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Palynostratigraphy of the Lower Gondwana sediments from Shobhapur Block, Pathakhera Coalfield, Madhya Pradesh

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Palynofloral investigations carried out on bore-hole samples from Shobhapur Block, Pathakhera Coalfield in Madhya Pradesh revealed two distinct palynofloral assemblages. Assemblage Zone-1 is rich in radial monosaccates, chiefly *Parasaccites* and includes the lowermost coal seam of the area, the Bagdona Seam. Assemblage Zone-2 is characterised by the dominance of nonstriate-disaccate—*Scheuringipollenites*, distributed in the younger coal seams including lower (Middle) and upper (Top workable). Assemblage Zone-1, corresponding to the known Upper Karharbari palynofloras, establishes the existence of Karharbari sediments in Shobhapur Block of Pathakhera Coalfield, which were hitherto assigned to Barakar Formation. The Barakar palynoflora has continued into the lower part of Motur Formation in bore-hole no. CMPS 43 of Shobhapur Block.

Key-words—Palynostratigraphy, Karharbari Formation, Barakar Formation, Lower Gondwana (India).

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सारांश

मध्य प्रदेश में पथखेड़ा कोयला-क्षेत्र के शोभापुर ब्लॉक से अधरि गोंडवाना अवसादों का परागाणुस्तरविन्यास

सुरेश चन्द्र श्रीवास्तव एवं ओमप्रकाश शिवदास सराटे

मध्य प्रदेश में पथखेडा कोयला-क्षेत्र के शोभापुर ब्लॉक मे **बेध-छिद्र** नमूनों के परागाणविक अन्वेषण से दो विभिन्न परागाणुवनस्पतिजातीय समुच्चय उपलब्ध हुई है। समुच्चय मडल-1 अरीय एककोष्ठीयों, मुख्यतया पैरासेक्काइटिस, से भरपूर है तथा इसमें इस क्षेत्र की अधरितम कोयला-सीम—बागडोना सीम, सम्मिलित है। समुच्चय मडल-2 अरेखीय-द्विकोष्ठीयों, **श्यौरिंगीपोलिनाइटिस**, से अभिलक्षणित है जो कि अधरि एव उपरि अल्पायु के कोयला-सीमों में वितरित है। उपरि करहरबारी से ज्ञात परागाणुवनस्पतिजातो से सम्बद्ध समुच्चय मडल-1 के आधार पर शोभापुर ब्लॉक में करहरबारी अवसादो की उपस्थिति इगित हुई है जिनको कि अब तक बराकार शैल-समूह का माना जाता था। बराकार परागाणुवनस्पतिजात शोभापुर ब्लॉक के बेध-छिद्र संख्या सी-एँम-पी-एँम० 43 मे स्थित मोतुर शैल-समूह के निचले भाग मे विद्यमान है।

SATPURA Basin is the westernmost Gondwana Basin and includes Mohpani, Pathakhera and Pench-Kanhan coalfields. The former represents the northernmost limb while the latter two represent the southern and south-western limbs of the Satpura Basin. Anand-Prakash (1972) studied the *sporae-dispersae* from Pench-Kanhan and Pathakhera area but the information as such does not throw any light on the age of the coal seams of Pathakhera Coalfield. The present investigation has been undertaken to develop palynological succession in bore-holes CMPS-35, 38 and 43.

GENERAL GEOLOGY

The Pathakhera Coalfield, named after a small village—Pathakhera (22°06′ : 78°10′), lies in the Betul District of Madhya Pradesh. It is 19 km east from Ghodadongri Railway Station. This coalfield is one of the most promising source of coal supply for western India. Shobhapur Block represents the northernmost portion of the Pathakhera Coalfield (Map 1).

The Archaeans here form the basement for the Lower Gondwana sediments which chiefly comprise

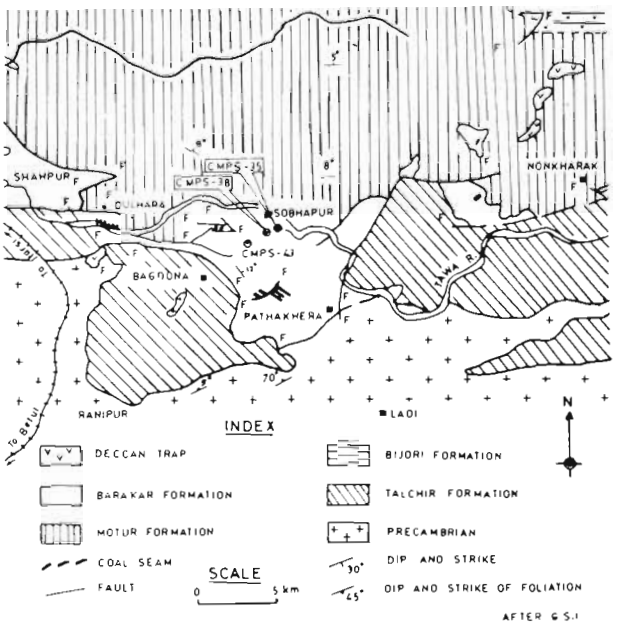
gneisses, schists and quartz veins. They also form hills of considerable heights on the northern margin. The Talchir sediments overlie the basement metamorphics and include khaki green needle shales, yellowish coarse-grained sandstone and the mudstone bands boundary in the south-east and west is faulted. The Talchir sediments are overlain by Barakar Formation which is the only coal-bearing horizon in Pathakhera Coalfield and includes three coal seams. The Barakar sediments mainly consist of coarse-grained sandstones, rarely fine-grained with occasional shale bands and coal seams. The Motur Formation overlies the Barakar Formation and consists of greenish coarse-grained sandstone and red, yellow or green clay. The clays are calcareous in nature with occasional shale bands. The Bijori Formation overlies the Motur Formation and contains fine-grained buff coloured sandstones, shales and micaceous flags. These exposures are seen on the banks of Tawa River in the north-central part of the Pathakhera Coalfield.

