# PALYNOLOGICAL DISTINCTION BETWEEN UPPER PERMIAN AND LOWER TRIASSIC IN RANIGANJ COALFIELD, BENGAL, INDIA

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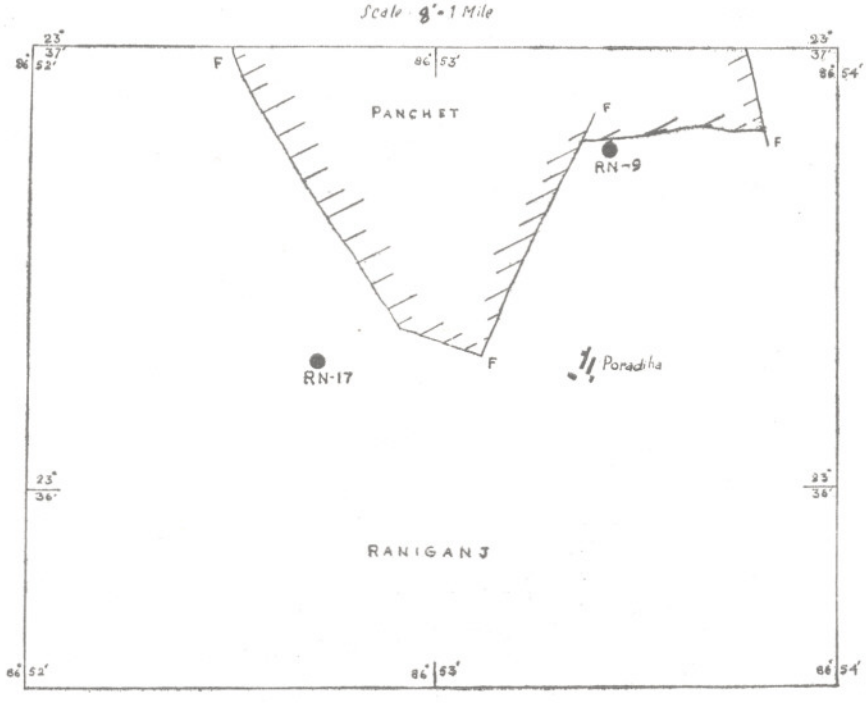
## ABSTRACT

The present paper deals with the palynological boundary between Raniganj (Upper Permian) and Panchet (Lower Triassic) in Raniganj coalfield, West Bengal, India. A good number of surface and subsurface samples have been investigated from Raniganj and North Karanpura coalfields, Bihar. It has been observed that in Upper Raniganj stage the palynological assemblage is dominated by striate bisaccate like *Strotersporites, Striatopiceites* and *Striatites* while trilete and monolete are subdominant and mostly represented by *Apiculatisporis, Lophotriletes* and *Laevigatosporites.* In Panchet, however, the trilete is dominant while striate bisaccate is only frequently met with. The trilete genera like *Decisporis, Divaripunctites* and *Dictyophyllidites* which are absent in Raniganj are dominant in Panchet. *Strotersporites, Striatopiceites* and *Striatites* though present in Panchet are never found in abundance.

