

# Palynostratigraphy of Permian sediments in Manuguru area, Godavari Graben, Andhra Pradesh

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Palynology of four bore-cores in Manuguru area, Godavari Graben has shown eight palyno-assemblages present in a succession from Karharbari to Kamthi formations. Presence of two coal measures (Early and Late Permian) in these bore-cores has been established.

**Key-words**—Palynostratigraphy, Permian, Godavari Graben.

## INTRODUCTION

THE MANUGURU area is a part of Cherla-Manuguru belt along south-eastern margin of the Godavari Graben. Cherla sector lies on the north while Manuguru sector is situated to the south of the Godavari River. The existence of workable coal seams in this area has been proved in the recent past. The lithological succession in Manuguru area is as follows (Ramanamurty, 1971 in Raja Rao, 1982).

Kamthi/Barren Measures (Kulti) Formation	
Barakar Formation	Seam B
	Thick Seam
	Seam A
Talchir Formation	

Presence of Karharbari sediments in this succession is lithologically not defined and so also the Barren Measures (Kulti) Formation overlying the Barakar.

In recent years the Geological Survey of India has carried out extensive drilling to prove coal reserves in Cherla/Manuguru area. At present the coal mining is confined to thick seam, which is of Barakar age. The exploratory drilling has also proved the occurrence of 3 coal seams within Lower Member of the Kamthi Formation. The palynoflora of these sediments from Manuguru area is unknown and therefore, the present investigation has been carried out on four bore-core samples, viz., GM-3, 4, 5 and 8 (Map 1) in which a continuous sequence from Talchir to Kamthi formations is represented. The details of yielding samples and their important palynotaxa

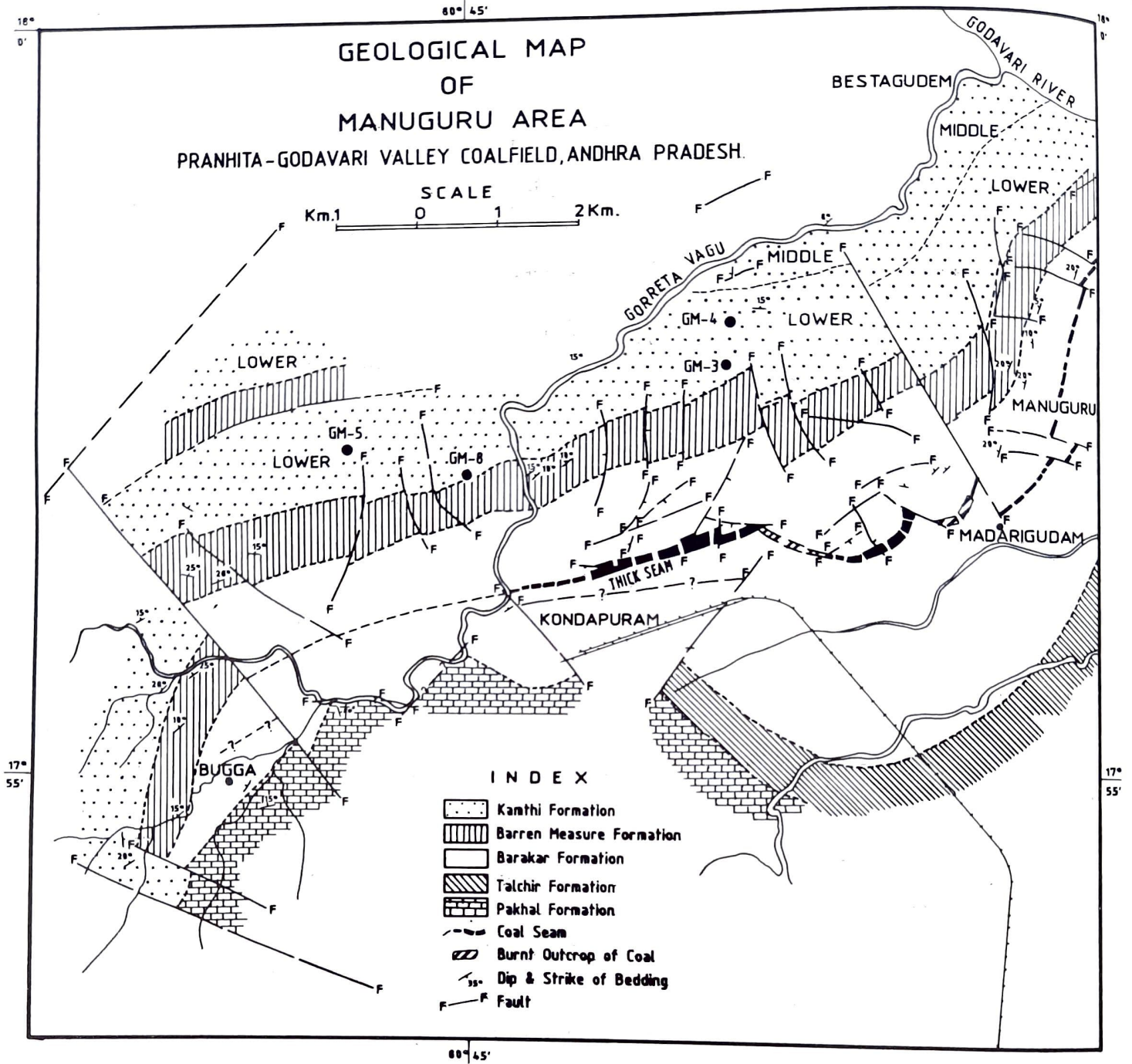
are plotted in histograms 1-4, wherein the taeniatates are represented by *Corisaccites*, *Guttulapollenites*, *Hamiapollenites*, *Lunatisporites* and *Lueckisporites* in Palyno-assemblages 5, 6, 7 and 8 and by *Lunatisporites*, *Lueckisporites* in Palyno-assemblage 4. The monosaccates wherever present are represented by *Parasaccites*, *Plicatipollenites*, *Virkipollenites*, *Barakarites*, *Divarisaccus* and *Crucisaccites*.