The geological succession (after Sastry *et al.*, 1973) in Pathakhera Coalfield is given below:

Recent to Sub-Recent	Detrittal mantle	Soil and newer alluvium sub-soil Older alluvium
Upper Cretaceous Basic intrusives		Dolerite dyke and trap
	.....Unconformity.....	
Upper Permian	Bijori Stage (Raniganj)	Green to grey sandstones, shales and micaceous flags
Middle Permian	Motur Stage (Barren Measures)	Green to grey sandstones with minor shales and coal seams
Lower Permian (not exceeding 500 m)	Barakar Stage	Grey sandstones with minor shales and coal seams
	.....Unconformity.....	
Talchir 150 to 600 m, maximum in the west)	Talchir Series	Greenish fine-grained shales and sandstone (boulders are recognised in other adjacent fields to the west)
	.....Unconformity.....	
	Archaeans	Gneisses, schists, quartzites, crystalline limestone

LOWER GONDWANA

Collection of samples—All the samples are from the bore-holes. Bore-hole no. CMPS-43 is 273.20 m in thickness (Litholog 1) and is located at about 2.5 km west of Shobhapur coal mine. The clay band at 78.75 m demarcates the overlying Moturs from underlying Barakar sediments. The details are as under:



Map 1—Geological map of Pathakhera Coalfield, Madhya Pradesh.

Sample no.	*Depth in meters*	*Lithology*	*Palyno-fossils Present (+) Absent (—) Rare (*)*
1.	18-19	Variegated clay	—
2.	19.70	Variegated clay	—
3.	20	Fine grained sandstone	—
4.	45	Green fine grained sandstone	—
5.	45.65-47	Green fine grained sandstone	—
6.	48 50	Clay + fine grained sandstone	—
7	49	Green fine grained sandstone	—
8.	50	Sandstone	—
9.	57	Micaceous sandstone	—
10.	59	Fine green sandstone	—
11.	61	Fine greyish sandstone	—
12.	61.50	Greenish sandstone	+
13.	62	Fine greenish sandstone	—
14.	63	Gritty sandstone	—
15.	63.5	Fine grained sandstone	—
16.	64	Fine grained sandstone + shale	+
17	67	Gritty sandstone + shale	+
18.	67.5-68.55	Variegated clay	—
19.	68.55-69.5	Green variegated clay	—
20.	70	Green fine clay	—
21.	75.5	Green clay	—
22.	76.75	Greyish sandstone	—
23.	77.5	Fine grained sandstone with micaceous streaks	*
24.	78	Variegated clay	—
.....	.....	.....Motur-Barakar boundary.....	
25.	78.75	Fine grained sandstone with coal and micaceous streaks	—
26.	90.50	Fine grained sandstone	+
27	94.25	Coarse grained sandstone with clay	+

28.	102.50	Fine grained clayey sandstone	—
29.	102.90	Fine grained clayey sandstone	—
30.	110	Coarse grained sandstone with coal streaks	•
31.		Coarse grained sandstone with coal streaks (greenish)	—
32.	115	Coarse grained greenish sandstone with shale patches	•
33.	124	Fine grained greenish gritty sandstone	•
34.	136	Micaceous shale	+
35.	136.5	Fine grained sandstone with micaceous streaks	—
36.	138-139	Shale	—
37.	139.25	Fine grained sandstone with shale patch	—
38.	147.85	Shaly sandstone	+
39.	151.90	Sandy shale	+
40.	153	Fine grained shaly sandstone	+
41.	156	Fine grained shaly sandstone	+
42.	164.10	Coal	—
43.	164.25-165	Carbonaceous shale	•
44.	181	Fine grained shaly sandstone	+
A-1	189.32	Shaly coal	+
A-2	189.54-190.20	Coal	—
A-3	189.20-190.82	Shaly coal	+
45.	191.20	Shale	+
B-1	211.53-212.25	Coal	—
B-2	212.25-212.42	Carbonaceous shale	—
B-3	212.42-212.85	Coal	—
B-4	212.85-213.85	Coal	•
B-5	214.40-216.42	Shale	•
B-6	216.42-217	Shaly coal	+
B-7	217-217.20	Coaly carb. shale	•
46.	217.40	Carbonaceous shale	—
47	218-219	Sandy shale	+
48.	221	Shale	+
49.	226	Shaly coal	—
50.	227	Greyish black shale	+
51.	228.5—229.5	Carbonaceous shale	+
52.	230.60	Shaly sandstone	—
53.	231.30	Fine grained sandstone with micaceous streaks	—
54.	242	Fine grained sandstone with micaceous streaks	•
55.	243	Shaly coal	—
56.	243-243.55	Sandy shale	+
57	244-247.60	Fine grained sandstone with micaceous streaks	+
58.	248	Shaly sandstone	+
59.	248.60-250	Fine grained sandstone with shale	+
60.	250.25	Shaly sandstone	—
61.	251.70-252	Sandy shale	+
62.	252.70-254	Shale	+
63.	256-257.75	Shale	•
64.	257.25-259.70	Shale	•
65.	259.75-260.25	Greyish black shale	+
66.	263-264.50	Sandy shale	+
67.	265-265.5	Sandy shale	•
BG-1	266-267.20	Coal	•
BG-2	267-20-267.40	Sandy shale	+
BG-3	267.70	Sandstone	+
BG-4	268.35	Coal	•
68.	268.5	Shale	+
69.	269	Micaceous shale	+
70.	270.50	Shale + sandstone	—
71.	270.60-271.60	Sandy shale	+
72.	272.30	Fine grained sandstone with micaceous bands	•
73.	273.10-273.30	Micaceous shale	+