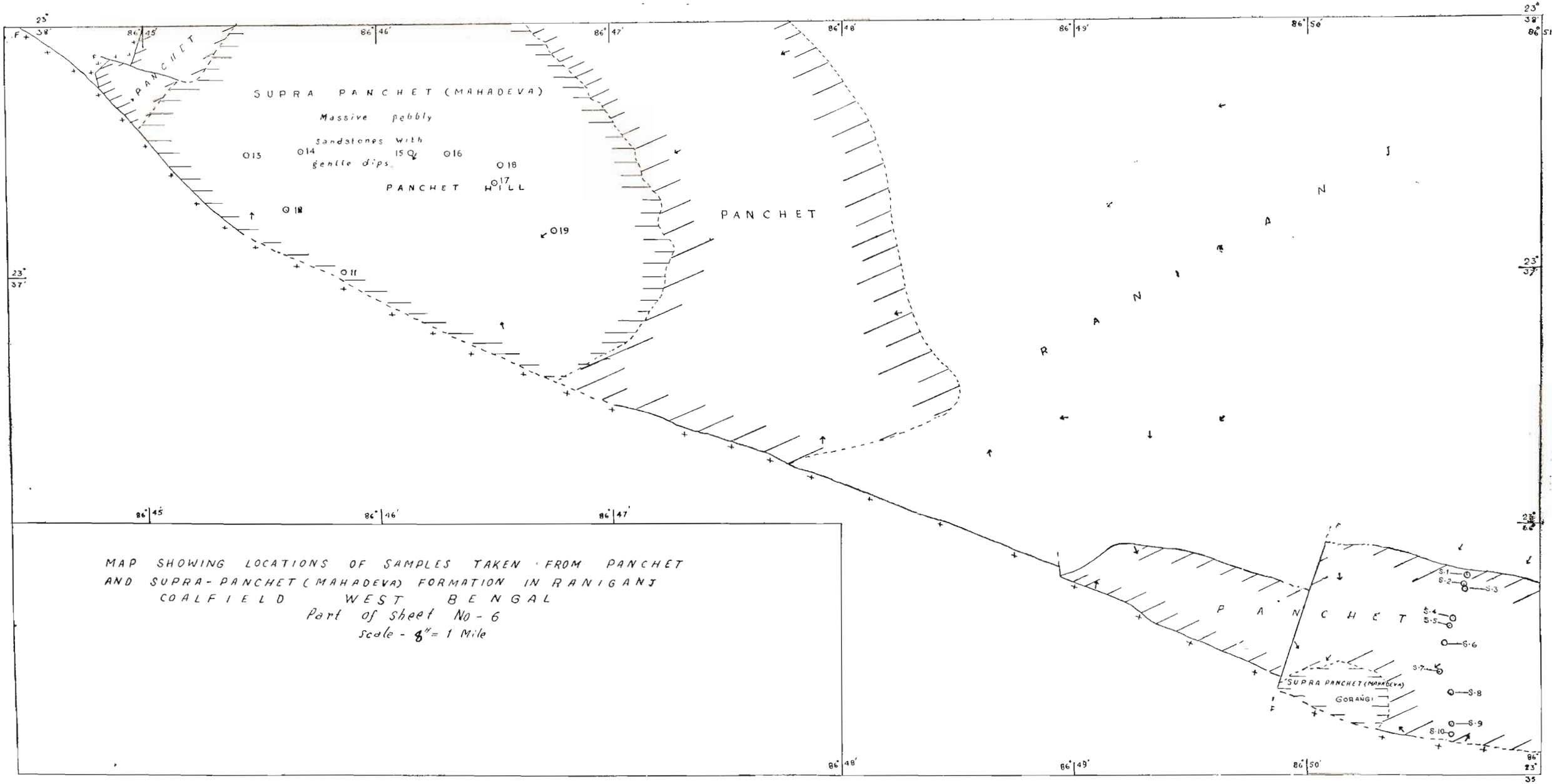
## INTRODUCTION

THE palynological investigation on Raniganj stage (Upper Permian) of the Lower Gondwanas in India had been carried out by Sen (1944), Ghosh & Sen (1948), Bhattacharya, Raychowdhury & Datta (1957), Bharadwaj (1962), Bharadwaj & Salujha (1964, 1965a, 1965b), Ghosh (1965), Salujha (1965), Bharadwaj & Tiwari (1966), Kar (1968, 1969) while that of Panchet had been done by Srivastava & Pawde (1962), Satsangi *et al.* (1968), Bharadwaj & Srivastava (1969) and Kar (1970).

The present paper deals with the palynological demarcation between Raniganj and Panchet particularly in Raniganj coal-




TEXT-FIG. 1 — Map showing location of bore holes RN-9 and RN-17 in Raniganj coalfield, West Bengal.

