

INTRODUCTION :

Towards the end of the Palaeozoic era a new series of changes occurred over the surface of the earth. They brought about a re-distribution of the land and sea and this resulted in mountain building movements. At this juncture series of land masses forming a great southern continent existed. This southern continent is named as 'Gondwana Land'. It includes India, Australia, South America, South Africa, Antarctica and Madagascar island. The Gondwana land had similar climatic conditions and wide distribution of the similar type of rocks.

Gondwana era in India resumed at the beginning of the Upper Carboniferous period and lasted upto Lower Cretaceous, spreading over 120 million years. The name Gondwana is derived after the 'Gond' tribes of Madhya Pradesh where the kingdom of Gonds were spread in this area.

The name Gondwana was proposed by H.B. Medlicott in 1872 in his manuscript report on the geology of Satpura basin but it was later on published by Feistmantel in 1876. The Gondwana rocks are of fluviatile or lacustrine type and were deposited in a series of large rivers and lake basins which sank along trough - faults amidst the ancient rocks. Due to this faulting the preservation of Gondwana strata took place and rich coal deposits are found in them.

Distribution :

The Gondwana rocks are developed from two sides of great triangular area. The third side of which is formed by northern part of the east coast consisting from Godavari valley to Rajmahal hills. It is also found in Damodar, Sone and Narmada valleys. In the interior region it is found along the Mahanadi valley. Extra-peninsular exposures are found along the Himalayan foothills of Nepal, Bhutan and Assam and also in Kashmir and Baluchistan. Besides these deposits detached outcrops are found along the East coast, in Rajmahal hills, Bihar, Madhya Pradesh, Saurashtra and Kutch.

Regarding the classification and the age of divisions of Gondwanas there are many controversies and uncertainties. According to Medlicott and Blandford (1879), Oldham (1893), Cotter (1917), Fox (1931) the Gondwanas were divided into two divisions, namely - Lower Gondwanas and Upper Gondwanas. On the other hand, three-fold division has been proposed by Feistmantel (1882), Vredenburg (1910), Wadia (1953).

Vredenburg (1910) supported 3-fold divisions on the basis of arid continental deposits containing Triassic reptiles and amphibians in the mid-formations of the Gondwanas. According to Lele (1968), Surange & Lele (1968) and others, two distinct floras had developed in the Gondwana flora. They are -

- (1) Glossopteris flora developed in the lower Gondwana period.
- (2) Ptilophyllum flora developed in the upper Gondwana period.

Feistmantel (1882) recognised presence of transitional beds in the South-Rewah-Gondwana basin and he studied the fossil flora of that area. He proposed the Middle Gondwana present during the Triassic period which developed a distinct flora. Wadia (1953) agreed with this and supported it on the basis of presence of reptiles and fishes. The Parsora beds were studied by Fox (1931) and he found that the flora there shows a typical mixture of Lower and Upper Gondwanas. Lele (1956-1963) made series of contribution on the fossil flora of this area and gave an evidence which supported the Feistmantel's idea of Middle Gondwanas. This flora is named as 'Dicroidium flora', which is considered as the Middle-Gondwana flora. Saksena (1952) studied plant fossils from Pali and Parsora beds and supported Middle Gondwanas. Lele (1964) on the basis of Palaeobotanical studies suggested that in India Gondwana consists of 3 divisions - Lower, Middle and Upper characterised by Gangomopteris, Dicroidium and Ptilophyllum indicating respective index fossils. According to him Glossopteris is 'Hold-over' fossil of the Lower Gondwana since it lingers in the Triassic period having Dicroidium flora.

Table-1 gives the three-fold classification of Gondwana based on the palaeobotanical evidence as suggested by Lele

	(Umia)	
Upper	(Jabalpur)	Jurassic to
	(Kota)	Lower
Gondwana	(Rajmahal)	Cretaceous
	(Mahadeva)	
Middle	(Parsora)	
	(Maleri)	Triassic
Gondwana	(Panchet)	
	(Raniganj)	
	(Barren Measures)	
Lower	(Barakar)	Permo-
	(Karharbari)	Carboniferous
Gondwanas	(Talchir and)	and Permian
	(Glacials)	

It was further supported by Bose (1966a, 1966b) Maheswari (1966b) and Surange (1966).