.....Bore-hole closed.....

The other two bore-holes CMPS-35 and CMPS-38 are located at about 1.2 km north-west of Shobhapur mine and the details of samples are as follows.

BORE-HOLE NO. CMPS-35

Depth in meters			*Palyno-fossils Present (+) Absent (—) Rare (•)*
164.96-166	Coal	Upper Workable seam	•
166-166.10	Shale	Upper Workable seam	•
166.10-166.60	Shale	Upper Workable seam	+
182.36-184	Shale	Lower Workable seam	+
184-184.30	Coal	Lower Workable seam	•
184.30-185	Shale	Lower Workable seam	+
185-186	Coal	Lower Workable seam	•
186-186.50	Shale	Lower Workable seam	+

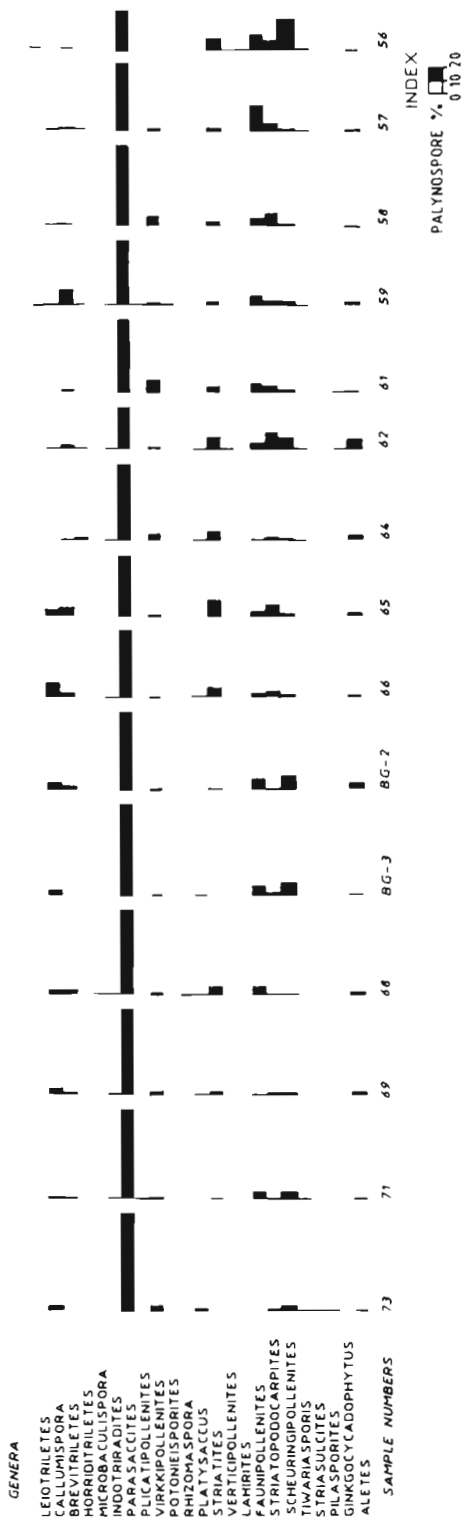
BORE-HOLE NO. CMPS-38

165-165.13	Coal	Upper Workable seam	•
165.13-165.65	Shale	Upper Workable seam	+
165.65-166	Coal	Upper Workable seam	•
166-166.83	Shale	Upper Workable seam	+
183-50-183.90	Coal	Lower Workable seam	—
183.90-186	Shale	Lower Workable seam	•
186-186.95	Coal	Lower Workable seam	•
186.95-187	Shale	Lower Workable seam	•
187-187.73	Coal	Lower Workable seam	+

PALYNOFLORA

In the present palynological investigation the following taxa have been recorded:

Indotriradites korbaensis Tiwari 1965
Horriditriletes novus Tiwari 1965
Brevitriletes crassus Sinha 1972
B. communis Bharadwaj & Srivastava 1969
Playfordiaspora annulata Tiwari & Rana 1980
Pseudoreticulatispora barakarensis Bharadwaj & Srivastava 1969
Latosporites intragranulosus Singh 1964
Callumispora tenuis Bharadwaj & Srivastava 1969



Histogram 1a—Showing palynofloral assemblages in bore-hole no CMPS-43, Shobhapur Block, Pathakhera Coalfield.

