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MIOFLORAL STUDIES OF THE LOWER GONDWANA SEDIMENTS IN JOHILLA COALFIELD, MADHYA PRADESH, INDIA

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ABSTRACT

The Lower Gondwana sediments (coal-bearing) exposed along Johilla River and also in Pali Coal Mine, Johilla Coalfield, Madhya Pradesh have been studied palynologically. The oldest miofloral assemblage (Zone 1) has been recorded near Manthar comprising *Callumispora*+*Jayantisporites*, which represents the Lower Karharbari mioflora. Miofloral assemblage Zone 2 occurs in the older coal seams (seam III-V) of Johilla Coal Mine and being dominant in *Parasaccites* represents the Upper Karharbari mioflora. Miofloral Zone 3 is marked by the dominance of nostriated-disaccates and occurs in the second coal seam of Johilla Coal Mine, second seam at Ganjra Nala confluence and the coal beds exposed near Lakhanpura. The youngest mioflora (Zone 4), being rich in striated-disaccates, occurs in the youngest coal seam (Seam I) of Johilla Coal Mine and also in the younger two seams exposed at the confluence of Ganjra Nala. Miofloral zones 3 and 4 represent the Lower and Upper Barakar miofloras, respectively. Thus, the coal-bearing horizon of the Johilla Coalfield encompasses not only Karharbari mioflora but also the Barakar mioflora.

Key-words — Palynology, Karharbari mioflora, Barakar mioflora, Johilla Coalfield, Lower Gondwana (India).

सारांश

मध्य प्रदेश (भारत) के जोहिल्ला कोयला-क्षेत्र में अधरि गोंडवाना अवसादों का सूक्ष्मवनस्पतिजातीय अध्ययन – आनन्द प्रकाश एवं सुरेश चन्द्र श्रीवास्तव

इस शोध-पत्र में मध्य प्रदेश के जोहिल्ला कोयला-क्षेत्र की पाली कोयला खान तथा जोहिल्ला नदी के साथ-साथ अनाच्छादित अधरि गोंडवाना अवसादों (कोयला-धारक) का परागाणविक अध्ययन किया गया है। मन्थार के पास कैलूमिस्पोरा+जयन्तिस्पोराइटिस से युक्त सबसे अधिक आयु वाली सूक्ष्मवनस्पतिजातीय समुच्चय (मंडल-1) अभिलिखित की गई है जो कि अधरि करहरबारी सूक्ष्मवनस्पतिजात का निरूपण करती है। सूक्ष्मवनस्पतिजातीय समुच्चय (मंडल-2) जोहिल्ला कोयला खान की प्राचीनतर कोयलासीमों में मिलती है तथा पैरासेक्काइटिस की बाहुल्यता के साथ-साथ उपरि करहरबारी सूक्ष्मवनस्पतिजात का निरूपण करती है। सूक्ष्मवनस्पतिजातीय मंडल-3 रेखित-द्विकोष्ठीय परागकणों से प्रभावी है तथा जोहिल्ला कोयलाखान की द्वितीय कोयला सीम, गंजरा नाला संगम पर स्थित द्वितीय सीम तथा लखनपुरा के पास अनावरित कोयला संस्तरों में मिलता है। रेखित-द्विकोष्ठीयों से भरपूर अल्पतम् आयु वाला सूक्ष्मवनस्पतिजात (मंडल-4) जोहिल्ला कोयलाखान की अल्पतम् आयु वाली कोयला सीम (प्रथम सीम) तथा गंजरा नाला संगम पर अनावरित अल्पतर आयु की दो सीमों में विद्यमान है। सूक्ष्मवनस्पतिजात मंडल 3 और 4 क्रमशः अधरि एवं उपरि बाराकार सूक्ष्मवनस्पतिजातों का निरूपण करते हैं। इस प्रकार जोहिल्ला कोयला खान का कोयला-धारक संस्तर करहरबारी को ही नहीं अपितु बराकार सूक्ष्मवनस्पतिजात को भी परिवेष्टित किये हुए है।