## PALYNO-ASSEMBLAGE

The quantitative analysis of various palynotaxa distinguished the following eight palyno-assemblages :

*Palyno-assemblage 1*—The grey, current bedded sandstone (450.88 m) overlying the Talchir green sandstone (455.50 m) in bore-core GM-8 contains overall dominance of trilete spore *Callumispora* followed by monosaccate pollen chiefly *Parasaccites* and few striate disaccate specimen of *Striatopodocarpites*. *Crucisaccites* is rare and is restricted to this assemblage.

*Palyno-assemblage 2* — The lowermost coal seam (441-429 m) overlying the current bedded sandstone (450.88 m) in bore-core GM-8 shows further increase of monosaccate pollen (*Parasaccites* upto 46%) and decrease in percentage of *Callumispora* (Histogram 1). Among other trilete spores *Brevitriletes*, *Verucosisporites* and *Horriditriletes* record significant rise, thus the average percentage of trilete spores increase upto 24 percent. Nonstriate disaccate *Scheuringipollenites* marks its subdominance (upto 16%). Striate



Map 1. Geological map of the Manuguru area showing location of bore-core GM-3, 4, 5 & 8.

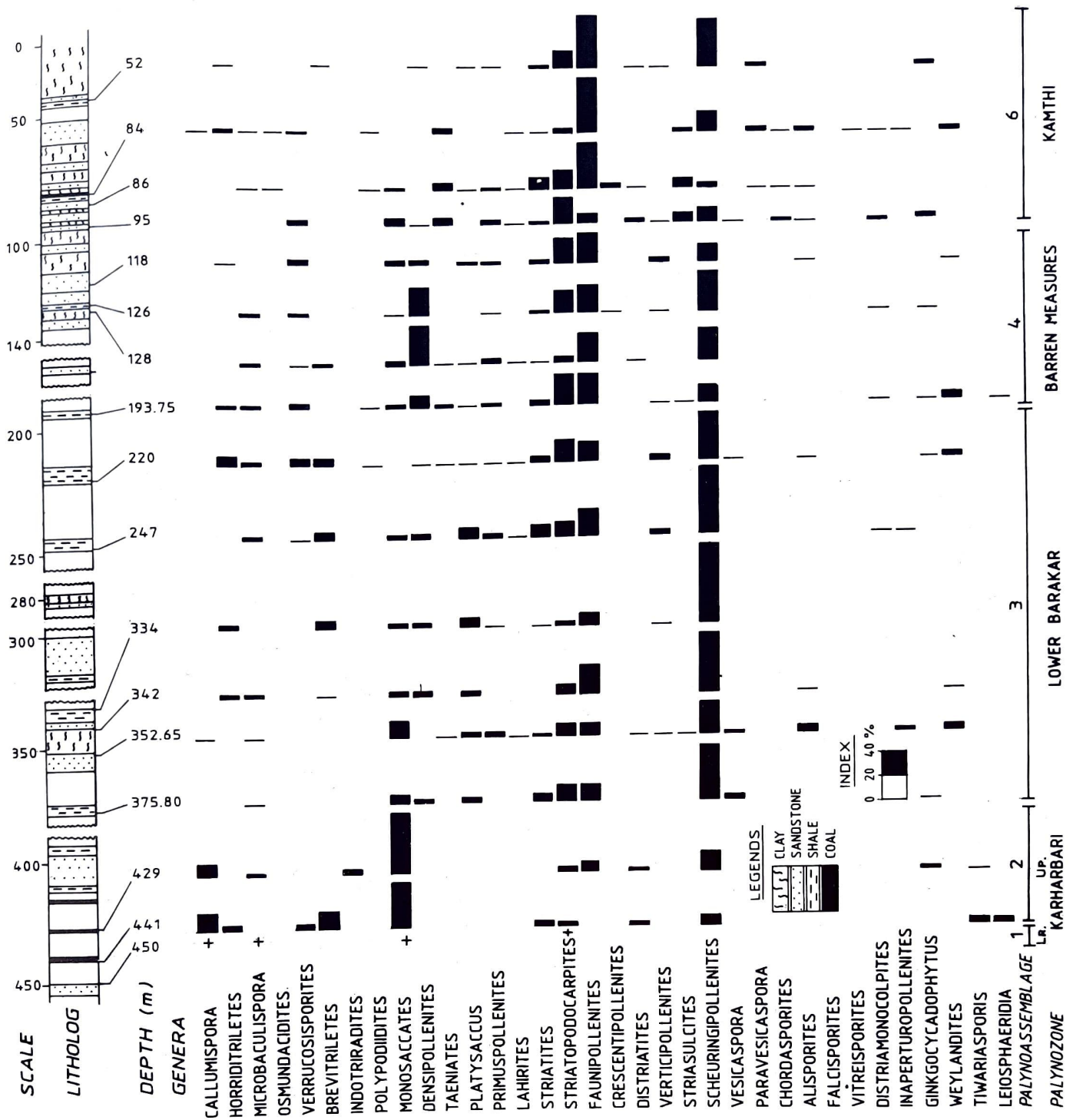
disaccate pollen also increase to 10 per cent.

*Palyno-assemblage 3*— In this palyno-assemblage *Scheuringipollenites* attains overall dominance while the corresponding dominant taxa of palyno-assemblages 1 and 2 have decreased appreciably. The percentage of nonstriate disaccate pollen rise upto 60 per cent and striate disaccate pollen rise upto 40 per cent in different samples. *Barakarites* is restricted to this assemblage. The trilete spores in general record further rise in percentage.

Palyno-assemblage 3 is distributed in bore-cores GM-

8 (375.80- 220 m), GM-5 (224-192 m) and GM-3 (320-310 m).

*Palyno-assemblage 4* — The striate disaccate pollen assume overall dominance in this assemblage, the main components being *Faupollenites* and *Striatopodocarpites*. The genus *Densipollenites* appears in this assemblage and assumes subdominance. Nonstriate disaccate pollen decline appreciably while trilete spores are rare. The percentage of *Densipollenites* is comparatively low in bore-core GM-3 which may be due to the poor