Surange (1966) considered Glossopteris as the index fossils of the Lower Gondwana against Gangamopteris of Lele (1964) as Gangamopteris is rather absent from the Raniganj stage. According to Surange (1966) (See Saksena 1974). "The classification adopted by the Geological survey of India envisages a two-fold division of Gondwana system. The line of division is taken above the Panchet series, the lower

portion being characterised by the Glossopteris flora and the upper by the Ptilophyllum flora. In between the Glossopteris and the Ptilophyllum floras there existed a third distinct flora called as "Dicroidium flora". Palaeobotanical evidence obtained so far supports the tripartite classification of the "Gondwanas". This remark summarizes in brief the palaeobotanical view point.

Bose (1966b) suggested "The Gondwana period (from Upper Carboniferous to Lower Cretaceous) needs further division into series and stages rather classifying the Gondwana system Lower and Upper or Lower, Middle and Upper and it will be more appropriate to refer the smaller sub-divisions directly to those of the Standard Geological time scale." He also remarked that now the time has come when for dating and placement of various beds within a series or stage, the geologists should first map the areas and let the palaeobotanists fit in their floras according to various sequence. To settle various problems in Gondwana stratigraphy Geologists and Palaeobotanists will have to seek a concerted efforts to tackle the various problems systematically from the very beginning. He also proposed to form a Gondwana Committee for their solutions.

Various workers have studied the Gondwana flora of India and made a significant contribution on it. Following workers have made important contribution on Indian Gondwana plants. They are Feistmantel (1876 to 1889), Zeiller (1902)

Arber (1905), Seward and Sahni (1920); Sahni (1928, 1931), Surange & Lele (1957), Surange (1966, 71), Bharadwaj (1953), Pant (1958-64) etc.

Since the present investigation is concerned with fossil flora of Chinna-Ganjam present in the Ongole area of Prakasam district the flora developed here is a typical Upper Gondwana flora. Hence, it should be worthwhile to see the other Upper Gondwana localities in India. The localities are found in Rajmahal Hills in Bihar, Narsinghpur, Jatamao, Paraspani and Jabalpur in Madhya Pradesh; Athgarh in Orissa, Chikiala, Kota, Vemavaram, Golapalli, Raghavapuram, Raghudevapuram and Gangapur in Andhra Pradesh, Sriperamatur, Sivaganga uttatur, Tereni, Naikulam, Trichinapalli, Vellum in Tamilnadu, Than, Songad, Tarnetar in Saurashtra, Kakadbit, Kurbi, Trambu, Dharesi, Habur and Dhawrh Mota in Kutch and Rajasthan.

Several workers have contributed to the fossil assemblage of these places. They are Bose & Zeba-Bano (1976), Bose and Kasat (1972), Bose (1974), Bose and Banerji (1981, 1984), Mahabale and Satyanarayana (1979), Baksi (1967), Seward and Sahni (1920), Sahni (1928) etc. In the present investigation the plant fossil were collected from one of the fossiliferous localities of India namely Chinna-Ganjam in the Ongole area. From this area much of the earlier work has been done on the Vemavaram plants only. Vagyani (1985, 86), discovered several localities in this area and described fossil plants from

Uppugunduru in the Prakasam district. In the course of investigation he came across plant fossils at Chinna-Ganjam which was not earlier known. Therefore, study of these plants is assigned to me and forms the subject matter of this dissertation.

ooo

TABLE SHOWING UPPER GONDWANA CORRELATIONS IN EAST COAST, INDIA

STANDARD SCALE	GONDWANA DIVISION	EAST COAST			
		GODAVARI	PRAKASAM	MADRAS	RAMNAD
LOWER	UMIA				
CRETACEOUS	JABALPUR				
	SERIES	JABALPUR	TIRUPATI	PAVALAUR	SATYAVEDU
MIDDLE -	KOTA				
UPPER JURASSIC	RAJMAHAL				
	SERIES	RAJMAHAL	GOLLAPALLE	BUDAVEDA	SRIPERAMATUR
					SIVAGANGA