INTRODUCTION

THE Johilla Coalfield is situated in the valley of Johilla River, Shahdol District, M.P. (Latitudes 23°16′-23° 23′ and Longitudes 85°57′-81°05′) and has attracted the attention of the geologists and palaeobotanists with respect to the age of the Ganjra Nala beds. Hughes (1884) and Fox (1932) considered the coal-bearing beds to represent a Barakar age while Feistmantel (1884) opined a Karharbari age. Mehta (1945) and Virkki (1946) equated these beds with the Pali beds. Basu

(1964) considered these beds to be equivalent to the Karharbari Formation on the basis of chemical analyses of coal. Saksena (1952, 1971) also worked out the plant fossils and microfossils of Ganjra Nala beds and opined a Karharbari age. Later Maithy (1969) studied the plant fossils and microfossils from the same horizon and favoured an opinion similar to that of Saksena (1952, 1971). Deshmukh (1971), while mapping the area in detail, grouped these beds within the Barakar. Recently, Chandra and Srivastava (1982) have again investigated plant fossils from a number of localities of the Johilla Coalfield and have considered them to represent the Karharbari age. Thus, the majority of workers favoured a Karharbari age while only a few advocated a Barakar age. In view of these divided opinions, the present investigation was undertaken in order to evaluate the succession of the coal-bearing beds palynologically.

GEOLOGY

Hughes (1884) first mapped the area systematically. The known geological sequence in the area is as follows:

Traps
Lametas
Supra Barakars
Barakar
Talchir
.....Unconformity.....
Metamorphics

Metamorphic rocks form the basement which are exposed in the form of an inlier separating the Gondwana sediments into two patches (Map 1). In the northern part the Talchir sediments overlie the basement rocks and underlie the coal-bearing Barakar sediments. In the southern part the Talchirs are in faulted contact with the Archeans. The coal-bearing sediments are composed of gritty to fine-grained sandstones and interbedded shale and coal seams. The Supra Barakar overlies the coal measures in the northern area while in the southern part they overlap the Talchirs and have faulted contact with the Archeans. The most important seam is the Johilla seam in the northern part.

The material for the present investigation was collected along Johilla River from Lakhanpura in south up to the confluence of Ganjra Nala in the north (Map 1). Coal samples were also collected from the working faces of the Johilla Coal Mine and the details of samples collected are presented in Table 1.

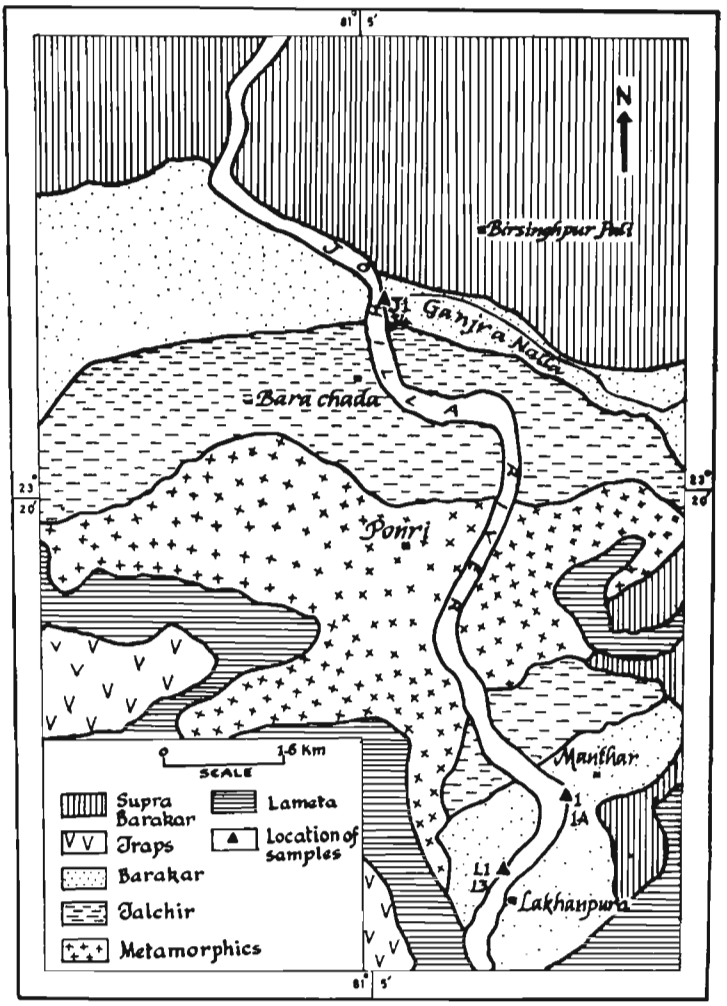
MIOFLORAL COMPOSITION

The mioflora of the Johilla Coalfield consists of the following 55 genera:

Leiotriletes, *Callumispora*, *Hennellysporites*, *Cyclogranisporites*, *Granulatisporites*, *Lophotriletes*, *Godavarisporites*, *Brevitriletes*, *Horriditriletes*, *Pseudoreticulatispora*, *Lacinitriletes*, *Microbaculispora*, *Indotriradites*, *Dentatispora*, *Jayantisporites*, *Latosporites*, *Densipollenites*, *Barakarites*, *Divarisaccus*, *Parasaccites*, *Caheniasaccites*, *Vestigisporites*, *Potonieisporites*, *Plicatipollenites*, *Virkkipollenites*, *Crucisaccites*, *Cuneatisporites*, *Platysaccus*, *Lueckisporites*, *Schizopollis*, *Striatites*, *Rhizomaspora*, *Primuspollenites*, *Lahirites*, *Verticipollenites*, *Hindipollenites*, *Striatopodocarpites*, *Crescentipollenites*, *Faunipollenites*, *Striapollenites*, *Illinites*, *Vesicaspora*, *Scheuringipollenites*, *Ibisporites*, *Tiwariasporis*, *Weylandites*, *Ginkgocycadophytus*, *Pilasporites*, *Brazilea*, *Circulisporis*, *Hindisporis*, *Quadrisporites*, *Balmeella*, *Peltacystia* and *Leiosphaeridia*.

Amongst these only few genera characterise the miospore spectrum by their overall dominance, viz., *Callumispora*, *Jayantisporites*, *Parasaccites*, *Platysaccus*, *Scheuringipollenites*, *Striatopodocarpites* and *Faunipollenites*. In addition to these dominant taxa some genera, viz., *Brevitriletes*, *Microbaculispora*, *Virkkipollenites*, *Lahirites* and *Vesicaspora* also mark their presence by their subdominance. The rest of the genera are present in low amounts and are inconsistent in occurrence, hence insignificant. The quantitative association of the above miospores suggests the occurrence of a number of miofloral assemblages which are diagrammatically represented in histogram 1 and the description of these assemblages in different localities are as follows:

Manthar area — A coal bed (sample no. 1) is exposed on the east bank of Johilla River, west of the village Manthar and another coal bed (sample no. 1A) occurs nearly three meters southwards. Sample no. 1 (Table 2) is marked by the dominance of the genus *Callumispora* (66%) and is associated with *Ginkgocycadophytus* (9%), *Brevitriletes* (4%) and *Cyclogranisporites* (4%).