**Histogram 1.** Showing distribution of palynotaxa in bore-core GM-8 from Manuguru area Godavari Graben.

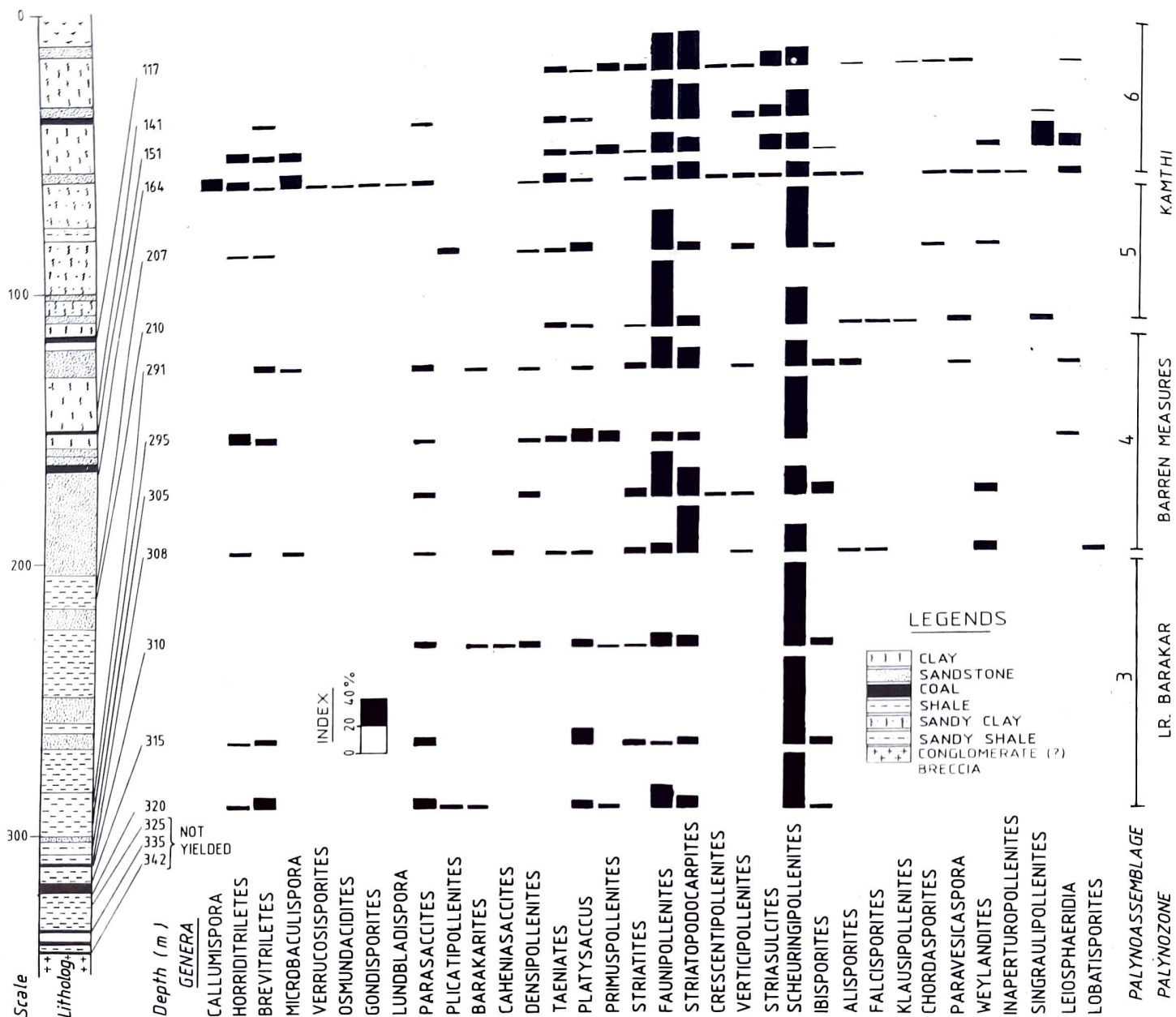
yield of palynofossils.

Palyno-assemblage 4 is present in bore-core GM-8 (193.75-118 m) and GM-3 (308-291 m).

*Palyno-assemblage 5*—The striate disaccate pollen rise further in Palyno-assemblage 5. Some taxa, viz. *Osmundacidites*, *Falcisporites*, *Klausipollenites* and *Lunatisporites* appear for the first time in low percentage. This assemblage is present in bore-core GM-3 (210-207m; Histogram-2), GM-5 (111 m; Histogram -3),

GM -4 (440-347 m; Histogram 4) and GM-8 (96-52 m).

*Palyno-assemblage 6*—*Striasulcites* appears in high percentage in Palyno-assemblage 6 while striate disaccate pollen continue to remain the dominant constituents. This assemblage occurs in bore-core GM-3 (164-117 m), GM-4 (306-248 m) and GM-5 (35-26 m). In bore-core GM-3, *Singraulipollenites* (17%) and *Leiosphaeridia* (8%) occur at 151 m. *Singraulipollenites* is also present in bore-core GM-4 at 260 m but the percent-



**Histogram 2.** Showing distribution of palynotaxa in bore-core GM-3 from Manuguru area, Godavari Graben.

age is considerably reduced. *Guttulapollenites* and *Corisaccites* appear in low percentage. *Parasaccites* in high percentage (10-15%) occur in bore-core GM-4 between 306-250 m.

*Palyno-assemblage 7*—*Corisaccites* and *Guttulapollenites* which appeared in palyno- assemblage 6 attains maximum percentage in palyno-assemblage 7. *Striasulcites* continue upto 16 per cent only in bore-core GM-4 (225-220 m) but in other bore-cores this genus is not so significant.