C. tenuis var. *minor* Bharadwaj & Srivastava 1969
Weylandites obscurus (Tiwari) Bharadwaj & Dwivedi 1981
W. dubius (Venkatachala & Kar) Bharadwaj & Dwivedi 1981
Parasaccites distinctus Tiwari 1965
P. obscurus Tiwari 1965
P. diffusus Tiwari 1965
P. bilateralis Tiwari 1965
Plicatipollenites indicus Lele 1964
Virkkipollenites corius Bose & Kar 1966
Crucisaccites indicus Srivastava 1970
Lunatisporites sp.
Corisaccites alutus Venkatachala & Kar 1968
C. distinctus Venkatachala & Kar 1968
Corisaccites sp.
Striatites panchetensis Tiwari & Rana 1981
S. tectus Venkatachala & Kar 1968
S. alius Venkatachala & Kar 1968
Lahirites rarus Bharadwaj & Salujha 1964
Verticipollenites gibbosus Bharadwaj 1962
Striatopodocarpites subcircularis Sinha 1972
Faunipollenites goraiensis (Potonié & Lele) Maithy 1965
F. singrauliensis Sinha 1972
F. parvus Tiwari 1965
F varius Bharadwaj 1962
F. enigmatus Maheshwari 1969
Striasulcites tectus Venkatachala & Kar 1968
Distriatites insolitus Bharadwaj & Salujha 1964
Rhizomaspora radiata Wilson 1962
R. indica Tiwari 1965
Crescentipollenites sellingi (Salujha) Tiwari & Rana 1980
Crescentipollenites hirsutus (Kar) Bharadwaj, Tiwari & Kar 1974
Marsupipollenites triradiatus Balme & Hennelly 1965
Ginkgocycadophytus vetus (Balme & Hennelly) Tiwari 1965
Potonieisporites neglectus Potonié & Lele 1961
P. concinus Tiwari 1965
Scheuringipollenites tentulus (Tiwari) Tiwari 1973
S. barakarensis (Tiwari) Tiwari 1973
Ibisporites diplosaccus Tiwari 1968
Platysaccus ovatus Maithy 1965
Falcisporites stabilis Balme 1970
Aurangapollenites gurturiensis Srivastava 1977

PALYNOASSEMBLAGE ZONES

The palynoflora recovered from the three bore-holes is distinctly divisible into two palynozones which are here designated as Assemblage Zone-1 and 2.

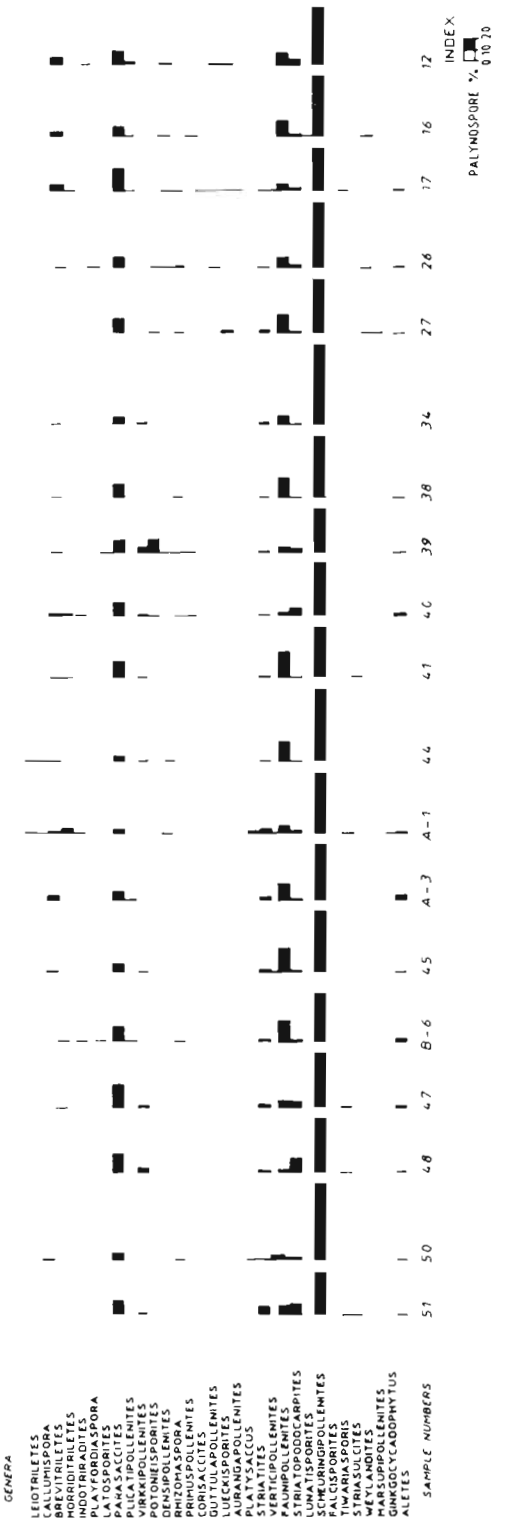
Assemblage Zone-1 — The palynofloral Assemblage Zone-1 is distinguished between 273.10 to 243.55 m in bore-hole CMPS 43 with an average representation of *Parasaccites* up to 60 per cent (Histogram-1a, Table 1). As we move from older to the younger sediments there is a slow but steady decrease in percentage of *Parasaccites* but it still maintains the dominance up to sample no. 56 (243-243.55 m). The total amount of monosaccates at an average remain 65 per cent, the striate-disaccates 17 per cent and non-striate disaccates 6 per cent. Triletes (8%) are comparatively low in percentage distribution. This zone includes the lowermost Bagdona coal seam.

