previous Work

PREVIOUS WORK

The present work deals with Lower Gondwana flora of Nagpur District and particularly with the floristics of 'Kamthi formation'. Hence a brief account of previous work done on the different parts of Lower Gondwana is considered here.

1) TALCHIR SERIES :

It is considered as the basal part of the Lower Gondwana system. In India Talchir represents a phase of glaciation and the rocks show distinct characteristic features such as olive green colour. On the basis of this character it is differentiated from other Lower Gondwana formation. The rock types represent conglomerates, sandstones, laminated shales, silt stones and clays. The green colour is due to presence of Ferrous sulphate ($FeSO_4$). The name Talchir is derived from a place Talchir located in Orissa. The flora represents few groups and comparatively less richer than the floras of other formations. The mega fossils records include the following members - Feistmantel (1881) reported Equisetalean stem and samaropsis seed from Madhya Pradesh. Hughes (1884), Surange & Lele (1966) reported the following plants Gangmopteris, G.major, G. cf. spatulata, G. cyclopteroids var. attenuta, Vartebraria, Cordaicarpus furcata and Arberia umbellata.

Chandra & Surange (1979) described Glossopteris talchirensis from Rikba beds they also noted small branches Paranocladus and Noeggerathiopsis hislopi. Chandra and

Srivastava (1982) reported Noeggerathipsis hislopi from Anupur area. They also reported Gangmopteris cyclopteroides, G. intermedia, G. clarkeuna, G. major from chirimiri coal field. From Umaria recently a new assemblage dominating seeds attached to some palmate leaf forms are reported.

In general Talchir flora is much poorer than the others.

Glossopteris is some what rare while Gangmopteris and Noeggerathiopsis are dominant. The paucity of several members is due to the glaciation which was unfavourable for the growth of rich flora.

2) KARHARBARI STAGE :

Karharbari stage succeedes the Talchir stage and the name is derived from the village Karharbari located in Bihar. The Karharbari rocks show distinct features. According to Pareek (1969) the rocks includes soft yellow coloured sandstones as well as gritts and pebbely sandstones mixed with small pieces of quartz the coal deposits are associated with sandstones layers. Recently Banerjee (1987) has given a brief account of Karharbari flora and suggested that it forms a distinct bio-zone.

Sastri et al. (1977 a) suggested Karharbari forms a seperate unit having carbonaceous sandstones with coal seams.

According to Banerjee (1987) Karharbari flora includes

31 genera and 100 species. Contribution to its floristics were made by following workers. Sen (1953); Maithy (1965 g, 1966, 1969 a, 1977); Pant and Nautiyal (1965, 1966, 1967, 1984); Pant and Singh (1976, 1979); Pant, Nautiyal and Misra (1981); Maheshwari and Tiwari (1986).

Feistmantel (1879, 1882, 1886) described number of Glossopteris species viz. G. decipins, G. longicaulis, G.taenioides, G. communis, G. indica, Karharbari sediments show common occurrance of Gangmopteris and as many as 15 species of Gangmopteris are known from Karharbari. Along with Gangmopteris, Noeggerathiopsis is also quite common. Hence Banerjee (1987) suggested Glossopteris, Gangmopteris and Noeggerathiopsis are common genera of Talchir and Karharbari formation which is younger than Raniganj formation.

Banerjee (1973, 1978 b); Srivastava (1973) have described Buriadia, Ottokaria, Euriphyllum, Rubidgea and Botrychiopsis. Pant and Nautiyal (1977) considered that presence of Noeggerathiopsis which is the members of Cordaitales represent the flora of Northern hemisphere. To apprise the mega floral assemblege of Karharbari following Table is introduced.

Table 1 : Megafloral assemblege of Karharbari formation

Genus	Quantitative Analysis	Relative Abundance of Occurance
Glossopteris	Mostly fine mesh form and also medium mesh form.	Common
Gangmopteris	Diverse	Dominant
Noeggerathiopsis	Diverse	Dominant
Botrychiopsis	Three species	Occur in Karharbari only
Ottokaria	Three species	Dominant
Buriadia	Diverse	Dominant
Euryphyllum	Two species	Occur in this horizon only
Rubidgea	Three species	Occur in this horizon only
Gymnospermic seed	Diverse	Frequent
Vertebraria	Two species	Frequent
Schizoneura and Equisetaceous stem	Diverse	Frequent
Neomariopteris	Three species	Frequent

3) BARAKAR STAGE :

According to Fox (1931), Lasker et al. (1976) the Barakar Stage is characterised by sandstones pebble beds carbonaceous shales, clays and coal seams. The Barakar sandstones are some what coarser than the Karharbari sandstones.

