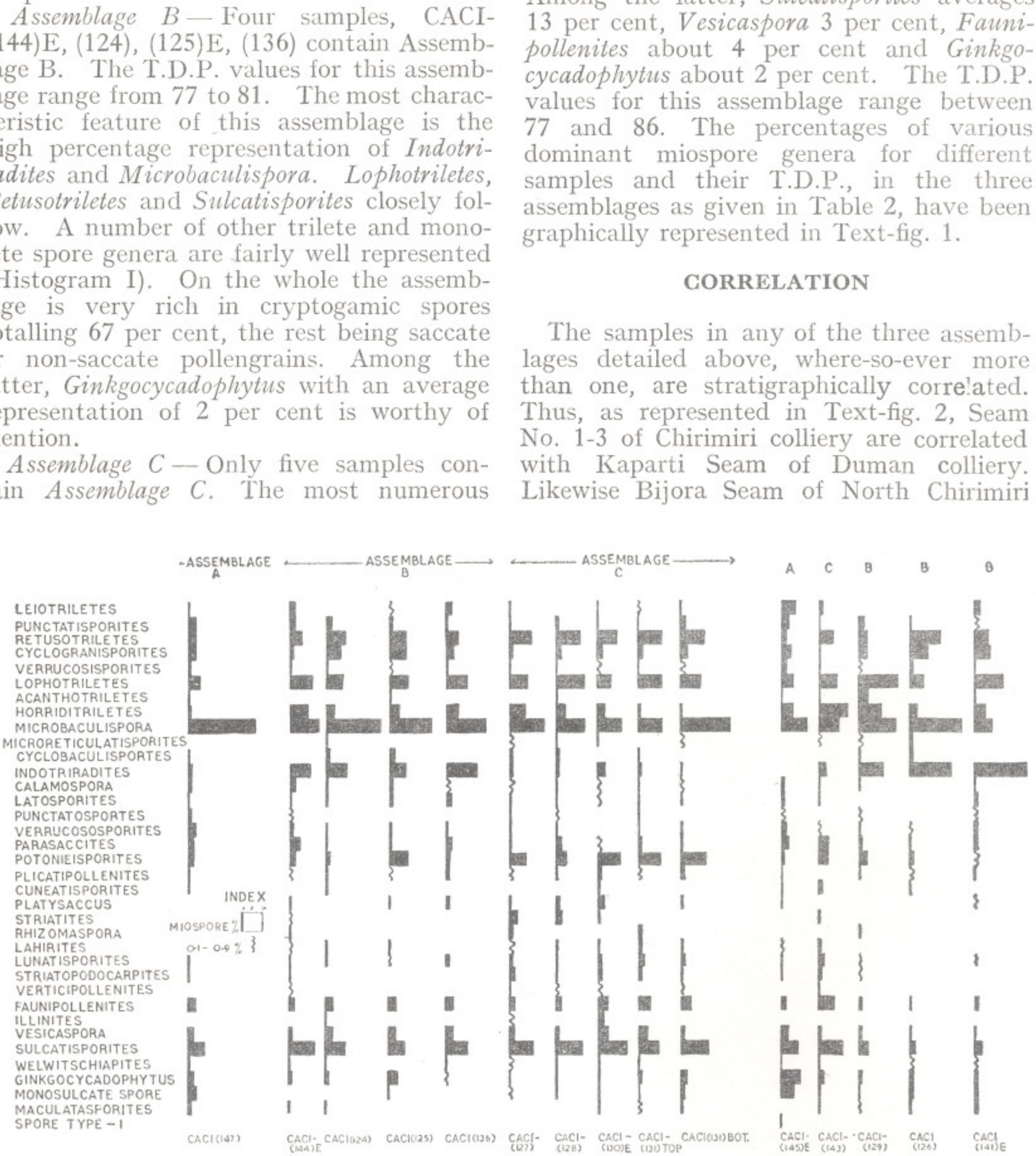
Assemblage A — Only one sample, CACI-(147) contains Assemblage A. This assemblage is characterized by a low T.D.P. of 70. Qualitatively the dominance is characterized by *Microbaculispora*. *Sulcatisporites*, *Lophotriletes* and *Faunipollenites* constitute the subdominant elements with rather low percentages. The cryptogamic spores total 66 per cent.

