PALYNOSTRATIGRAPHY OF LOWER GONDWANA SEDIMENTS FROM UMRER QUARRY, NAGPUR, MAHARASHTRA, INDIA

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ABSTRACT

The coal seams and associated sediments from Umrer Quarry have been studied palynologically. The mioflora recovered is either dominated by the trilete miospores or the radial monosaccate spores. Three biozones are recognised on the basis of statistical analysis. Basal, biozone-I, is characterised by the over all dominance of apiculate triletes along with *Callumispora* and *Parasaccites*. The middle biozone-II is dominated by the radial monosaccates and *Sulcatisporites*. The youngest biozone-III shows the dominance of radial monosaccates and *Sulcatisporites* and a significant increase in striated disaccates also. These biozones have been suggested to represent the Karharbari Stage in Umrer Coalfield.

INTRODUCTION

Umrer Coalfield is situated 44 km south-east of Nagpur and extends over an area of about 4 sq km lying between latitudes 20° 50′ 45″ to 20° 52′ 50″ and longitudes 79° 16′ to 79° 18′ 30″. The area falls in the Survey of India toposheet No. 55 P/5. The sketch map of Umrer Coalfield has been published by SARIN, KUDWALI AND KRISHNA (1973).

The Gondwana sediments comprise the Talchir, Coal beds, Kamthi and Lameta rocks. The beds occur in a semielliptical basin forming a semicircular structure in the east, whereas towards south the Gondwana sediments come in contact with the Archaean rocks due to the boundary fault. The succession is well exposed in Umrer Quarry. Coal is being extracted from the Coal beds sequence. Four workable coal seams have been proved in the area. The coal is of low rank and friable in nature with low sulphur and phosphorus contents. A reserve of 77.75 million tons of coal for all the four coal seams has been estimated.

These coal beds have so far been considered to be of Barakar stage. This conception is mainly based on lithological characteristics. The present work gives an account of the miofloral contents of the Coal beds. On the basis of palynological findings, the age and stratigraphic position of the coal deposits in Umrer Coalfield have been discussed.

MATERIAL AND METHODS

An excursion to the Umrer Quarry was undertaken by the authors in 1972 for the collection of samples from the various lithologies of the Coal beds sequence of Umrer Coalfield. In all 18 coal and shale samples were collected for palynological study (Table-I).

Table-I

Sample No.	Details
IA.	Bottom shale of Bottom seam (plenty of spores).
IB.	Shale above IA (spores rare).
IC.	Coal above IB, Bottom seam (Barren).
1.	Bottom seam, durain block (Barren).
2.	Above sample No. 1, durain block (spores rare).

3. Below the sandstone band between Bottom and Middle seams (Barren).
4. Sandstone, parting between Bottom and Middle seams (Barren).
5. Shale above the sandstone parting below Middle seam (Barren).
6. Coal above shale band (spores rare).
7. Coal 5′ above from sample No. 6, Middle seam (spores rare).
8. Coal 5′ above sample No. 7, and below local shale band (spores rare).
9. Local shale band (plenty of spores).
10. Above local shale band (spores rare).
11. Shale 7′ above sample No. 10 (spores rare).
12. Bottom shale of Top seam (plenty of spores).
13. Coal above Bottom shale of Top seam (Barren).
14. Top seam, Middle portion durain (spores rare).
15. Top seam, topmost coal (Barren).

Before the collection of samples, the exposed surface of the bed was dug up to a depth of about one foot along a 6″ wide channel cut through the entire thickness in order to remove the weathered and oxidised material. The samples were collected from the base of the channel separately for each band present in the seam. All the samples were subjected to similar maceration process. About 5 gm of the material from each sample was treated with commercial Nitric Acid for three days followed by the treatment with 10% Potassium Hydroxide, after thorough washing with water as suggested by BHARADWAJ (1962) and BHARADWAJ AND SALUJHA (1964), the macerates were placed in glycerine jelly and slides were prepared. 200 miospores were counted from each sample at generic level for statistical palynological analysis.

In the case of shale samples a treatment with Hydrofluoric acid was also done before the digestion of the material in Potassium Hydroxide.

GEOLOGY OF THE AREA

The Gondwana sediments around Umrer were unconformably laid down over the uneven eroded surface of the phyllites and schists (Archaean) of Sakoli Series. Talchir rocks form the basal formation and are overlain by the Coal beds. Kamthi shales and sandstones unconformably overlie the coal beds and are overlain after a depositional break marked by another unconformity by the Lameta sediments. The area is mostly covered by the trap soil except for some isolated patches of Lameta rocks.