The Barakar stage is famous due to rich coal deposits found in it. It is named after the Barakar river section of Raniganj coal field. Barakar coal is economically important due to its good quality. It is described as bituminous coal. The fossil flora of Barakar is characterised by abundance of Glossopteris and more or less absence of Gangmopteris and Noeggerathiopsis. Glossopteris is represented by 14 species, viz. G.communis, G. angustifolia, G. communis var. stenoneura, G. indica, G.intermetance, G. fusus, G. browniana, G. damudica, G. formosa, G. retifera, G. tortuosa, G. stricta, G.karanpurensis, G. barakarensis.

Genus Phyllotheca is represented by 5 species. Genus Schizoneura represented by one species viz. S. gondwanensis, Lelstotheca one species. The fern like plants are represented by Neomeriopteris 2 species Pecopteris and Alethopteris. The confiers are represented by Walkomiella indica, Voltzia heterophylla.

The Ginkgoales are represented by Ginkgophyllum kidstonii, G. sahnii, G. hollandii, G.hydenii. The characteristic fern Gondwanidium indicum is found in Barakar stage. The above plants have been recorded by following workers Kulkarni (1971); Maithy (1965 a, 1969, 1971 a); Surange and Saxena (1958); Surange (1966) and Maithy (1971 b, 1974 a).

Recent revision is made by Chandra & Chandra (1987).

According to Maheshwari (1972) numbers of gymnosperms woods have been described by several workers they include Barakaroxylon, Damudoxylon, Araucarioxylon, Polysolenoxylon and Dadoxylon.

Agashe and Chitnis (1971) added Prototaxoxylon andrewsii to this flora. However, its nomenclature has been recently revised by Agashe (1977) as Prototaxopytis andrewsii. This is done in the view of presence of primary features in the wood. Several reproductive organs belonging to Glossopteridales have been described from Barakar Stage, they are Eretmonia karanpurensis, Dictyopteridium sporiferum.

Lele, Swarup and Singh (1966) and Srivastava (1977) described from Singrauli, South Karanpura and Auranga coal field. Some new types they are Neomeriopteris barakarensis, Ottokaria biharensis and Diphyllopteris.

Barakar stage is an important period which produced abundant coal. The presence of coal indicates a swampy dense vegetation and heavy rainfall. Basu (1964) suggested that the Barakar vegetation (Barakar flora) might have developed in deeper waters.

The palaeoclimate indicates warm temperate condition having intermediate spells of hot and cold seasons. Therefore, Barakar flora not only reflects a rich vegetation but also indicates a distinct Palaeoclimate.

4) KULTI (BARREN MEASURE) :

Fox (1931) described the thick deposits devoid of coal present between Barakar and Raniganj stage of Jharia coal field as Barren measures. It is correlated with the Kulti formation of Raniganj coal field in Satpura lithologically and also stratigraphically. It is also found in Central India near Kamptee bed. In Damoder valley, it is found in the form of micaceous shales and medium to coarsgrade sandstones. Lithology of Barren measures indicate thick carbonaceous shells having ferruginous beds. Roy-chowdhari and Ghosh (1972) observed that lithology of Barren measures changes in the Motur sediments of Pench-Kanhan Valley.

The fossil records of Barren measures are scanty and they are found in Jharia and Raniganj coal field. Feistmantel (1881) reported occurrence of Glossopteris damudica, G.musafolia, G. communis and G.? stenoneura. Kar (1968) reported Cyclodendron leslii. Equisetalean stems, Neomeriopteris, Glossopteris damudica, G.communis, G. conspicua and G.retifera.

The palaeoclimate of Barren measures indicate poor formation of the flora due to unfavourable condition for the plant growth.