Assemblage B — Four samples, CACI-(144)E, (124), (125)E, (136) contain Assemblage B. The T.D.P. values for this assemblage range from 77 to 81. The most characteristic feature of this assemblage is the high percentage representation of *Indotriradites* and *Microbaculispora*. *Lophotriletes*, *Retusotriletes* and *Sulcatisporites* closely follow. A number of other trilete and monolete spore genera are fairly well represented (Histogram I). On the whole the assemblage is very rich in cryptogamic spores totalling 67 per cent, the rest being saccate or non-saccate pollengrains. Among the latter, *Ginkgocycadophytus* with an average representation of 2 per cent is worthy of mention.

Assemblage C — Only five samples contain *Assemblage C*. The most numerous genera in Assamblage C are *Microbaculispora*, *Retusotriletes*, *Lophotriletes*, *Potonieisporites* and *Sulcatisporites*. However, the most characteristic genus is *Potonieisporites* with an average percentage of 10. *Cyclogranisporites* and *Latosporites* are fairly well represented components. The assemblage is rich in cryptogamic spores which total about 54 per cent and the rest are gymnospermous pollengrains (Histogram I). Among the latter, *Sulcatisporites* averages 13 per cent, *Vesicaspora* 3 per cent, *Faunipollenites* about 4 per cent and *Ginkgocycadophytus* about 2 per cent. The T.D.P. values for this assemblage range between 77 and 86. The percentages of various dominant miospore genera for different samples and their T.D.P., in the three assemblages as given in Table 2, have been graphically represented in Text-fig. 1.

CORRELATION

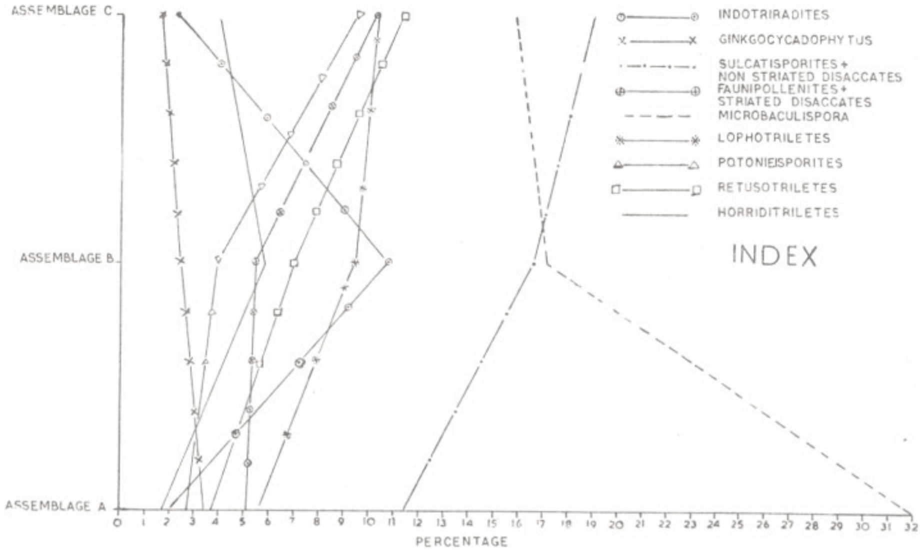
The samples in any of the three assemblages detailed above, where-so-ever more than one, are stratigraphically correlated. Thus, as represented in Text-fig. 2, Seam No. 1-3 of Chirimiri colliery are correlated with Kaparti Seam of Duman colliery. Likewise Bijora Seam of North Chirimiri