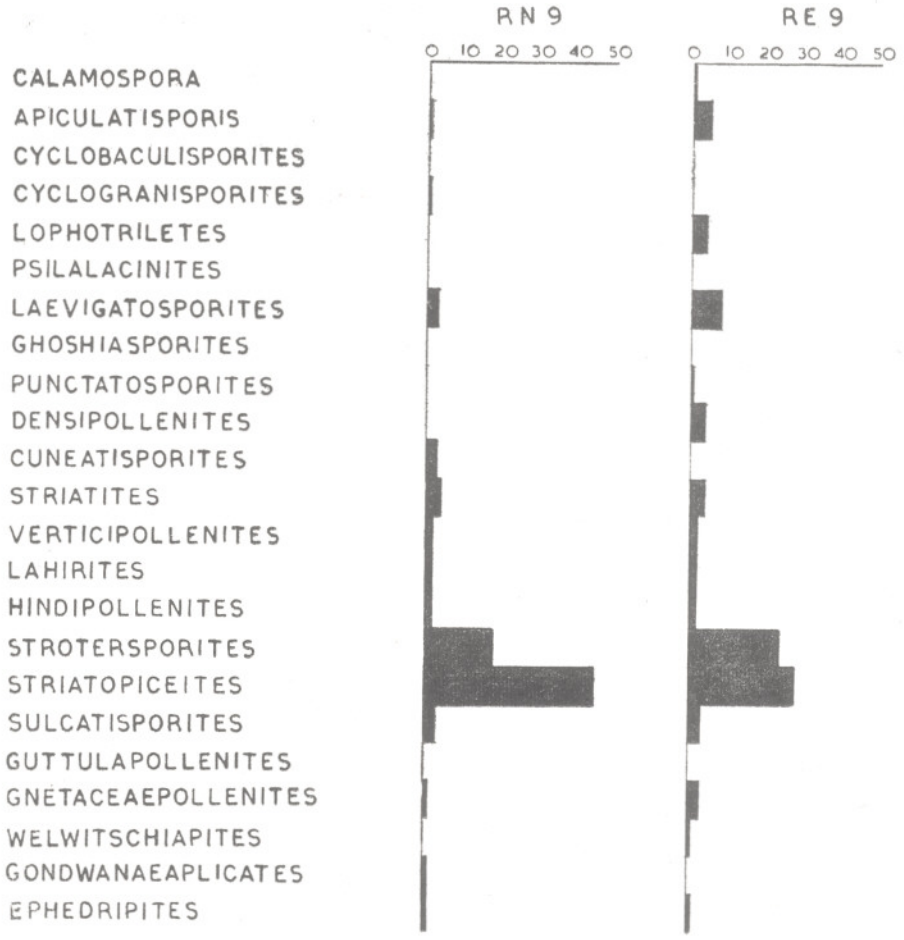



TEXT-FIG. 2 — Map showing location of surface samples from Panchet in Raniganj coalfield, West Bengal.

field, West Bengal. A large number of surface and subsurface samples have been investigated for this purpose and corroborative evidences have also been considered from the data of other coalfields. Most of the surface and all subsurface samples were kindly supplied by Shri P. K. Ghosh, Director, Coal Division, Geological Survey of India. Of all the bore cores, the bore core no. RE9, located in Laudoha area (23°40′ and 87°20′) in east Raniganj coalfield is of special importance. It comprises Raniganj at bottom (89·25-87·65 M.) which passes conformably to Panchet (87·65-30·90 M.). The shale belonging to Raniganj is carbonaceous while that of Panchet is green-grey. The two shale bands are separated by sandstone. The playnological fossils have been recovered in all the shale samples of this bore core belonging to two different stages helping to demarcate the palynological boundary (TEXT-FIGS. 1-2).

**Raniganj palynological assemlage** — The palynological assemblage of Raniganj stage comprises 69 genera as follows:

*Leiotriletes* (Naum.) Pot. & Kr., 1954
*Retusotriletes* Naum., 1953
*Calamospora* Schopf et al., 1944
*Psilalacinites* Kar, 1969
*Aulisporites* (Lesch.) Kl., 1960
*Punctatisporites* Ibr., 1933
*Ricaspora* Bharad. & Sal., 1964
*Cyclogranisporites* Pot. & Kr., 1954
*Apiculatisporis* Pot. & Kr., 1956
*Verrucosisporites* (Ibr.) Smith & Butter,. 1967




TEXT-FIG. 3 — Showing the percentage of different spore-pollen genera in bore holes RN 9 and RE 9 comprising Upper Raniganj.