5) RANIGANJ STAGE :

Raniganj stage marks the end of Lower Gondwana and

represents warm humid environment where luxuriant plant growth took place along the river valleys. The environment was more suitable due to abundance of water, more sunlight and better soil covering. Due to these factors a rich flora developed in Raniganj stage called as 'Glossopteris flora'. The flora reached its climax in this period and represented by several genera and species.

Important contributions on the Raniganj flora were made by Maheshwari (1965 a, 1965 b, 1965 c and 1966); Maithy (1969 b, 1974 a); Surange (1966, 1974); Pant and Gupta (1968), and others.

The flora shows dominance of gymnosperms and Glossopteridales. As many as 40 species of Glossopteris are found in this stage. In addition to Glossopteris, Palaeovittaria with 2 sp. Rhabdoptenia 3 sps. and Belmnopteris 3 sps. were also found. An interesting Ginkgolian member Rhipidopsis is represented in this stage. Seed genera like Samaropsis, Stephalosoma, Stellotheca are also found. Recently some new Glossopteridean fructifications have been discovered by Chandra and Surange (1966, 1977) they are Jambadostrobus, Plumsteadiostrobus. The new female fructifications like Partha and Denkenia which are found in Kamthi are absent in Raniganj Stage. Large amount of coniferous woods like Dadoxylon, Kaokoxylon, Trigonomeylon have been recorded.

Following list gives a brief summary and several plants found in the Raniganj Stage.

Schizoneura gondwanensis, Phyllotheca indica, P. griesbachii, Raniganjia bengalensis, Trizygia speciosa, Cyclodendron leslii, Dichotomopteris lindleyii, D. major, Pecopteris phegopteroides, Ptychocarpus srivastavae, Sphenopteris hugheshii, S. polymorpha, S. lobifolia, Glossopteris angustifolia, G. arberi, G. communis, G. decipens, G.emerginato, G.indica, G. linearis, G.retusa, G.taenioides, G.taeniopteroides, G.intermittens, G.waltoni, G. harrisii, G.tennifolia, G.petiolata, G.brongniarti, G.vulgaris, G. varia, G.tenuinervis, G.damudica, G.formoso, G.leptoneura, G.arbicularis, G.retifera, G.sahnii, G.srivastavae, G.tortuosa, G.stricta, G.gondwanensis, G.verticillata, G.eurynura, G.subtilis, Palaeovittaria kurzi, Macrotaeniopteris danaeoides, M. feddeni, Gangamopteris, cyclopteroides, Noeggerathiopsis, hislopii, Glossotheca utkalensis, Eretmonia utkalensis, E.hingirdiensis, Lidgetonia indica, Dictyopteridium sporiferum, Senotheca mahudensis, Scutum sp., Cistella sp., Rhipidopsis densinervis, R.gondwanensis, Pseudoctenis balli, Senia reticulata, Voltzia heterophylla, Samaropsis raniganjense Stereocarpus emarginatus.

Woods : Dadoxylon jamuriense, D.ningahense, D.parbeliense, Kaokoxylon zelesskyi, Trigonomeylon raniganjense, Dadoxylon waltonii, Megaporoxylon krauselii.

6) KAMTHI STAGE :

The Kamthi formation is characterised by typical red coloured sandstones. The sandstones show varigated nature. They are associated with mica deposits and red coloured bands. The name Kamthi is derived from a military station called as 'Kamptee' near Nagpur. It overlies the Barakar in Wardha-Godavari Valley and also exposed in Chintalpudi sandstone in Andhra Pradesh, where it is covered by coastal Upper Gondwana deposits. In Orissa it is represented near Handappa in Denkenal District.

The fossil flora of Kamthi Stage broadly agrees with that of Raniganj but differs in some respects Bunbury (1861) first described Glossopteris species from Kamthi near Nagpur. Recently Chandra and Prasad (1981) have given a brief account of Kamthi flora and noted that the Glossopteris leaves in Kamthi are larger in size. Following species of Glossopteris are noted G.leptoneura, G. stricta, G. musaefolia, G.damudica, G.angustifolia, G.indica. The Equisetaleqn members are Phyllotheca, Schizoneura, Neomeriopteris represents an unassigned fern member. Feistmantel (1881) described from Isapur near Chandrapur town Glossopteris indica, G.browniana, G. cf.musaefolia. He also described from Charwat Actinopteris and Cycadinocarpus from Kawarsa. He recorded Phyllotheca indica, Schizoneura, Glossopteris indica and G. browniana. From Anur locality 3 Km. South east of Antargaon. He described Phyllotheca indica, Schizoneura sps. Glossopteris browniana, G.leptoneura.