STRATIGRAPHIC SUCCESSION

Recent—soil and sand
Lameta—sandstone and limestone

——————————unconformity ——————————

Kamthi—sandstone and shale

——————————unconformity ——————————

Coal beds—interbedded shales, sandstones and coal seams
Talchir—sandstones, shales and grits

——————————unconformity ——————————

Archaean—Metamorphics, Phyllites and Schists

Talchir Rocks—The Talchir sediments are less developed in the area as the thickness of these beds is only about 50 meters. Shales and sandstones form the major part of the Talchir sediments.

Coal Beds—The coal beds sequence regarded as of Barakar Formation is about 184 meters in thickness. Coal seams, carbonaceous shales, sandy shales and sandstones are the main lithologies of this sequence. Four workable coal seams occur as Nos I-IV, from Bottom to Top. The coal seams No. I and II are separated by a thick parting towards the eastern side of the coalfield but towards the western side they unite to form one coal seam. Therefore these can be considered as one seam. The other two seams No. III and IV are separated by thick parting in the entire area. The coal seams form a sickle-shaped structure with centripetal dips. The dip increases in the eastern part of the coalfield without much of a geological disturbance. The details regarding the thickness of coal seams and partings are given (after Sarin, Kudwali & Krishna, 1973) below:—

Top seam	seam IV	4.3—9.5 meters	
	Parting	14.2—24.9 meters	
Middle seam	seam III	3.8—8.8 meters	
	Parting	4.9—11.7 meters	
Bottom seam	seam II	13.3—21.6 meters	12.6—24.0 m
	Parting	1.7—7.4 meters	
	seam I	1.0—8.6 meters	

Kamthi Sediments—Sandstones and shales are the main lithological units of the Kamthi Formation. Thickness of the Kamthi sediments is variable and at places these rocks have not been recorded in the boreholes.

Lameta Beds—Limestones and sandstones form the major part of the Lameta Formation. The thickness of these sediments varies from 3.8 to 22.4 meters.

PALYNOLOGICAL FINDINGS

During the palynological investigations it has been noticed that the miospores could not be recovered from the coals. The maceration of coal has shown the high percentage of tracheids and cuticles forming the main organic components. Spores and pollen are present, but are very rare. Unlike coals, the associated shales contain rich mioflora. On the basis of the statistical analysis of the shale mioflora, three biozones are distinguishable, incidently corresponding to the three coal seams of the area. Thus, the biozones I, II and III presumably represent the bottom, middle and top coal seams respectively.

Biozone I (Histogram 1) is prominently characterised by the following genera:

Brevitriletes 27%, *Horriditriletes* 20.0%, *Sulcatisporites* 5.0%, *Callumispora* 11.5% and *Parasaccites* 10.5%

Quantitatively less prominent genera are:

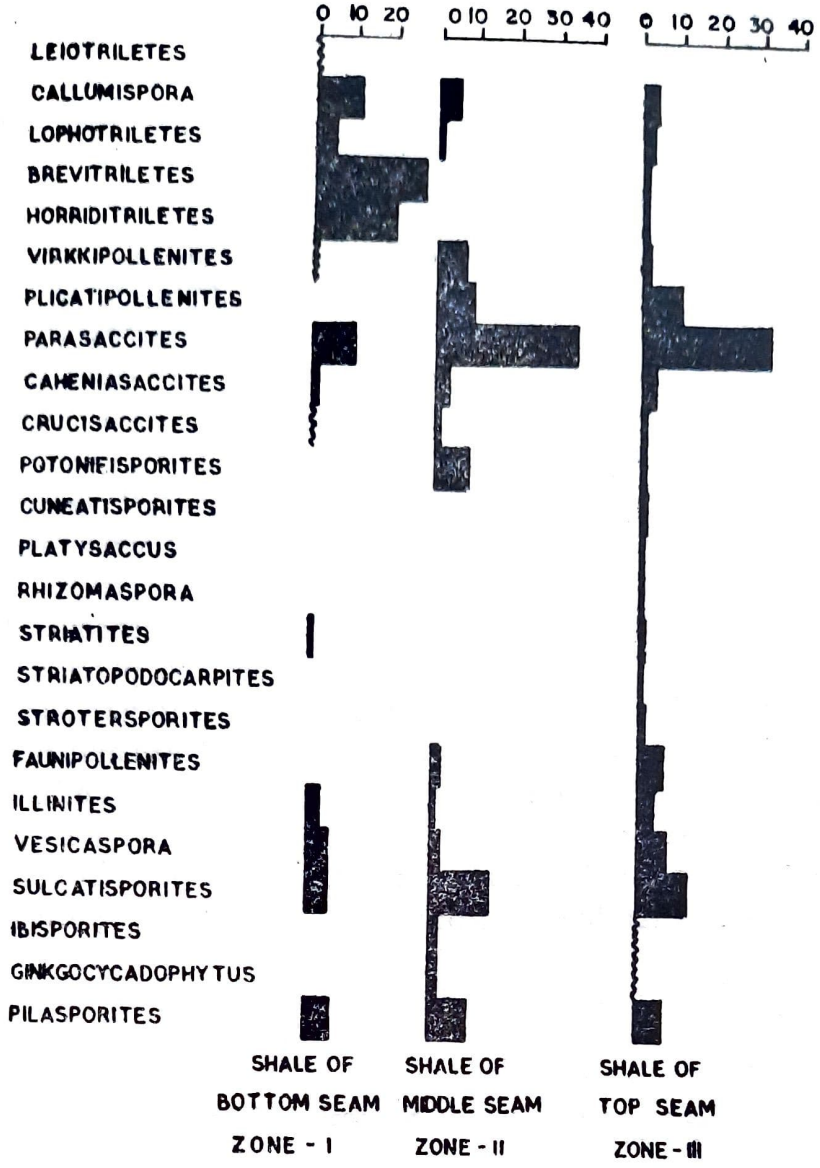
Vesicaspora 5%, *Illinites* 3%, *Caheniasaccites* 15.%, and *Striatites* 1%