Assemblage Zone-2—The first palynofloral change in bore-hole CMPS 43 is recorded in sample no. 51 (depth 228.5-229.5 m). *Scheuringipollenites* takes over the dominance while *Parasaccites* reduces to considerably low percentage. *Faunipollenites* (average 14%) and *Parasaccites* (average 13%) are next in the order of dominance. *Striatopodocarpites* (average 5%), *Striatites* (average 2%), *Callumispora* (4 to 7%) are in low percentages. *Lueckisporites, Marsupipollenites, Weylandites, Guttulapollenites, Corisaccites, Rhizomaspora, Primuspollenites, Densipollenites* and *Potonieisporites* appeared after sample no. 40 (153 m) and are present between 1 to 2 per cent only. Aletes are also recorded to be 1 to 6 per cent (Histogram 1b, Table 2).

Thus, the total representation of the monosaccates have reduced to 15 per cent on an average, while the non-striate disaccates have risen to 56 per cent. The striate-disaccates have also increased to 21 per cent. The triletes do not record any significant variation, but the incoming of certain elements, though in rare amount, is characteristic showing younger aspect to the palynoflora. The Upper (Top) and the Lower (Middle) Workable coal seams occur within this palynofloral assemblage zone.

The sample nos. 1 to 24 (depth 18-78 m), lithologically correlatable with the Motur Formation in the present bore-hole, however, contained similar palynoflora as has been observed in the underlying samples of Assemblage Zone-2. This shows the continuity of the same palynoflora irrespective of a change in lithology (Histogram 1b, Table 2).

The palynoflora of Lower Workable and Upper Workable coal seams encountered in bore-holes CMPS 35 and CMPS 38 (Histogram 2, Table 3) shows the dominance of *Scheuringipollenites* and thus correlate with Assemblage Zone-2. In bore-hole CMPS 35, the *Parasaccites* and *Faunipollenites* are present in almost similar percentage in Lower



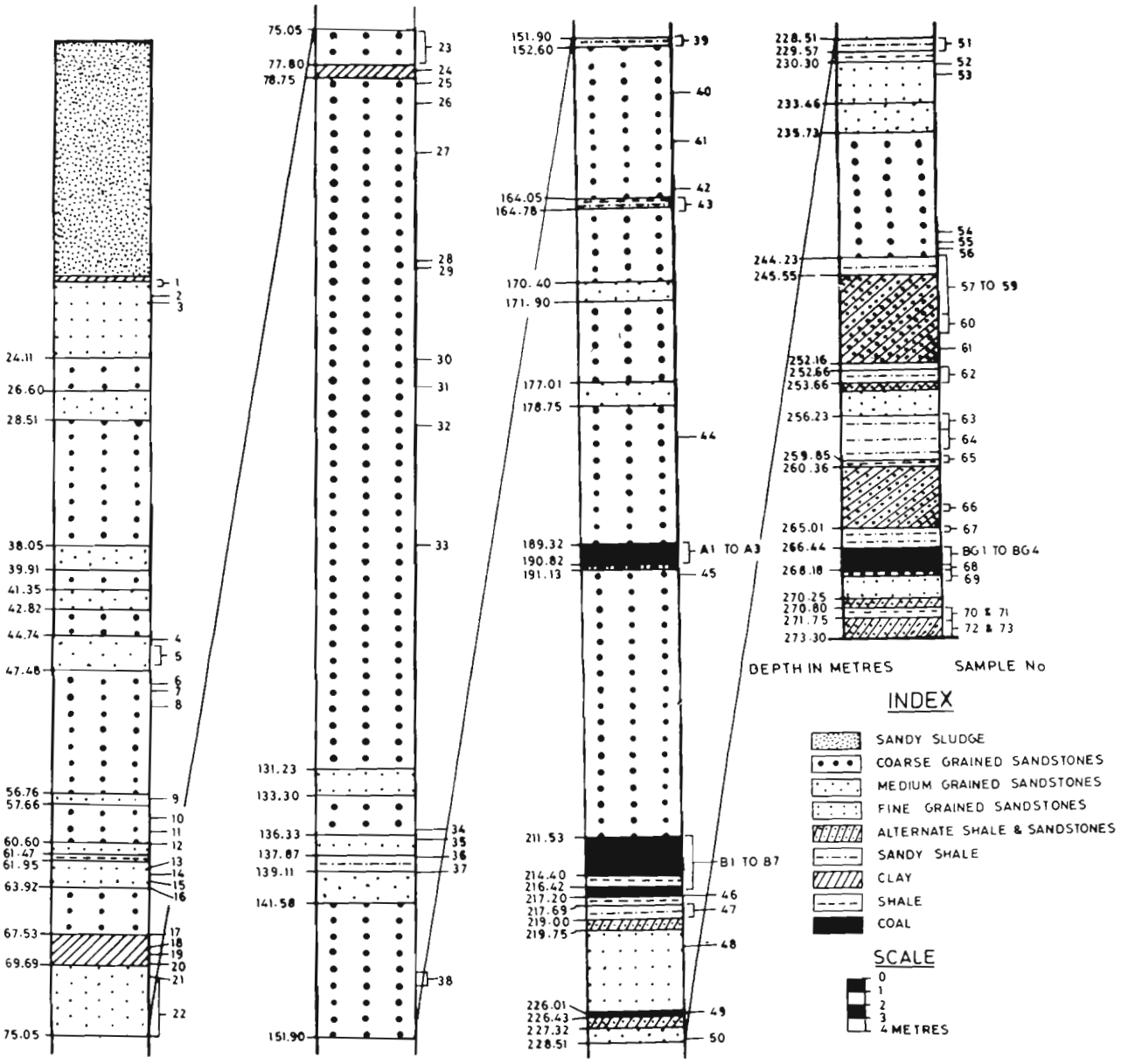
Histogram 1b—Showing palynofloral assemblages in bore-hole no. CMPS-43, Shobhapur Block, Pathakhera Coalfield.