Oldham (1880) reported from Kamthi Phyllotheca indica, Vertebraria indica, Glossopteris communis, G.damudica, G.browniana, G.stricta, G.musaefolia, G.leptoneura, Gangmopteris hughesii, Angiopteridium Cf. McClendi, Macroteaniopteris danoides, M. feddeni and Noeggerathiopsis hislopii.

Chandra and Prasad (1981) described from Bazargaon in Nagpur District and Kanhargaon from Chandrapur district, several impressions and several coniferous woods. Impression belongs to Neomariopteris hughesii, Trizygia speciosa, Schizoneura gondwanensis, Glossopteris musaefolia, G.stricta, G.leptoneura, G.mohudensis, G.indica, G.bosei, G.raniganjensis, G.angustifolia, G.taenifolia, G.dencinervis, G.venustus.

The woods belong to Dadoxylon chandrapurensis, D.maharashtraensis, D.parenchymosum, Trigonomeylon kamthiensis, Kaokoxylon pseudotrimedullaris, Taxopitys indica, T.surangei, Australoxylon kanhargaonses, A.longicellularis, Zaleskyoxylon lepekheni, Z.simplexum, Prototaxoxylon uniseriale, P.maithyi, Baieroxylon multiseriale. The fossil woods show large number of genera and species and they compare with Raniganj Stage in several aspect. Chandra and Prasad (1981) reported from Bazargaon Schizoneura gondwanensis, Glossopteris musaefolia, G.mohudaensis Dictyopteridium sporiferum.

Recently Chandra and Rigby (1981, 1983) described a rich floral assemblage from Orissa. It includes Cyclodendron

leslii, Trizygia speciosa, Phyllotheca indica, Raniganja bengolensis, R.etheridgei, Schizoneura gondwanensis, Lelstotheca robusta, Sphenophyllum crenulatum, S.churulianum, S.utkalensis, Dizeugotheca phegopteroides, Neomariopteris hughesi, N.polymorpha N.khanii, Pantopteris gracillus, Damudopteris bengalensis and Asansolia Cf. phegopteroides, Pseudoctenis balli, Senia reticulata, Eretmonia utkalensis, E.hinjridaensis, E.ovata, Glossotheca utkalensis, G.orissiana, G.immanis, Dictyopteridium sporiferum, Indocarpus elongatus, Cistella ovato, Scutum sahnii, S. elongatum, S. indicum, Partha indica, P.spathulata and Utkalia dichotoma (Surange and Chandra (1973); Surange, 1974). Hence, it appears that Kamthi flora shows diversified nature as Raniganj flora. So far the Palaeoclimate is concerned it shows some similarity with Raniganj but has its own distinction in having intermitant dry spells.