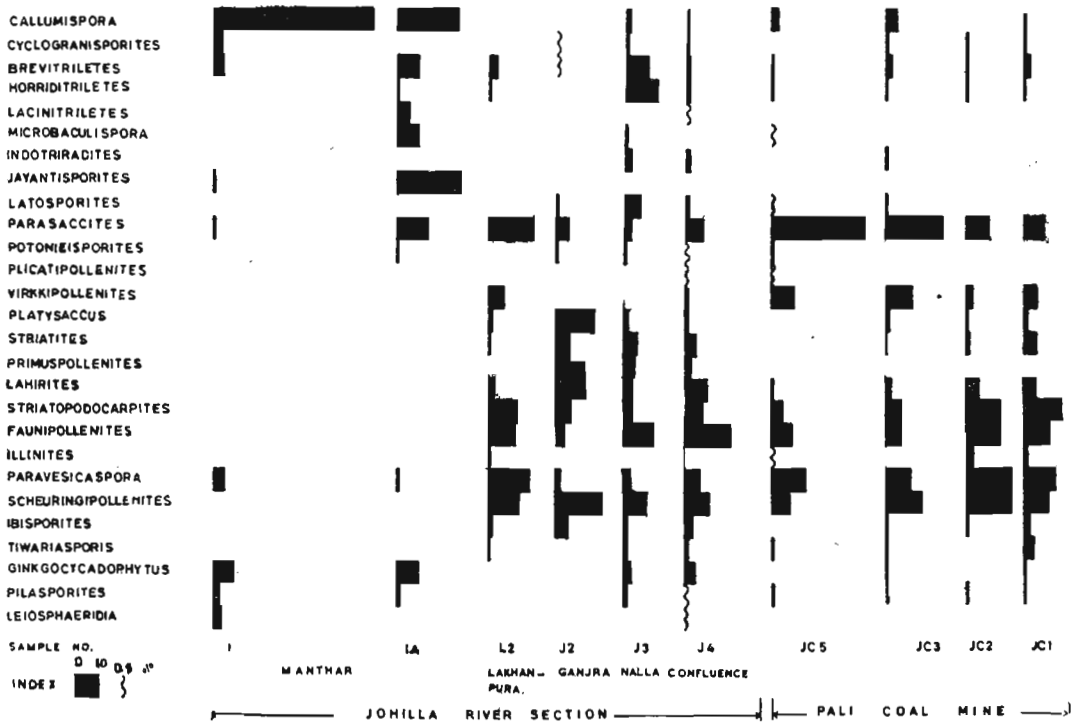


MAP 1 — Geological map of Johilla Coalfield, M.P., India (after Hughes, 1884).

The mioflora is characterised by the overall abundance of laevigate trilete miospores (67%) while apiculate trilete spores (9%) and colpate (9%) pollen grains follow next in order of dominance (Histogram 2, Table 3).

In sample no. 1A, *Callumispora* declines sharply to 20 per cent. On the other hand, *Jayantisporites* rises to attain the dominance (27%). *Microbaculispora* (10%), *Parasaccites* (13%) and *Lacinitriletes* (6%) also increase to attain significance. *Ginkgocycadophytus* (10%) maintains almost a uniform trend. In this sample the total percentage of laevigate triletes is reduced to 27 per cent giving way to zonate triletes (27%) and varitriletes (17%). Monosaccate pollen also rise to 14 per cent.

Lakhanpura area — On the west bank of Johilla River, north of the village Lakhanpura, another sequence of coal is exposed which shows a different miofloral succession. In sample no. L2 the maximum percentage is attained by *Parasaccites* (19%) and *Vesicaspora* (18%). The subdominance is attained by *Scheuringipollenites* (14%), *Striatopodocarpites* (13%) and *Faunipollenites* (12%). Thus, the overall dominance is marked by the nonstriate-disaccate (37%) followed by striate-disaccate (30%) and monosaccate (28%) pollen grains.



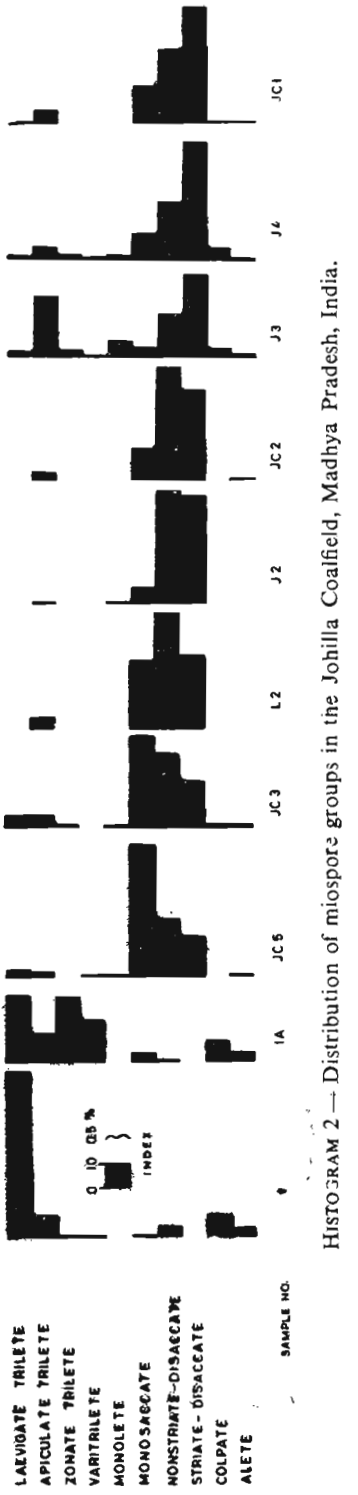
HISTOGRAM 1 — Palynological composition of the Lower Gondwana sediments in Johilla Coalfield, M.P., India.

