

PALAEOBOTANICAL EVIDENCE ON THE AGE OF THE KHATANGI BEDS (? DUBRAJPUR), IN THE RAJMAHAL HILLS, BIHAR

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ABSTRACT

The present paper describes some plant megafossils from Khatangi Hill, in the Rajmahal Hills. The bed from which these fossils were collected are infratrappean in position to the Rajmahal Volcanic Series and directly overlie the Lower Gondwana formations. Lithologically they cannot be distinguished from the rocks of the Dubrajpur group. The Khatangi plant fossil assemblage is typically similar to that of the Rajmahal Flora and, therefore, undoubtedly of Jurassic age.

In the light of the present finding the stratigraphical position of these beds and the Dubrajpur group as a whole has been discussed.

INTRODUCTION

FOSSIL plants treated in this paper were collected from Khatangi hill (locally called as Kuthganwan Pahar), about two to three furlongs south of Kharikasol village along the Silingi-Urma road (Topo sheet No. 72 P/6; 24° 30' 16" N; 87° 27' 20" E). The area is about 10 miles west of Amrapara and about

2 miles ESE of Silingi in the Rajmahal Hill.

The information regarding this locality was given to me by Mr. R. N. Srivastava, Geologist, Geological Survey of India, and I wish to take this opportunity of expressing my sincere thanks to Mr. Srivastava.

GEOLOGICAL OBSERVATIONS

The section exposed in the Khatangi Hill is given in Table 1 along with the general succession in the Rajmahal Hills (after Ball, 1877) for comparative purposes. At a casual glance the whole area near about Khatangi Hill appears to be mainly composed of gritty sandstones very similar in appearance to that of the neighbouring Barakar country. The hill is about 63 metres high, covered with a fairly moderate vegetation, chiefly composed of small trees, shrubs and under-growths. The outcrops show a general north-west dip, tending