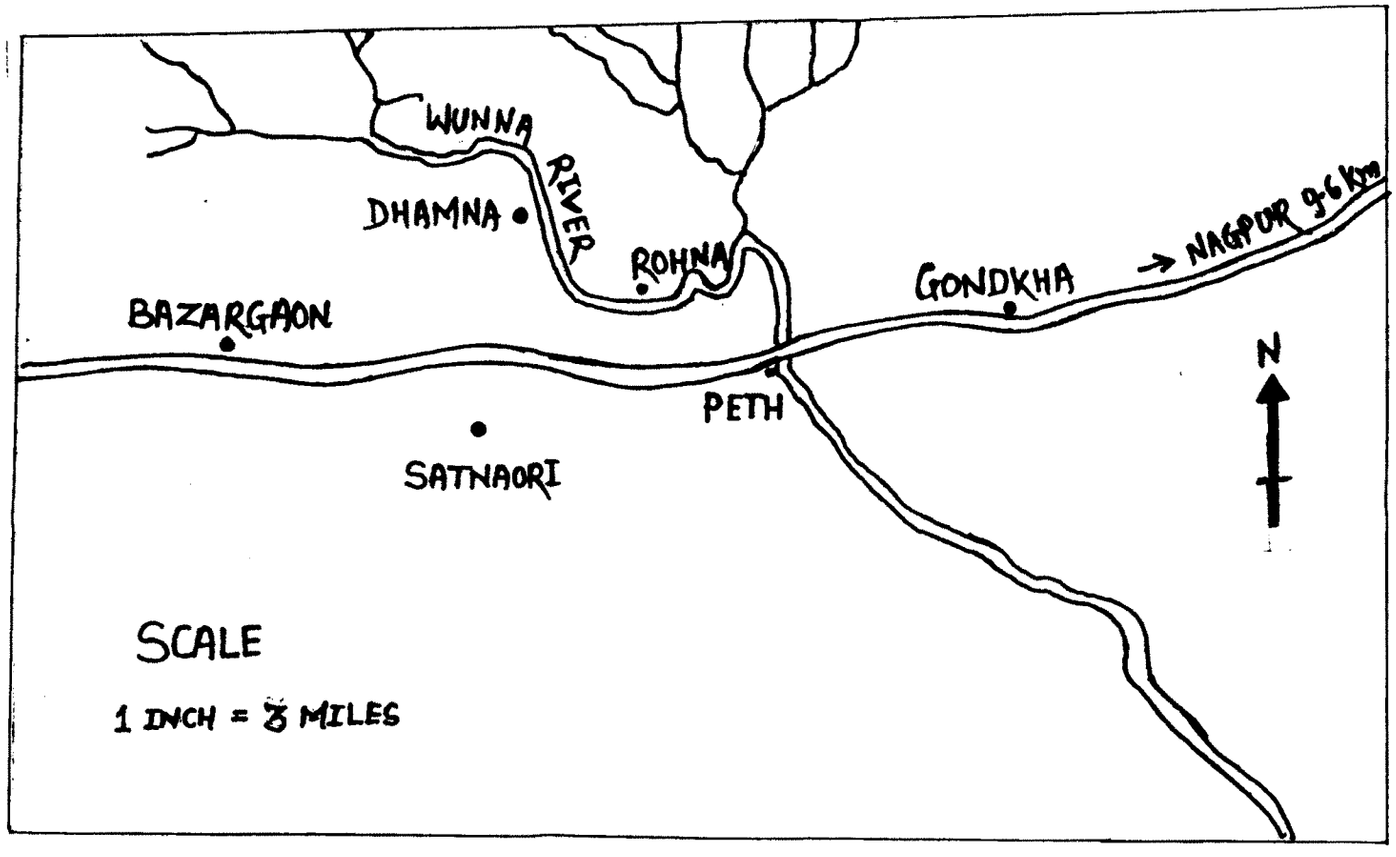
Recently Biradar and Bonde (1981) described Nandorioxylon saksenii. Vagyani and Mahabale (1972) described Planoxylon indicum from Adhari, from the same locality. Mahabale and Vagyani (1980) described Kamthioxylon adheriense. Vagyani and Raju (1982) described Araucarioxylon nandori from Nandori in Chandrapur district. Jamane and Vagyani (1984) described Agathioxylon maheshwarii, hence it appears that in Kamthi formation several genera of gymnospermous woods are found and therefore the flora is equally rich in having petrified material as well as impressions.

This marks the end of Lower Gondwana floral assemblage and contributions made to it by several workers.

Though Kamthi is included in Lower Gondwana, Vagyani and Mahabale (1972) suggests Lower Triassic age to it. It has raised a contraversy between Chandra and Surange School and the opinion of above workers the present investigation will be assessed in the light of these two different views.