*Anapiculatisporites* Pot. & Kr., 1954
*Cyclobaculisporites* Bhard., 1955
*Lophotriletes* (Naum.) Pot. & Kr., 1954
*Acanthotriletes* (Naum.) Pot. & Kr., 1954
*Neoraistrickia* Pot., 1956
*Didecitriletes* Venkat. & Kar, 1965
*Lacinitriletes* Venkat. & Kar, 1965
*Microbaculispora* Bharad., 1962
*Microfoveolatispora* Bharad., 1962
*Lycopodiumsporites* Thierg., 1938
*Gravisporites* Bharad., 1962
*Indospora* Bharad., 1962
*Divarireticulates* Bharad., 1962
*Cirratriradites* Wils. & Coe, 1940
*Gondisporites* Bharad., 1962
*Striasporis* Kar, 1969
*Laevigatosporites* Ibr., 1933
*Altimonoletes* Kar, 1969
*Punctatosporites* Ibr., 1933
*Thymospora* (Kos.) Wils. & Venkat., 1963a
*Ghoshiasporites* Kar, 1969
*Mammialetes* Kar, 1969
*Zonareticulatisporis* Kar, 1969
*Cannanoropollis* Pot. & Sah, 1961
*Parasaccites* Bharad. & Tiw., 1964
*Densipollenites* Bharad., 1962
*Divarisaccus* Venkat. & Kar, 1966a
*Striomonosaccites* Bharad., 1962
*Distriomonosaccites* Bharad., 196?
*Platysaccus* Pot. & Kl., 1954
*Cuneatisporites* Lesch., 1955
*Raniganjiasaccites* Kar, 1969
*Kosankeisporites* Bharad., 1955
*Striatites* (Pant) Bharad., 1962
*Verticipollenites* Bharad., 1962
*Lahirites* Bharad., 1962
*Hindipollenites* Bharad., 1962
*Lunatisporites* (Lesch.) Bharad., 1962
*Stroteršporites* Wils., 1962
*Striatopiceites* (Zor. & Sed.) Sed., 1962
*Rhizomaspora* Wils., 1962
*Corisaccites* Venkat. & Kar, 1966b
*Hamiapollenites* Wils., 1962
*Vittatina* (Lub.) ex Sam., Wils., 1962
*Distriatites* Bharad., 1962
*Sulcatisporites* (Lesch.) Bharad., 1962
*Labiisporites* Lesch., 1956
*Tumoripollenites* Bharad., 1962
*Vesicaspora* (Schem.) Wils. & Venkat., 1963b
*Trochosporites* Wils., 1962
*Crustaesporites* Lesch., 1962
*Guttulapollenites* (Goub.) Venkat. *et al.*, 1967
*Gnetaceaepollenites* Thierg., 1938
*Ephedripites* Bolkhov., 1953
*Welwitschiapites* Bolkhov., 1953
*Gondwanaeaplicates* Kar, 1969
*Boutakoffites* Bose & Kar, 1966
*Ginkgocycadophytus* Sam., 1953
*Decussatisporites* Lesch., 1955

The genera listed above are, however, not found in all the samples. It has also been observed that the striate bisaccate pollen grains are dominant in all the samples while trilete and monolete spores are fairly common in middle-upper part of Raniganj stage. The other major groups are meagrely represented throughout the stage and thus two palynological zones can be distinguished as:

| *Major groups* | *Zone A* (Lower Raniganj) | *Zone* B (Middle-Upper Raniganj) |
|---|---|---|
| Trilete | Mostly absent | Subdominant |
| Monolete | Mostly absent | Subdominant |
| Alete | Absent | Absent |
| Monosaccate | Subdominant | Mostly absent |
| Bisaccate | Dominant | Dominant |
| Polysaccate | Absent | Rare or accessory |
| Polyplicate | Rare | Common |
| Monocolpate | Mostly absent | Mostly absent |