TABLE 1 — SHOWING DETAILS OF SAMPLES COLLECTED FROM THE JOHILLA COALFIELD, MADHYA PRADESH

SAMPLE NO.	LOCATION	DESCRIPTION OF LITHOTYPES	RECORD OF MIOSPORES
		JOHILLA RIVER SECTION	
1	Manthar Village	Coal	Present
1A	do	Coal — Three meters south of sample 1	do
L1	Lakhanpura	I Seam (Lowermost)	do
L2	do	II Seam	
L3	do	III Seam (Uppermost)	
J1	At the confluence with Ganjra Nala	Carbonaceous shale — I Seam (Lowermost)	
J2	do	Carbonaceous shale — II Seam	Present
J3	do	Coal (60 cm)— III Seam	do
J4	do	Coal (1.2 m)—IV Seam (Uppermost)	do
		JOHILLA COAL MINE	
JC1		Carbonaceous shale (Upper most)	Present
JC2		Coal	do
JC3		Carbonaceous shale (15 cm)	do
JC4		Coal	
JC5		Carbonaceous shale	

TABLE 2 — PERCENTAGE COMPOSITION OF DIFFERENT MIOSPORE GENERA IN THE LOWER GONDWANA SEDIMENTS OF JOHILLA COALFIELD, MADHYA PRADESH

Locality	Manthar		Lakhan-pura	Ganjra Nala Confluence			Johilla Coal Mine			
Genera/Sample No.	1	1A	L2	J2	J3	J4	JC5	JC3	JC2	JC1
Leiotriletes	1·0	4·0			1		1			
Callumispora	66	20			0·5	1	2	4		
Hennellysporites		3			1·0	0·5	0·1	1		1
Cyclogranispo-rites	4			0·5	0·5			0·5	1	0·5
Granulatisporites										0·5
Lophotriletes			0·5		2	0·5		0·5		
Godavarisporites	1	8								
Brevitriletes	4	2	4	0·5	10	2	1	3	1	3
Horriditriletes		1	0·5		12	2	1	1	0·5	1
Pseudoreticulati-spora										
Lacinitriletes	1	6				0·5				
Microbaculispora		10			0·5		0·5			
Indotriradites					3	2		1		
Dentatispora		0·5								
Jayantisporites	1	27								
Latosporites				1·0	7	2	0·5	1		
Densipollenites					0·5					
Barakarites			0·5							
Divarisaccus			0·5	0·5	0·5	1				
Parasaccites	1	3	19	6·0	2	6	35	22	10	9
Caheniasaccites		0·5	1			1	6	3		
Vestigisporites		1·5			1	0·5	1			
Potonieisporites				1·0						
Plicatipollenites						0·5	0·5			
Virkkipollenites			7			2	10	12	3	6
Crucisaccites							1			
Cuneatisporites			2					1		2
Platysaccus				17·0	2	2		1	1	
Lueckisporites									1	
Striatites			1	6·0	6	6		1	1	6
Rhizomaspora				5·0						
Primuspollenites				8·0	5	3				
Lahirites			2	12·0	4	10	1	2	4	5
Verticipollenites						1				
Crescentipolle-nites								1		2
Striatopodocar-pites			13	7·0	4	8	5	6	15	15
Hindipollenites			1	2·0			0·5	1	2	1
Faunipollenites			12	4·0	13	20	9	7	15	12
Striapollenites					0·5					
Illinites			1				0·5		3	2
Vesicaspora	5	1·5	18	2·0	4	7	15	11	20	14
Scheuringipolle-nites			14	21·0	10	11	7	16	20	11
Ibisporites			2	6·0	2	4		1	1	3
Tiwariasporis			1		2	2	1	1		5
Weylandites					0·5					
Ginkgocycado-phytus	9	10			5	5·5		1		1
Pilasporites	3	2			1	0·5	1	1	0·5	0·5
Brazilea									0·5	
Circulisporis									0·5	
Hindisporis										0·5
Peltacystia					0·5					
Leiosphaeridia	4					0·5				



HISTOGRAM 2 — Distribution of miospore groups in the Johilla Coalfield, Madhya Pradesh, India.