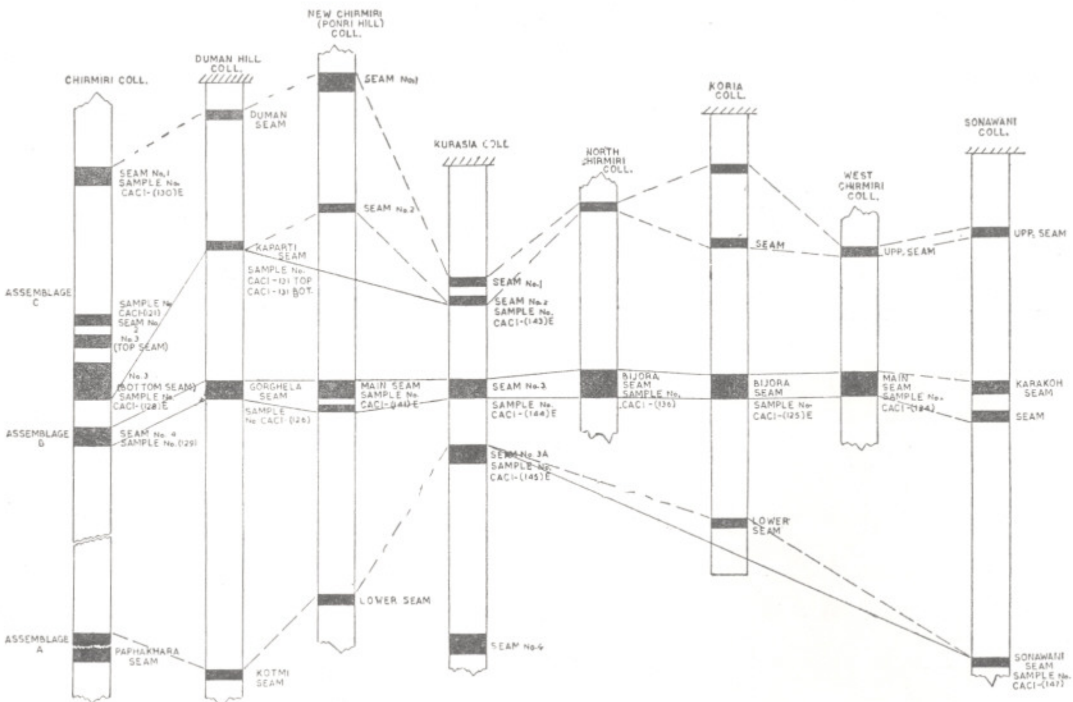
HISTOGRAM -1

TABLE 2

ASSEMBLAGES	SAMPLE NO.	DOMINANCE CONSTITUENTS PERCENTAGES									
		Indotriradites	*Ginkgocycadophytus*	*Sulcatisporites* ± Non-striated disaccates	*Faunipollenites* ± striated disaccates	*Microbaculispora*	*Lophotriletes*	*Potonieisporites*	*Retusotriletes*	*Horriditriletes*	Total dominance percentage
A	CACI-(147)	2	4	8+4	4+1	32	6	3	4	2	70
B	CACI-(144) E	10	2	13+3	3+3	14	11	3	6	9	77
,,	CACI-(124)	10	2	10+4	4+1	26	8	2	10	4	81
,,	CACI-(125)	8	5	8+4	4+1	20	8	8	8	5	79
,,	CACI-(136)	15	0	11+4	4+2	19	10	2	6	6	79
C	CACI-(127)	2	1	12+3	3+8	17	9	8	11	8	82
,,	CACI-(128)	2	1	13+3	3+4	14	14	6	12	5	77
,,	CACI-(131) BOT.	1	3	13+2	5+3	24	9	12	12	1	86
,,	CACI-(130)	4	1	14+5	5+6	12	7	11	10	4	79
,,	CACI-(131) TOP	2	2	10+5	6+9	12	12	11	12	2	83
Incomplete Samples											
	CACI-(145) E	0	10	9+6	3+4	13	6	2	3	6	62
	CACI-(129)	11	2	5+2	2+2	18	19	4	4	11	80
	CACI-(143) E	4	3	12+4	8+6	10	9	5	7	14	82
	CACI-(126)	20	2	3+2	1+0	25	7	2	15	4	81
	CACI-(141) E	28	2	4+1	2+0	9	15	0	7	6	74



TEXT-FIG. 1



TEXT-FIG. 2

colliery, Bijora Seam of Korea colliery, Main Seam of West Chirimiri colliery and Seam No. 3 of Kurasia colliery are also correlated.

The Sonawani Seam of Sonawani colliery is an isolated sample. Besides these samples there are five other samples which could not be taken into consideration because they represent only parts of the seam. The sporological composition of these samples may be reflecting a near average of the whole seam or may be individualistic. In Indian coals we have evidence of variation in the quantitative representation of spore genera from base to the top of a seam (BHARADWAJ & TIWARI, 1966) as well as of uniformity (BHARADWAJ & SALUJHA, 1965). Thus considering this, it is difficult as well as risky to suggest correlation on sporological evidence alone. Hence, stratigraphical position of these samples with reference to those already correlated has been considered for correlation. In the case of sample CACI-(143)E representing top portion of Seam No. 2 of Kurasia colliery the sporological picture (Histogram I) is very individualistic yet in view of the association of its more prominent elements and high T.D.P. (82) it can be reasonably placed in Assemblage C. Unfortunately we have not been given the opportunity to examine a sample of Seam No. I of this colliery. Had it been so, the correlation of both the seams with Assemblage C might have been much more obvious. Sample CACI-(129) represents only the top portion of seam No. 4 in Chirimiri colliery. Its sporological picture (Histogram I) is very individualistic but its T.D.P. as well as the prominent percentage of *Indotriradites* places it in Assemblage B without much hesitation. Stratigraphically it underlies seam 3 (Bottom) which is already placed in Assemblage A. Likewise, sample CACI-(126) represents the working section of Gorghela seam in Duman Hill colliery. In its sporological picture (Histogram I), T.D.P. as well as the high incidence of *Indrotriradites*, it correlates with Assemblage B.