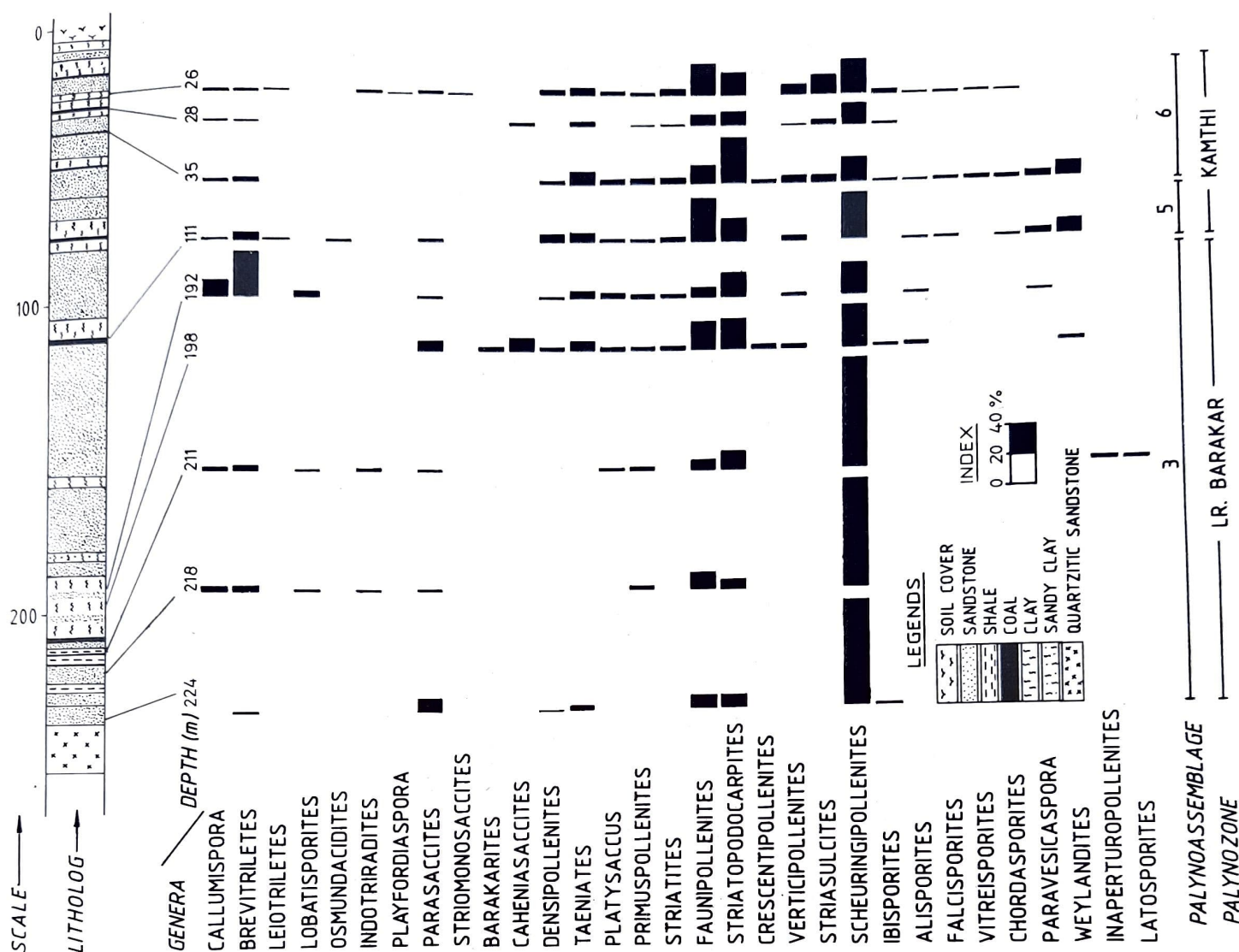
*Palyno-assemblage 8*,—This assemblage is represented by the associaton of *Densipollenites* and striate disaccate pollen between 170-45 m in bore-core GM-4. This marks the youngest palyno-assemblage in the

present investigation. Rare presence of *Gondisporites* has been observed at 45 m. *Inaperturopollenites* in higher percentage (28%) at 170 m is also significant.

### COMPARISON

Palynological succession studied in the Manuguru area shows a close comparison with other areas of Godavari Graben.