Table 1—Showing the percentage of various genera in Bore-hole no. CMPS-43

		ZONE-1														
Genera	Sample no.	73	71	69	68	BG-3	BG-2	66	65	64	62	61	59	58	57	56
Leiotriletes		—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Callumispora		4	2	5	4	5	6	13	6	2	2	—	2	1	1	—
Brevitriletes		—	2	2	4	—	4	4	7	3	4	3	13	2	2	2
Horriditriletes		—	—	—	—	—	—	—	—	—	1	—	1	—	1	—
Microbaculispora		—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Indotriradites		1	1	1	1	—	—	1	—	1	1	—	1	—	—	—
Parasaccites		78	72	74	68	73	62	54	49	62	35	60	52	65	54	32
Plicatipollenites		—	2	—	—	—	—	—	—	—	—	—	1	—	—	—
Virkkipollenites		5	3	5	3	—	1	2	3	7	4	11	4	9	4	3
Potonieisporites		—	1	—	—	—	—	—	—	—	—	1	—	—	—	—
Rhizomaspora		—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Platysaccus		2	—	1	1	—	—	2	—	1	1	—	—	—	—	—
Striatites		—	1	3	6	1	1	8	13	8	10	5	3	3	3	10
Verticipollenites		—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
Labirites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Faunipollenites		—	6	1	6	7	9	4	5	3	6	8	8	7	21	13
Striatopodocarpites		2	1	2	—	2	1	6	10	4	14	6	4	11	7	8
Scheuringipollenites		4	6	2	1	10	11	3	3	2	10	3	4	2	3	26
Tiwariasporis		1	2	—	—	1	—	—	—	1	1	—	1	—	1	2
Striasulcites		1	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Pilasporites		1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ginkgocycadophytus		—	—	—	—	—	—	—	—	—	1	2	—	—	—	—
Aletes		1	1	4	3	1	5	3	4	6	9	2	4	1	3	1

Table 2—Showing the percentage of various genera in Bore-hole no. CMPS-43

		ZONE-2																	
Genera	Sample no.	51	50	48	47	B6	45	A3	A1	44	41	40	39	38	34	27	26	17	16	12
Leiotriletes		—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—
Callumispora		1	2	—	—	—	2	6	2	1	1	3	2	1	1	—	1	7	4	7
Brevitriletes		—	—	—	1	1	—	—	5	—	1	4	—	—	—	—	—	1	—	—
Horriditriletes		1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Indotriradites		—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Playfordiaspora		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Latosporites		—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Parasaccites		15	8	19	22	16	8	10	5	5	17	15	13	14	7	13	10	22	10	12
Plicatipollenites		—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	2	1	2
Virkkipollenites		4	—	5	2	—	1	—	—	1	1	3	7	—	2	—	—	—	—	—
Potonieisporites		—	—	—	—	—	—	—	—	—	—	1	13	—	—	1	1	—	—	—
Densipollenites		—	—	—	—	—	—	—	1	1	—	—	2	—	—	—	1	1	1	1
Rhizomaspora		—	1	—	—	1	—	—	—	—	—	1	2	1	—	1	2	1	—	—
Primuspollenites		—	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	1	—
Corisaccites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Lueckisporites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	1	—	1
Aurangapollenites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
Platysaccus		—	2	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—
Striatites		8	2	2	3	3	2	3	5	1	2	2	2	1	2	3	1	2	—	—
Verticipollenites		1	5	—	—	—	1	—	1	—	—	—	—	—	—	—	—	1	—	—
Faunipollenites		10	4	4	8	22	24	17	9	20	26	5	7	21	10	19	12	8	7	13
Striatopodocarpites		12	4	15	7	3	3	3	4	1	2	9	6	1	2	4	5	5	4	7
Lunatisporites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Scheuringipollenites		42	71	52	52	47	57	54	58	69	48	52	42	60	77	52	62	42	60	55
Falcisporites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Tiwariasporis		1	—	1	2	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—
Striasulcites		2	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
Weylandites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2	—
Marsupipollenites		—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Ginkgocycadophytus		—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Aletes		3	1	2	3	5	2	6	3	—	—	3	1	1	—	1	2	2	—	—