Sample CACI-(145)E has an individualistic sporological picture with very high incidence of monosulcates, absence of *Indotriradites* and the lowest T.D.P. This sample represents the bottom portion of seam No. 3A of Kurasia colliery. The seam overlying it, is undoubtedly correlated with Assemblage B. Hence, this seam is either a local development or is equivalent of Assemblage A. The low representation of *Microbaculispora* in this seam may be due to incompleteness of the sample.

Sample CACI-(141)E represents the bottom 10 feet of Main Seam in New Chirimiri (Ponri Hills) colliery. The sporological picture of this seam is individualistic in respect of very high incidence of *Indotriradites* and low of *Microbaculispora*. However, its T.D.P. is closer to Assemblage B which is also characterized by well represented *Indrotriradites*. Hence, inspite of only a partial sampling this sample can be safely correlated with Assemblage B.

The final picture of correlation of the samples on palynological basis is given in Text-fig. 2. A critical perusal of Text-fig. 2 might suggest an improbability of the correlation of Seams 1-3 of Chirimiri colliery with Kaparti seam of Duman Hill colliery and Seam No. 2 of Kurasia colliery on the grounds of much larger thickness of the first as compared to the latter two. But, if it is supposed that Duman Seam in Duman Hill colliery and Seam No. I in Kurasia colliery of which we have not had any samples to study, could, together with Kaparti seam and Seam no. 2 of the two respective collieries be equivalent to the Seams 1-3 of Chirimiri colliery, the correlation would seem very much plausible. In view of the very uniform miospore composition of seams 1-3 of Chirimiri colliery through a considerable thickness of strata, the latter possibility is very much probable. Hence, we have indicated this probability by broken lines in Text-fig. 2.

DISCUSSION

In view of there being three different assemblages it is evident that three different coal seams are represented among the samples. If there are more than three seams in any succession, some of them are evidently splits of one or the other of the three main seams established palynologically. In Assemblage A, *Indrotriradites* is almost absent but *Microbaculispora* is highest as compared to all the assemblages. In Assemblage B, *Indotriradites* is represented together with a high percentage of *Microbaculispora*. This occurrence of *Indotriradites* is closely comparable to the high representation of this genus in the older coal seams of Korba coalfield (BHARADAWAJ & TIWARI, 1964a — Assemblage B).

In Assemblage C, *Indotriradites* is negligible though always present. In the coal seam succession of Ghordewa sector in Korba coalfield *Indotriradites* is present in two of the older seams (Assemblages A & B). Considering that a similar significance be attached to the distribution of *Indotriradites* in the coal seams of Chirimiri coalfield, the two coal successions are of similar age, i.e. Lower Barakar.

Microbaculispora is very prominent and consistent component in Chirimiri coals. Actually it dominates the whole succession in Chirimiri coalfield. Such a distribution of this genus is not present in the seams of any of the sectors from Korba coalfield. On the other hand *Faunipollenites* which is very dominant in the Assemblage D of Korba coalfield is very much in the background in Chirimiri coalfield. Likewise in Assemblage C of Chirimiri coalfield the prominence of *Potonieisporites* in association with *Microbaculispora* is not to be found in any of the assemblages of Korba coalfield. It is apparent that but for the dominance of *Indrotriradites* in some seams of Chirimiri coalfield the overall composition of the floral succession contributing to the formation of its coals was somewhat individualistic and thus different from that giving rise to the coal seams in Korba basin.

Miofloristically speaking, there is a gradual decrease in the cryptogamic spores and corresponding increase in gymnospermic pollen from older to younger sequence. This tendency is characteristic of Lower Barakar deposits (BHARADWAJ, 1966).

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