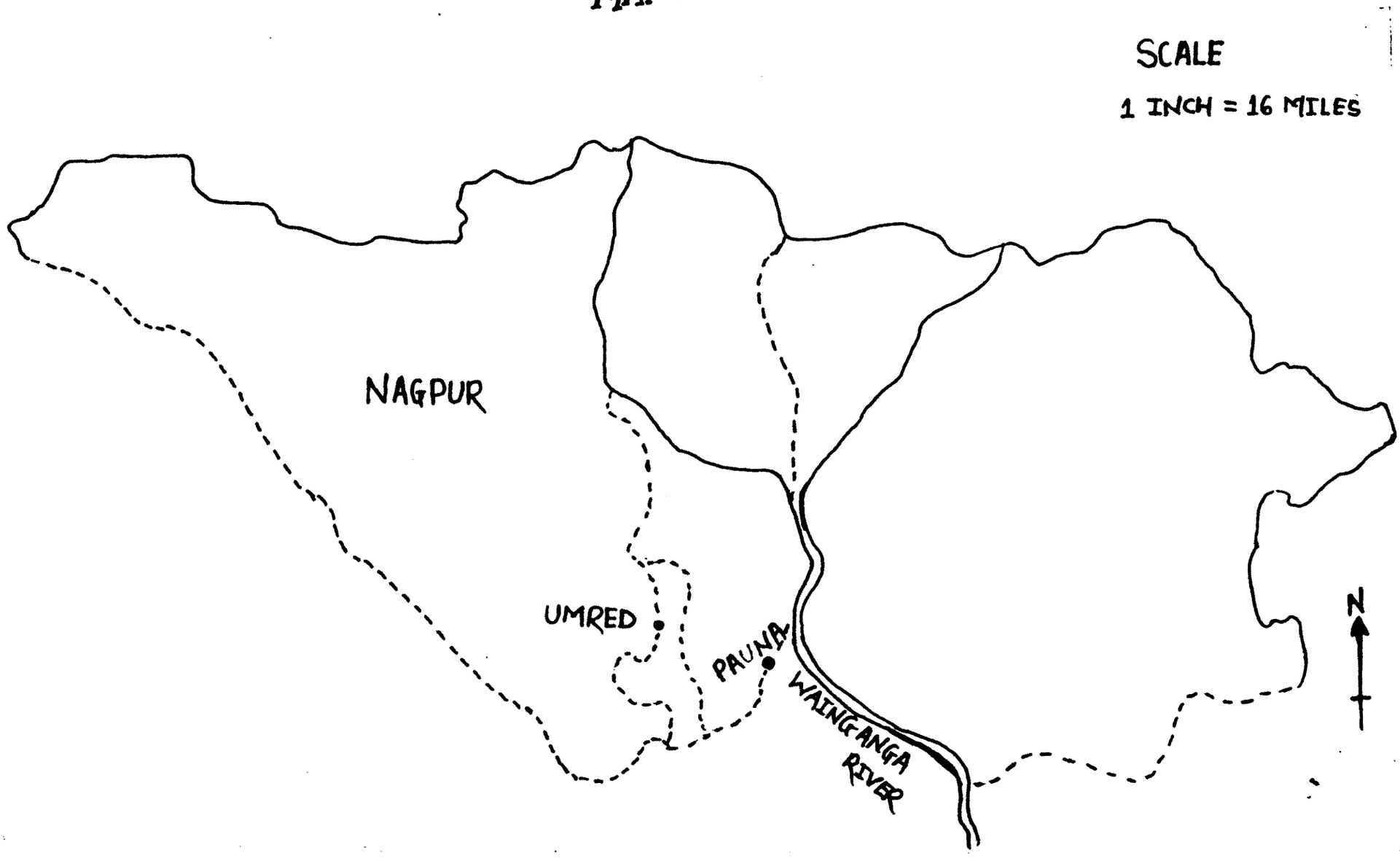
Varadpande (1977 a) reported Dadoxylon satnavriense. It is the first record of coniferous woods from this locality. Prasad (1982) created a new genus Parapalaeoxylon and revised the name of the earlier woood as P.satnavriense. From Chandrapur district several coniferous woods have been described by following authors. Agashe & Gowda (1979, 1982) reported Araucarioxylon loharense, A.lathiense, A.surangei, and Prototaxoxylon chandrapurense.

MAP-I



MAP SHOWING THE FOSSILIFEROUS LOCALITIES IN NAGPUR DISTRICT

MAP-II



MAP SHOWING THE FOSSILIFEROUS LOCALITIES IN NAGPUR DISTRICT