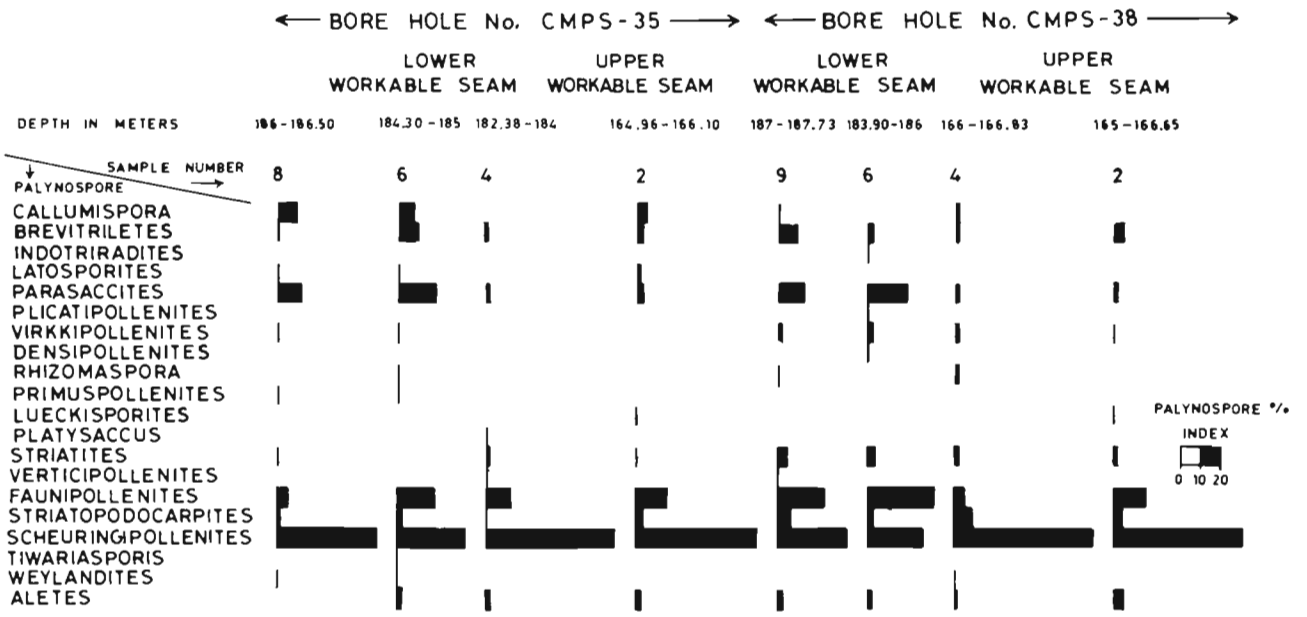
Litholog 1—Succession of Lower Permian sediments in bore-hole no. CMPS-43, Shobhapur Block, Pathakhera Coalfield.

Workable seam while it reduces in Upper Workable seam. The percentage of *Faunipollenites* is considerably higher (28%) in the Lower Workable seam of bore-hole CMPS-38.

DISCUSSION

The Lower Karharbari Seam from Giridih Coalfield (Srivastava, 1973) contained the dominance of *Callumispora* and *Parasaccites*, while the Upper Karharbari Seam contained *Illinites* and other nonstriate-disaccate pollen grains. In subsequent investigation from Korba Coalfield (Bharadwaj & Srivastava, 1973) it was observed that the Lower Karharbari palynoflora is characterised by *Callumispora* and *Parasaccites* while in Upper Karharbari *Parasaccites* attains overall dominance. Both the assemblages were recorded in the subsurface of Korba Coalfield in a continuous and conformable sequence and similar occurrences have also been reported in latter works on Karharbari Formation.

The palynoflora recorded from the Bagdona Seam of Pathakhera Coalfield and lower part of the bore-hole CMPS-43 contains the dominance of *Parasaccites* and in this respect it compares with the lower part of Upper Karharbari palynoflora of the



Histogram 2—Showing palynofloral assemblages in bore-hole nos. CMPS-35 and 38, Shobhapur Block, Pathakhera Coal-field.

Korba Coalfield. In the Barakar type area too, *Parasaccites* dominant assemblage underlying Lower Barakar palynoflora has been recorded from Pusai-Shampur region by Tiwari (1973) which also compares with the present palynoflora. The Upper Karharbari palynoflora recorded from Kauakoh Nala Section from Chirimiri Coalfield (Srivastava, 1980) also shows similar dominance of *Parasaccites* but contains significant percentage of *Ginkgocycadophytus* and *Callumispora*. The palynoflora recorded from Umaria Coalfield (Srivastava & Anand-Prakash, 1984; Zone-2) also contains the dominance of monosaccates but the association of zonate trilete differentiates it from the present assemblage. In the adjoining Johilla Coalfield also, the dominance of monosaccates has been recorded from Johilla Coal

Table 3—Showing the percentage of various genera in Bore-hole nos. CMPS-35 and 38

PALYNOFOSSILS	BORE HOLE NO. CMPS-35				BORE HOLE NO. CMPS-38			
	Lower Workable seam		*Upper Workable seam*		*Lower Workable seam*		*Upper Workable seam*	
Sample no.	8	6	4	2	9	6	4	2
Callumispora	9	8	—	5	1	—	2	—
Brevitriletes	1	10	2	3	9	3	2	5
Indotriradites	—	—	—	—	—	1	—	—
Latosporites	1	1	—	2	—	—	—	—
Parasaccites	12	19	2	4	13	20	2	2
Plicatipollenites	—	—	—	—	—	1	—	—
Virkkipollenites	1	1	—	—	2	3	2	1
Densipollenites	—	—	—	—	—	1	—	—
Rhizomaspora	—	1	—	—	1	—	2	—
Primuspollenites	1	1	—	—	—	—	—	—
Lueckisporites	—	—	—	1	—	—	—	1
Platysaccus	—	—	1	—	—	—	—	—
Striatites	1	—	2	1	3	4	3	2
Verticipollenites	—	—	1	—	2	—	—	—
Faunipollenites	6	19	13	16	23	33	5	16
Striatopodocarpites	2	3	1	4	7	3	9	4
Scheuringipollenites	50	34	75	61	34	28	70	64
Tiwariasporis	—	1	—	—	—	—	—	—
Weylandites	1	—	—	—	—	—	1	—
Aletes	15	2	3	3	3	3	2	5

Mine (Anand-Prakash & Srivastava, 1984; Zone-2) but in the presence of *Scheuringipollenites* and *Vesicaspora* this obviously differs from the present palynoassemblage of the Pathakhera Coalfield (Zone-1).