Ganjra Nala (Johilla River confluence)— The sequence of coal beds exposed at the junction of Ganjra Nala and Johilla River shows three different assemblages. Sample no. J2 contains maximum percentage of *Scheuringipollenites* (21%) followed by *Platysaccus* (17%) and *Lahirites* (12%). The miofloral assemblage, in general, is dominated by nonstriated-disaccate (46%) and striate-disaccate (44%) pollen grains while the other groups of miospores are poor in representation.

The next younger coal bed (sample no. J3) shows dominance of *Faunipollenites* (13%) and *Horriditriletes* (12%). *Brevitriletes* (10%) and *Latosporites* (7%) show their maximum development in this sequence. *Scheuringipollenites* (10%) shows a decreasing tendency from this sample upwards. As compared to sample no. J2, the striated-disaccates attain the maximum percentage (34%) in sample no. J3; apiculate triletes also increase to attain subdominance (25%) but nonstriated-disaccates (18%) show a decreasing trend.

The uppermost coal (sample no. J4) of the present sequence shows maximum proliferation of *Faunipollenites* (20%) as compared to the older two coal beds at Ganjra Nala-Johilla River confluence. *Lahirites* rises to 10 per cent while *Scheuringipollenites* (11%) remains almost similar to the underlying coal bed. Striated-disaccates in sample no. J4 rise further to maintain the overall dominance while the other group of miospores further decreases in their percentages.

Johilla Coal Mine — The mioflora in coal seams of Johilla Coal Mine is rich in monosaccate and disaccate pollen grains. *Parasaccites* is dominant (35%) in sample no. JC5 and declines in the younger beds. *Virkkipollenites* follows a similar trend. *Scheuringipollenites* and *Vesicaspora* record their maximum (20%) in sample no. JC2 and then again declines. The striate-disaccate pollen grains, chiefly *Striatopodocarpites* and *Faunipollenites*, however, follow a reverse sequence thereby increasing in their percentages towards younger seams. Thus the monosaccates are maximum (53% & 37%) in sample nos. JC5 and JC3 and the nonstriate-disaccates follow the subdominat (23% & 30%) trend but in sample no. JC2 the nonstriate-disaccates rise to overall dominance being

TABLE 3 — DISTRIBUTION OF MIOSPORE GROUPS IN THE JOHILLA COALFIELD, MADHYA PRADESH

Locality	Manthar		Lakhan-pura	Ganjra Nala Confluence			Johilla Coal Mine			
Miospore Groups/ Sample No.	1	1A	L2	J2	J3	J4	JC5	JC3	JC2	JC1
Laevigate trilete	67	27			2	1	3	5		1
Apiculate trilete	9	11	5	1	25	5	2	5	3	5
Zonate trilete	1	27			3	2		1		
Varitrilete	1	17			1	1	1			
Monolete				1	7	2	1	1		
Monosaccate	1	14	28	7	4	11	53	37	13	15
Nonstriated-disaccate	5	1	37	46	18	24	23	30	46	30
Striated-disaccate			30	44	34	48	16	19	37	47
Colpate	9	9			4	5		1		1
Alete	4	4			2	1	1	1	1	1

present up to 46 per cent. Striate-disaccates also rise to subdominance (37%), while the monosaccates show a decreasing trend from this seam. In sample no. JC1 the striate-disaccate pollen grains attain maximum (47%), whereas nonstriate-disaccates reduce to subdominance (30%).