TABLE 1

KHATANGI HILL SECTION	GENERAL SUCCESSION IN THE RAJMAHAL HILLS	PERIODS
	Alluvium	Recent
?	Trap	
	Intertrappean Series (shales, sandstones, porcellanites and cherts. Plant Fossils abundant).	Jurassic
	Trap	
2. Ferruginous gritty conglomerate and sandstones with intercalated bands of greyish-white compact shale. (Plant Fossils described in this paper were found here. This horizon is referred to as the <i>Khatangi Plant Beds</i>).	Dubrajpur Group (Sandstones, shales, grits and conglomerate).	? Mahadeva
1. Sandstones and conglomerate with intercalated bands of soft, buff coloured shales (<i>Glossopteris</i> and <i>Vertebraria</i> found here).	Damudas (Sandstone, shales, coal, fire clay and conglomerates).	Damudas
?	Talchirs (Boulder bed, shales and sandstones)	Talchir
~~~~~~	~~~~~~ Unconformity ~~~~~~	
Metamorphic Series	Metamorphics (Gneisses, dykes and sills).	Archeans

towards a northern direction as one travels farther east. The two sandstone groups show considerable similarity and in the field it is rather difficult to distinguish between them.

The conglomerate associated with the upper group of sandstone (No. 2 in the sequence given) is reddish in colour and gritty in texture, consisting of small quartz pebbles in a rather compact, highly ferruginous matrix. It is present as a thin band, frequently jointed and usually caps the shale bed. The sandstone is creamy to dirty brown in colour and has a medium-grained gritty texture. The rock is ferruginous and composed mainly of small pebbly grains of quartz, some iron-oxide and rarely feldspars. The intercalated shale bed within this sandstone is light greyish to light bluish in colour, more or less arenaceous, with a fine-grained texture.

The lower group of conglomerate (No. 1 in the sequence given) is comparatively less compact and less ferruginous. It consists of quartz pebbles in a felspathic matrix. The feldspars are usually decomposed and kaolinized giving the sandstone a less compact appearance. The sandstone is creamish in colour, sometimes with brownish specks. It is essentially composed of quartz, feldspar and iron-ore. Quartz is the predominant constituent mineral followed by a fair amount of feldspar which is mainly kaolinized. The intercalated shale is soft, arenaceous, buff coloured and more or less fine grained in texture.

The two sandstone groups mentioned above show considerable lithological similarity and there is no definite evidence for an unconformity between them.

#### ELEMENTS OF THE KHATANGI FLORA AND ITS AGE

The Khatangi flora represents a rather small assemblage and the preservation is not always very satisfactory for specific comparisons. Despite this difficulty the assemblage contains quite a few diagnostic elements which provide a means to assess and compare the Khatangi flora with that of the Rajmahal Intertrappean Series. The total number of species of fossil plants, composing the Khatangi Plant Bed, which could be determined (both reasonably or doubtfully) is 12. It is considered unnecessary to describe the plant fossils in detail

as they belong to already well-known genera and species. A brief note on these plants is, however, given with the explanation of plate 1. The constitution of the flora is as follows:

#### I. FILICALES

1. *Cladophlebis indica* (O. & M.) Sahni & Rao (Pl. 1, Fig. 1)
2. *Cladophlebis* sp. (Reg. No. 16802)
3. *Gleichenites gleichenoides* (O. & M.) Seward (Pl. 1, Figs. 7-8)
4. *Microphylopteris* sp. (Pl. 1, Fig. 5)
5. ? *Thinnfeldia* sp. (Pl. 1, Fig. 3)

#### II. CYCADOPHYTA

##### (a) BENNETTITALES

6. *Ptilophyllum acutifolium* Morris (Pl. 1, Fig. 6)
  7. *Pterophyllum* (a new species described elsewhere)
  8. *Williamsonia* sp. (Reg. No. 16783)
- ##### (b) NILSSONIALES
9. *Nilssonia princeps* O. & M. (Reg. No. 16765)
  10. *Nilssonia* spp. (Reg. Nos. 16758, 16802)
  11. *Macrotaeniopteris lata* (O. & M.) Feistm. (Pl. 1, Fig. 9)

#### III. CONIFERALES

12. *Elatocladus conferta* (O. & M.) Sahni (Pl. 1, Fig. 4)

A survey of the Khatangi plant assemblage, from the viewpoint of its composition and affinities, reveals that it is characterized by three major groups (i) Filicales, (ii) Cycadophyta and (iii) Coniferales. Of these Cycadophytes form the most important part, being represented by 5 genera and 6 species. Amongst these, three species were found in great abundance. The Filicales are almost equally represented in genera and species but their occurrence is slightly less frequent than the Cycadophytes. They are represented by 4 genera and of these only one is found in abundance. The Coniferales are very poorly represented by only a single species.

#### DISCUSSION

In its overall aspect the Khatangi flora can be undoubtedly called as the '*Ptilophyllum Flora*' which is so well developed in the Rajmahal Intertrappean Series. Besides *Ptilophyllum* which is a diagnostic