Anand-Prakash (1972) described the *sporae dispersae* from some bore-hole coal samples of the Pathakhera Coalfield, but he did not provide the quantitative representation of various palynospore genera. The present investigation provides a greater detail of the *sporae dispersae* of the Barakar Formation and the nature of palynological succession in Pathakhera Coalfield and adjoining areas. Bharadwaj, Navale and Anand-Prakash (1974) studied the palynological succession among the coals from Pench-Kanhan Coalfield. Their Assemblage-F is also dominated by *Scheuringipollenites* associated with *Pilasporites* and *Hennellysporites*. In this respect it differs from Assemblage Zone-2 of the present investigation the two genera being absent. Bharadwaj and Anand-Prakash (1972) described *Scheuringipol-lenites* dominant assemblage from the coal-bearing beds of Mohpani Coalfield. The present assemblage of coal-bearing beds and associated sediments from Pathakhera Coalfield compares in the nature of the dominance of various taxa but differs from it in having very small amount of *Brevitriletes* and *Indotriradites* which are associated in subdominance in Mohpani Coalfield. In Korba Coalfield (Bharadwaj & Srivastava, 1973) the *Scheuringipollenites* assemblage (Zone-3) succeeds the underlying Upper Karharbari *Parasaccites* dominant assemblage, but it is associated with *Brevitriletes* and thus differs from the present assemblage. In Giridih Coalfield the palynoflora recorded from Bali and Jatkuti seams shows similar dominance of *Scheuringipol-lenites* and paucity of trilete palynospores.

Thus, in Pathakhera Coalfield (Bore-hole no. CMPS-43) the *Scheuringipollenites* dominant assemblage occurs at the close of *Parasaccites* dominant assemblage. This transition is gradual and continuous either in sedimentation or palynofloral succession. The clay band at the depth of 78.15 m and onwards marks that there is a distinct change in the lithological constituents of the sediments which are designated as Motur Formation. The sandstones in this horizon become coarse-grained and greenish. However, *Scheuringipollenites*-complex continue unabatedly alienating them with Barakar sediments.

The palynoflora representing the Upper Barakar Formation and also Motur Formation (= Barren Measures Formation of the Damodar Valley) are yet to be distinguished in the sediments of Pathakhera Coalfield palynologically. Feistmantel (1879) classified most of the coal seams of Satpura Basin under Karharbari. This contention is applicable only for the lowermost Bagdona coal seam of Pathakhera Coalfield which contains Upper Karharbari palynoflora.

CONCLUSION

The lowermost Bagdona coal seam in bore-hole CMPS-43, contains the dominance of *Parasaccites* representing the Upper Karharbari palynoflora and thus is different from the two younger coal seams, viz., the Lower Workable and Upper Workable coal seams which contain *Scheuringipollenites* dominant Lower Barakar assemblage. The equivalent of Bagdona seam of CMPS-43 has not been studied in bore-holes CMPS-35 and 38. The two coal seams studied in latter two bore-holes correlate closely with the two younger coal seams of bore-hole CMPS 43. Further, Bagdona Seam being the lowermost and associated with the Upper Karharbari palynoflora, contains better quality of coal as compared with the two younger coal seams.

REFERENCES

Anand-Prakash 1972. Sporae dispersae in the coals of Pench-Kanhan and Pathakhera Coalfield (M.P.), India. *Palaeobotanist* **19** : 206-210.

Anand-Prakash & Srivastava, S. C. 1984. Miofloral studies of Lower Gondwana sediments in Johilla Coalfield, M.P., India. *Palaeobotanist* **32** : 243-252.

Bharadwaj, D. C. & Anand-Prakash 1972. Geology and palynostratigraphy of Lower Gondwana formation in Mohpani Coalfield, Madhya Pradesh, India. *Geophytology* **1** : 103-115.

Bharadwaj, D. C. & Srivastava, S. C. 1973. Subsurface palynological succession in Korba Coalfield, M.P., India. *Palaeobotanist* **20** : 137-151.

Bharadwaj, D. C., Navale, G. K. B. & Anand-Prakash 1974. Palynostratigraphy and petrology of Lower Gondwana coals in Pench-Kanhan Coalfield, Satpura Gondwana Basin, M.P., India. *Geophytology* **4** : 7-24.

Srivastava, S. C. 1973. Palynostratigraphy of Giridih Coalfield. *Geophytology* **3** : 184-194.

Srivastava, S. C. 1980. Palynostratigraphy of Lower Gondwana sediments in Chirimiri Coalfield, M.P., India. *Geophytology* **10** : 62-71.

Srivastava, S. C. & Anand-Prakash 1984. Palynological succession of Lower Gondwana sediments in Umaria Coalfield, M.P., India. *Palaeobotanist* **32** : 26-34.

Tiwari, R. S. 1973. Palynological succession in the Barakar type area. *Geophytology* **3** : 136-183.