PALYNOSTRATIGRAPHY

The present investigation has revealed the oldest miofloral assemblage near the village Manthar where *Callumispora* characterises the palynological spectrum. The dominance of this genus is known in the Lower Karharbari seam of the Giridih Coalfield (Srivastava, 1973) where the same is associated with *Parasaccites* and *Brevitriletes*. In Korba Coalfield, *Callumispora* dominant assemblage occurs immediately above the monosaccate dominant Talchir mioflora (Bharadwaj & Srivastava, 1973; younger subzone of Zone 1). The Karharbari sediments of Jayanti Coalfield (Lele & Makada, 1974) also contains the dominance of *Callumispora* (*Punctatisporites* + *Callumispora*). Similar succession also occurs in the lowermost coal facies overlying the Talchir Formation in the Paradol-Chirimiri railway cutting of the Chirimiri Coalfield (Srivastava, 1980b; sample no. CR/15) in which *Callumispora* is associated with *Microbaculispora* and *Jayantisporites*. The latter genus attains dominance in the second coal bed (sample no. 1A) near Manthar village presumably at the cost of *Callumispora* which usually shows a decreasing tendency towards the younger sediments as has been observed in the Umrar Nala section of the Umaria Coalfield also (Srivastava & Anand Prakash, 1984; sample nos. G15-G-13), thus represnting a comparatively younger aspect within this biozone. The Lower Karharbari assemblage of the West Raniganj Coalfield (Sonbad Nala, Pusai-Shampur area) also contains the dominance of *Callumispora* (Tiwari, 1973, Zone 1) and is comparable with sample no. 1 of Manthar Village. In the North Karanpura Coalfield (Srivastava, 1980a; sample nos. B/5 & B/3, Honhe area) *Callumispora* is associated with *Brevitriletes*, *Microbaculispora* and *Jayantispora* and thus bears a closer resemblance with the present mioflora. The coal-bearing sediments above the Talchir Formation of West Bokaro Coalfield also shows the dominance of *Callumispora* associated with *Brevitriletes*, *Microbaculispora* and *Lacinitriletes* (Anand Prakash *et al.*, 1979). All these assemblages occur in the coal-bearing sediments overlying the Talchir Formation and if a similar significance be attached to the miofloral assemblage of Manthar Village it should represent the Lower Karharbari mioflora in the Johilla Coalfield and is designated here as miofloral assemblage Zone 1.

The lower two coal seams represented by sample nos. JC5 and JC3 in Johilla Coal Mine show the dominance of *Parasaccites*. The total percentage of radial monosaccate pollen grains exceed the nonstriate-disaccates.

The lower coal bed near Lakhanpura Village (sample no. L2) also shows a similar association of monosaccates and nonstriated-disaccates *Vesicaspora* and *Scheuringipollenites* but with increased percentages of striated-disaccates and in this respect it shows a younger aspect as compared with the above two coal seams of Johilla Coal Mine. In Korba Coalfield, *Parasaccites* assumes dominance once again above the *Callumispora* dominant zone (Bharadwaj & Srivastava, 1973; Bore-hole NCKB-19; older subzone of Zone 2) and is associated with the coal bearing sediments. As opposed to the monosaccate dominant phase of the Talchir Formation it is distinguished by the incoming of nonstriate-disaccate pollen grains and in this respect the above samples of the Johilla Coalfield contain a closely comparable mioflora. Similar succession has been also observed in the Raniganj Coalfield (Tiwari, 1973; Sonbad Nala section, Pusai-Shampur area, Zone 2). In North Karanpura Coalfield also a monosaccate dominant Upper Karharbari assemblage underlies the Lower Barakar nonstriate-disaccate assemblage (Kar, 1973; Bore-core no. KB21, 481.8 m, p. 312). Considering the above successions the lower two coal seams of Johilla Coal Mine and the lower coal bed near Lakhanpura Village (sample no. L2) are suggested to represent the Upper Karharbari mioflora in the Johilla Coalfield and have been designated as Zone 2.

The coal-bearing beds exposed at the Ganjra Nala-Johilla River confluence (sample nos. J2 & J3) and the third coal seam (sample no. JC2) of Johilla Coal Mine contain a nonstriate-disaccate assemblage and are placed in Zone 3 of the Johilla Coalfield. The subsurface palynological investigation of the Lower Gondwana sediments of Korba Coalfield has shown that nonstriate-disaccate dominant mioflora occurs above the monosaccate dominant phase and represents the Lower Barakar mioflora (Bharadwaj & Srivastava, 1973; Bore-hole no. NCKB-19, older subzone of Zone 3). Similarly in Bore core no. KB 21 (405.6 m) of the North Karanpura Coalfield (Kar, 1973, p. 312) nonstriate-disaccate mioflora succeeds the monosaccate dominant phase. Tiwari (1973) has also recorded a very closely comparable assemblage from the Raniganj Coalfield (Zone 4, Pusai Nala Section). Thus, the lower coal beds (sample nos. J2 & J3) of the Ganjra Nala-Johilla River confluence and the third coal seam (sample no. JC2) of the Johilla Coal Mine represent the Lower Barakar mioflora of the Johilla Coalfield (Zone 3).