Palyno-assemblages 1 & 2 representing Lower and Upper Karaharbari palynozones compare Palynozones 2 and 3 of Ramkrishnapuram area (Srivastava & Jha, 1992). The lowermost seam of Manuguru area shows dominance of *Parasaccites* as it is present in the King Seam of Yellandu area which, however, contains greater



**Histogram 3.** Showing distribution of palynotaxa in bore-core GM-5 from Manuguru area Godavari Graben.

percentage of *Brevitriletes* (Srivastava, 1987).

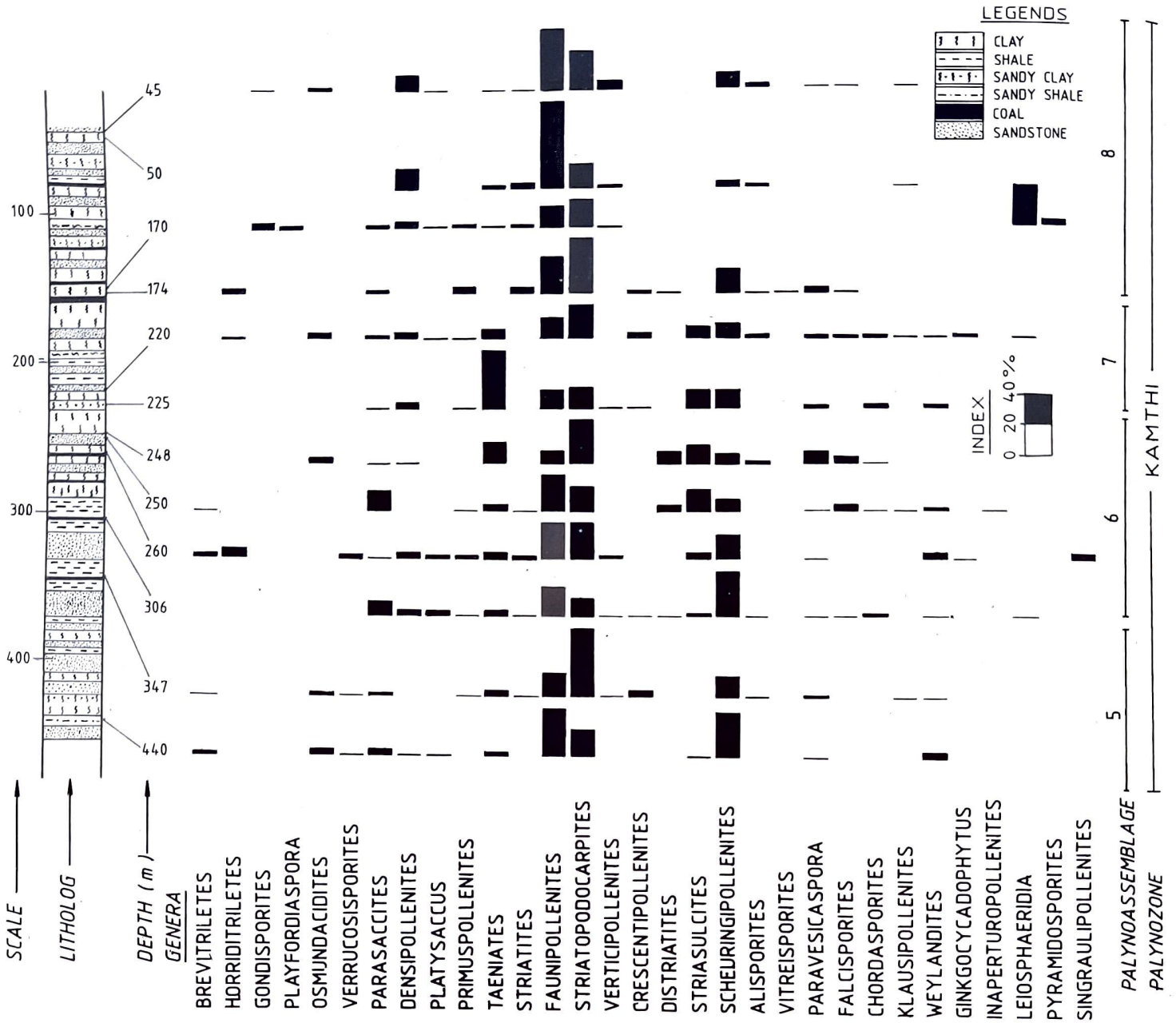
Palyno-assemblage 3 representing Lower Barakar palynozones compares with the Palynozone 4 of Ramakrishnapuram (Srivastava & Jha, 1991) and Ramagundam area (Srivastava & Jha, 1989). Palyno-assemblage 4 representing Barren Measures palynozone resembles with the Palynozone 5 of Ramakrishnapuram area and Palynozone 6 of Ramagundam area. However, percentage of *Parasaccites* in Palynozone 5 of Ramakrishnapuram area is significantly high as compared to other areas.