plant of the Rajmahal Jurassic Flora, there are also the ferns, viz. *Cladophlebis indica* and *Gleichenites gleichenoides* characteristic of Rajmahal flora. In addition to these, the Cycadophytes and Coniferales of the Khatangi assemblage are also typical of the Rajmahal Intertrappean Series. The relationship of the Khatangi plants with those of the Rajmahal Intertrappean flora are very strong. Since the Khatangi Plant Bed is infratrappean in position to the Rajmahal volcanic series, the present palaeobotanical evidence would seem to afford the first instance of the occurrence of an undoubted *Ptilophyllum* Flora before the commencement of the Rajmahal volcanic activity. Therefore, I am inclined to contend that the Khatangi Plant Bed is amongst the basal members of the Rajmahal Series.

In the geological succession of the Rajmahal area given by Ball (*l.c.*) the infratrappean rocks overlying those containing *Glossopteris*, are called Dubrajpur and correlated with the Mahadevas of Satpura Basin. So far the Dubrajpurs have no record of plant fossils from them. If we compare the succession as well as the lithology of Dubrajpur and those of Khatangi hill, a very close similarity is apparent in their lithology, their infratrap-

pean position with regard to the Rajmahal volcanic activity and supraposition with regard to the *Glossopteris* bearing beds. Hence, it is almost certain that Khatangi Plant Beds belong to the Dubrajpur group and that the *Ptilophyllum* flora started here. The presence of *Ptilophyllum* indicates that the Khatangi Plant Bed is not older than Jurassic in age. Since the Rajmahal Intertrappean flora is generally regarded as Middle to Upper Jurassic in age the Khatangi Plant Bed may be Lower Jurassic.

It is now necessary to explore the Dubrajpurs in other localities of the area to reveal the relative position of other beds in the Dubrajpur sequence which lie below the present Khatangi Plant Bed. It is equally essential to determine, by pursuing detailed palaeobotanical studies, the exact stratigraphical horizon of the *Glossopteris* bearing beds. These beds have generally been referred to the Damuda or the Barakars on the scanty evidence of *Glossopteris*. But *Glossopteris* alone has a wide vertical range and has extremely limited use (unless it occurs in abundance) in the stratigraphical determination of Lower Gondwana sediments (LELE, 1964). Therefore more typical plants from these strata will have to be discovered before a decision can be reached.

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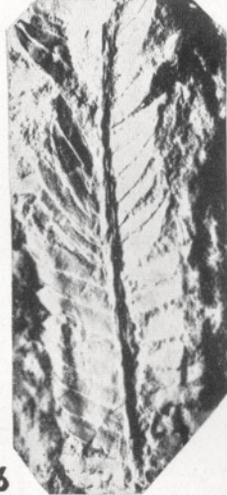
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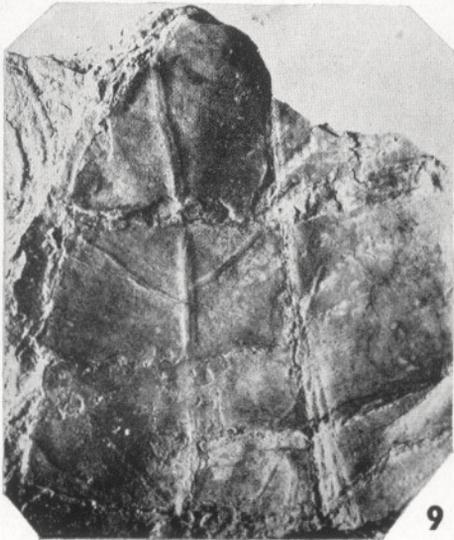
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## EXPLANATION OF PLATES

(The specimens are preserved in the Museum of the Birbal Sahni Institute of Palaeobotany.

Locality — Khatangi hill, Rajmahal hills, Bihar. Horizon — Khatangi Plant Bed. Age — Jurassic)

1. *Cladophlebis indica* (O. & M.) Sahni & Rao. × 1. Reg. No. 16803.
2. *C. indica*. Apical region of another pinna in the same specimen as Fig. 1 showing the imparipinnate condition. Note the characteristic venation. × 2.
3. ? *Thinnfeldia* sp. A few pinnules enlarged to show their ± rhomboidal shape, decurrent nature of the base and alethopteroid type of venation. The pinnules are rather too small but they could well be from the apical region. × 6. Reg. No. 16801.
4. *Elatocladus conferta* (O. & M.) Sahni. A fairly well preserved specimen showing a sterile shoot of the radial type. Note the spreading and spirally arranged habit of the frond. × 1. Reg. No. 16799.
5. *Microphylopteris* sp. A few pinnules enlarged to show their oval form and venation. Although the general form of the pinnules show some similarity with those of the genus *Gleichenites* Goepp., the pinnules in the latter are comparatively smaller in size than those of the present specimens. They are closely comparable to those of the genus *Microphylopteris* instituted by Arber (1917, pp. 38-41) for fern forms which show considerable resemblance to sterile pinnules of *Gleichenites* but are different from it. × 3. Reg. No. 16801.
6. *Ptilophyllum acutifolium* Morris. Several specimens of this well known Jurassic plant were collected. The figured specimen shows a linear frond with ± short pinnules having acutely pointed apex. × 1. Reg. No. 16793.
7. *Gleichenites gleichenoides* (O. & M.) Seward & Sahni. A fairly abundant species in the Khatangi Plant Bed. All the specimens are sterile. The specimen figured here shows three pinnae, the one in the middle having slightly larger pinnules. Note the closely set pinnules with broadly rounded apex. × 1. Reg. No. 16754.
8. A few pinnules, of the specimen in Fig. 7, enlarged to show their form, attachment and venation. × 3.
9. *Macrotaeniopteris lata* (O. & M.) Feistm. The incomplete but fairly well preserved specimen belongs to the upper middle portion of a lamina. The leaf appears to be coreaceous and fairly large in size. Midrib fairly distinct, giving off lateral veins at right angles which usually fork either just at the base or near the middle region. × 1. Reg. No. 16780.