In *Biozone* II (Histogram 1) the radial monosaccate miospores increase significantly mostly at the cost of trilete spores, as given below:—

Parasaccites 34%, *Sulcatisporites* 14%, *Plicatipollenites* 9%, *Potonieisporites* 8% and *Virkkipollenites* 7%

The less prominent genera are:

Callumispora 5%, *Caheniasaccites* 3%, *Faunipollenites* 2%, *Vesicaspora* 2%, *Ibisporites* 2% and *Ginkgocycadophytus* 2%



Histogram-1. Percentage frequency of miospore genera, Umrer Coalfield.

Biozone-III (Histogram 1): The radial monosaccate miospores dominate the assemblage although with a slight decrease as compared to Biozone-II. The striated disaccates rise in representation instead, as given below:—

Parasaccites 31.5%, *Sulcatisporites* 12.5%, *Plicatipollenites* 9.5%, *Vesicaspora* 7.0% and *Faunipollenites* 6.0%

The following genera occur persistently though in rare percentages.

Callumispora 3.5%, *Lophotriletes* 2.5%, *Illinites* 4.0% and *Caheniasaccates* 3.0%

The genus *Pilasporites* has not been taken into consideration for the palynological zonation as their affinities are doubtful and also their significance in the biostratigraphy of Lower Gondwanas of India is not precisely known.

The miospore assemblage of Biozone-I is characterised by the overall prominence of apiculate-trilete spores comprizing *Brevitriletes* and *Horriditriletes*. However, the stratigraphically more significant spore genus in the assemblage is *Callumispora*. The Biozone-II shows the prominence of radial monosaccate spores and hence, it is distinctly separable from the Biozone-I, though the parting between the bottom and the middle seams is not much. The Biozone-III is also dominated by the radial monosaccate miospores and is very closely comparable with the Biozone-II though the parting between the middle and

the top seams is substantial. Nevertheless, these two biozones have been kept separated as representing two distinct seams, in order to exhibit the detailed composition of the mioflora in each of them.

BIOSTRATIGRAPHY

The three biozones described so far represent the three successive coal seams in Umrer Coalfield, Maharashtra. The bottom seam, being the oldest, is associated with higher percentages of apiculate trilete group of miospores *Horriditriletes* and *Brevitriletes* while *Callumispora* and *Parasaccites* occur next to them. In the next younger seam (i.e. middle seam) the apiculate triletes decline appreciably while the radial monosaccates attain their maximum. The striated and nonstriated disaccates remain almost at the same level. In the youngest coal seam the radial monosaccate pollen grains still command the dominance while striated disaccates increase slightly. Thus, the middle seam and top seam, while showing similar dominance still maintain their identity.

The palynological succession exhibited in the three carbonaceous horizons of Umrer indicate deposition prior to and during the later of the two phases of radial monosaccates dominance in the older part of Lower Gondwana (Bharadwaj and Srivastava, 1973; Kar, 1973). The apparently low incidence of *Callumispora* and *Parasaccites* in shale of oldest seam appears to be due to an abnormal over-representation of the apiculate triletes. Evidently, the oldest biozone corresponds to Lower Karharbari Formation (Srivastava, 1973) whereas the two younger biozones are apparently homotaxial with the radial monosaccates dominated younger Karharbari Formation (Tiwari, 1973; Bharadwaj, 1974).

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