Palyno-assemblage 5, recorded in almost all the bore-cores in the present investigation, compares well with the palynoflora of Lower Member of Kamthi Formation, i.e. Assemblage 1 of Ramagundam, Chelpur, Bhopalpalli and Ramakrishnapuram areas (Srivastava & Jha, 1988) and Raniganj Formation of Damodar Valley (Bharadwaj & Tiwari, 1977; Bharadwaj, Tiwari & Anand-Prakash, 1979).

## DISCUSSION

Bore-core GM-8 is deepest among the four bore-cores investigated herein. The basal sediments representing the Talchir Formation have not yielded palynofossils. However, the overlying cross bedded sandstone that underlies the coal seam (441-429 m) contains Lower Karaharbari palynoflora while the coal seam at (441-429 m) shows Upper Karaharbari affinity.

The overlying Lower Barakar palynoflora in bore-core GM-8 occurs between 375.80-220 m. This Palyno-assemblage 3 is most widely distributed in bore-cores GM-3 and GM-5. The sediments in this palynozone include coal, carbonaceous shale and sandstone. Coal-seam of workable thickness is present in bore-core GM-3 between 320-310m. In bore-cores GM-3 & 5 the Barakar Formation represents the basalmost lithostratigraphic unit which is underlain by conglomerate (?), breccia and hard compact quartzitic sandstone. The drilling was



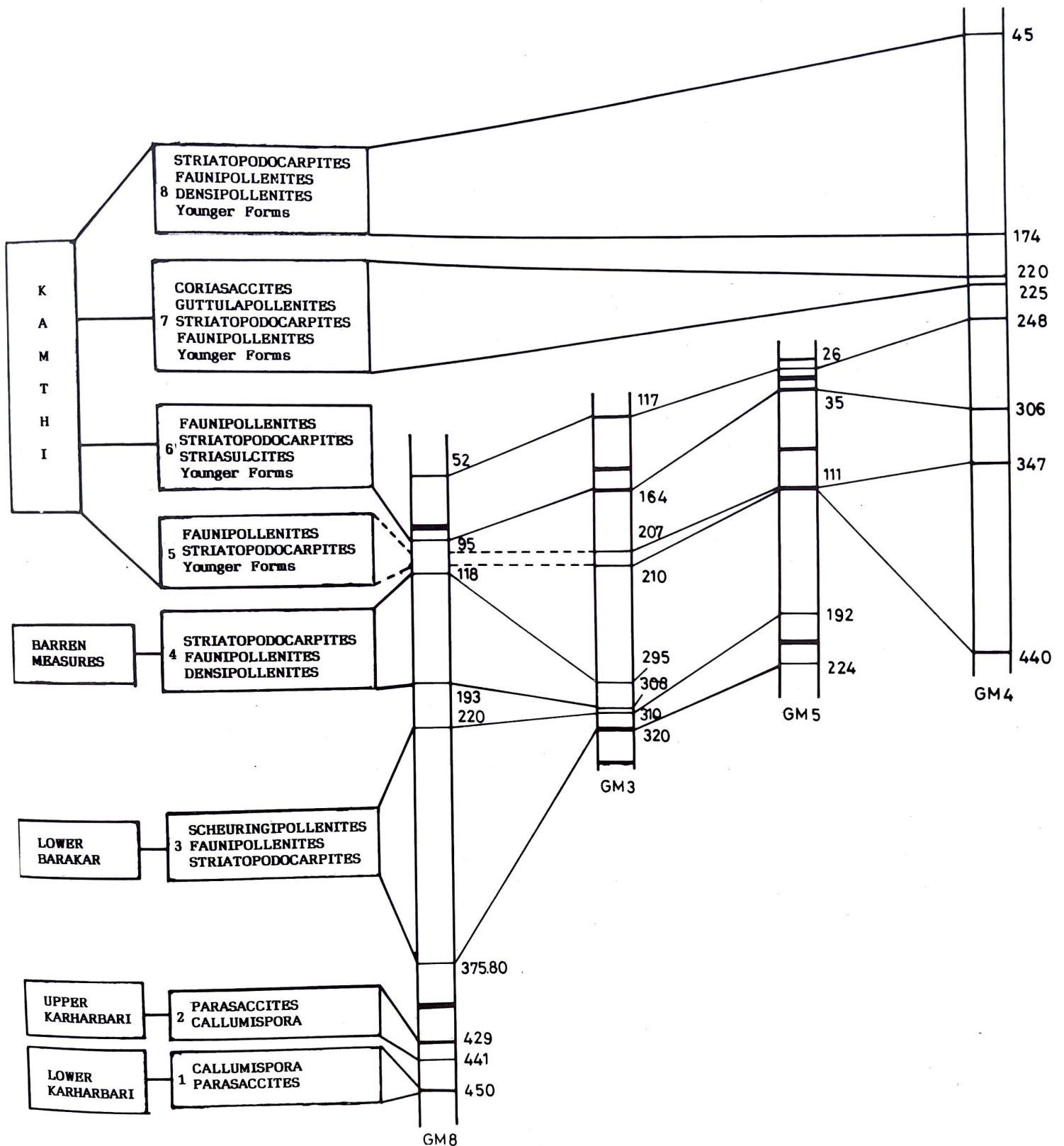
**Histogram 4.** Showing distribution of palynotaxa in bore-core GM-4 from Manuguru area, Godavari Graben.