The youngest coal seam of the Johilla Coal Mine (sample no. JC1) and the upper most coal bed exposed at the confluence of Ganjra Nala-Johilla River (sample no. J4) shows maximum development of striated-disaccate pollen grains and the association of nonstriated-disaccates is reduced to subdominance. Such association is known in the Raniganj Coalfield (Tiwari, 1973; Zone 5, Khudia Nala section) where the striated-disaccate mioflora occurs above the nonstriated-disaccate dominant zone representing the Upper Barakar mioflora. In the miofloral succession of South Karanpura Coalfield (Bharadwaj & Tripathi, 1978) also the striate-disaccate dominant phase succeeds nonstriate-disaccate dominant phase. Similarly, the Upper Barakar assemblage in the North Karanpura Coalfield (Kar, 1973) is also dominated by striated-disaccate pollen grains but the percentage of nonstriate-disaccates in the above samples of Johilla Coalfield is comparatively higher and represents an older aspect.

The palaeobotanical investigation of mega- and microfossils in the coal-bearing sediments exposed at Ganjra Nala-Johilla River confluence by Saksena (1952, 1971) and Lele and Maithy (1969) have suggested a Karharbari age. Recently, Chandra and Srivastava (1982) have opined a similar view for all the coal-bearing beds exposed at Manthar, Lakhanpura, Ganjra Nala-Johilla confluence on the basis of plant fossils which are mostly fragmentary. The present investigation, however, has shown that the coal-bearing sediments exposed at Lakhanpura, Manthar, Ganjra Nala-Johilla River confluence and Johilla Coal Mine encompasses a succession of Lower Karharbari to Upper Barakar miofloras. The lithological distinction between the Karharbari and Barakar formations may not be as sharp as the miofloral assemblages studied which are developed in comparatively very narrow thicknesses of the Lower Gondwana sediments in Johilla Coalfield presumably because of the truncated and undulatory development of the coal-bearing sediments in the various areas of Johilla Coalfield.

Thus, the miofloral succession in Johilla Coalfield investigated may be summarised as given below:

		Miofloral zone	Manthar	Lakhanpura	Johilla Coal Mine	Ganjra Nala Confluence	Miofloral Association
BARAKAR	UPPER	4			Sample No. JC1	Sample No. J4	*Faunipollenites*+Striate+nonstriate-disaccate
	LOWER	3			Sample No. JC2	Sample Nos. J2 and J3	*Scheuringipollenites*+*Vesicaspora*
KARHARBARI	UPPER	2		Sample No. L2	Sample Nos. JC3-JC5		*Parasaccites*+nonstriate-disaccates
	LOWER	1	Sample Nos. 1 and 1A				*Callumispora*+*Jayantisporites*+*Microbaculispora*

CONCLUSIONS

The palynological investigations carried out from the coal-bearing sediments of Johilla Coalfield suggest that a succession of Lower Karharbari to Upper Barakar miofloras is distinctly developed as opposed to the earlier contention of their being mostly Karharbaris. The oldest mioflora has been recorded at Manthar Village and is comparable to the known Lower Karharbari miofloras of the Lower Gondwanas of India. Coal bed exposed near Lakhanpura village bears an Upper Karharbari affinity. The miofloras in the coal seams of Johilla Coal Mine, being distinctly different in all the coal seams, incorporate a succession of Upper Karharbari to Upper Barakar miofloras. The sequence of coal seams exposed at Ganjra Nala-Johilla River confluence is not Karharbari as suggested earlier since the miofloral succession indicates a Lower Barakar to Upper Barakar affinity. All the three coal seams can be palynologically differentiated from each other.

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