stopped at this level hence further older sediment could not be studied. It may thus be deduced that Seam A (Split seam) in Manuguru area corresponds to Karharbari while the 'Thick Seam and Seam B' (Top Seam) show Lower Barakar affinity. It is significant to record that lithologically differentiated Barakar Formation contains Karharbari palynoflora in the lower part while Lower Barakar palynoflora is present in the upper part of the succession. In bore-cores GM-3,5 and 8 the Lower Barakar palyno-assemblage is succeeded by *Densipollenites* + striate disaccate rich palynoflora representing the Barren Measures palynozone (Palyno-assemblage 4) and thus there is a distinct absence of Upper Barakar palynozone in Manuguru area.

The Kamthi Formation in Manuguru area contains four palyno-assemblages (Palyno-assemblages 5-8; Text-

fig. 1). In bore-core GM-8 Palyno-assemblages 5 and 7 are not recorded as the sediments are mostly represented by grey sandstone-siltstone which have not yielded palynofossils. In bore-core GM-4 the entire sediments upto 440m represent the Kamthi Formation (Lower and Middle Members). The bore-core was closed at 450 m. Presence of Early and Late Permian coal measures in Manuguru area is palynologically proved in bore-cores GM-3,5 and 8. Recurrence of *Parasaccites* in bore-core GM-4 (306-250 m) in the Middle Member of Kamthi Formation is significant as this genus is found associated with the glacial/fluviog-lacial sediments of Talchir and Upper Karharbari formations. Here it occurs in association with *Striasulcites* rich assemblage (Palyno-assemblage 6). The sediments (grey, compact sandy clay) overlying this palyno-assemblage in bore-core GM-4 have

PALYNOLOGICAL ASSEMBLAGES IN MANUGURU AREA AND THEIR CORRELATION



Text-figure 1. Showing correlation of various palyno-assemblages in bore-cores GM-3,4,5 & 8 from Manuguru area, Godavari Graben.

not yielded palynofossils and hence the *Parasaccites* rich assemblage is not distinctly differentiated. Occurrence of *Leiosphaeridia* and *Singraulipollenites* in bore-core GM-4 (Palyno-assemblage 7) shows a significant variation which have not been recorded in any other area of Godavari Graben.

### CONCLUSION

On the basis of spore and pollen grains Lower Karharbari, Upper Karharbari, Lower Barakar, Barren Measures and Kamthi palyno-assemblages have been identified in Manuguru area of the Godavari Graben. The lithological succession as well as the palynological succession show gradational transition between various formations. Presence of two workable coal horizons (Early and Late Permian) has been established in bore-cores GM-3,5 and 8. Seam A (Split Seam) shows Karharbari affinity while the Thick Seam and Seam B (Top Seam) correspond to Lower Barakar. The Upper Barakar palynoflora has not been observed in any bore-core. The equivalents of Sondila Seam (Late Permian) are present in all the bore-cores studied. Presence of *Singraulipollenites* and *Inaperturopollenites* in higher percentage in two bore-cores only precludes the possibility of further correlation.

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