In upper part of Raniganj stage in east Raniganj coalfield the diversity of the assemblage is decreased and the following genera are only encountered: *Calamospora, Punctatisporites, Eupunctisporites, Cyclogranisporites, Apiculatisporis, Anapiculatisporites, Cyclobaculisporites, Laevigatosporites, Punctatosporites, Ghoshiasporites, Cannanoropollis, Parasaccites, Densipollenites, Cuneatisporites, Raniganjiasaccites, Striatites, Verticipollenites, Lahirites, Hindipollenites, Lunatisporites, Stroteršporites, Striatopiceites, Corisaccites, Striapollenites, Tumoripollenites, Vittatina, Sulcatisporites, Guttulapollenites, Gnetaceaepollenites, Gondwanaeaplicates, Welwitschiapites, Ephedripites, Boutakoffites* and *Ginkgocycadophytus*. The assemblage is, however, as usual dominated by the striate bisaccate and genera like *Stroteršporites* and *Striatopiceites* are very common. The pteridophytic spores are sub-dominant and mostly represented by *Cyclogranisporites, Apiculatisporis, Cyclobaculisporites* and *Lophotriletes* (TEXT-FIG. 3).

**Lower Panchet assemblage** — The palynological assemblage of Lower Panchet consists of the following 24 genera:

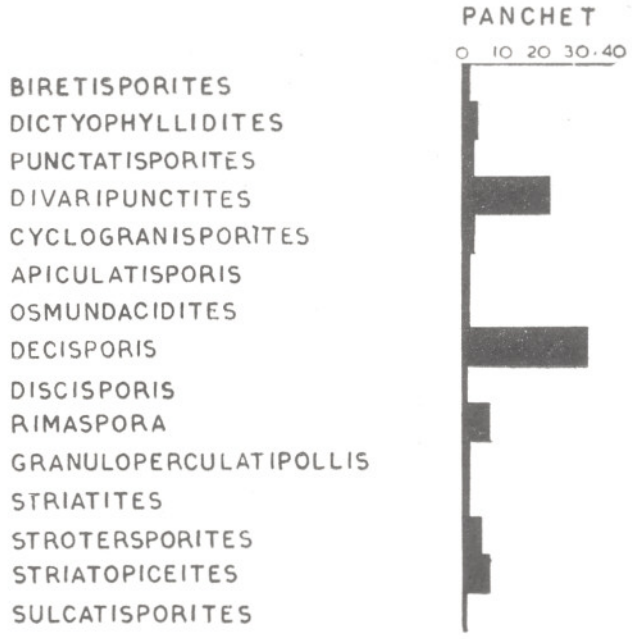
*Biretisporites* (Delc. & Sprum.) Delc. *et al.*, 1963
*Dictyophyllidites* (Coup.) Dettm., 1963
*Punctatisporites* (Ibr.) Pot. & Kr., 1954
*Eupunctisporites* Bharad., 1962
*Divaripunctites* Kar, 1970
*Cyclogranisporites* Pot. & Kr., 1954
*Apiculatisporis* Pot. & Kr., 1956
*Anapiculatisporites* Pot. & Kr., 1954
*Osmundacidites* Coup., 1953
*Decisporis* Kar, 1970
*Ghoshiasporites* Kar, 1969
*Baculatisporis* Thoms. & Pfl., 1953
*Subverrusporis* Kar, 1970
*Discisporis* Lesch., 1955
*Rimaspora* Kar, 1970
*Granuloperculatipollis* Venkat. & Góc., 1964
*Densipollenites* Bharad., 1962
*Podocarpidites* Cooks. ex Coup., 1953
*Striatites* (Pant) Bharad., 1962
*Verticipollenites* Bharad., 1962
*Strotersporites* Wils., 1962
*Striatopiceites* (Zor. & Sed.) Sed., 1962
*Striapollenites* Bharad., 1962
*Sulcatisporites* (Lesch.) Bharad., 1962

The assemblage is dominated by trilete spores (71-80%) and the bisaccate pollen grains are next in abundance (13-22%). Monolete, monosaccate, polyplicate and monocolpate pollen grains are hardly represented in the assemblage (TEXT-FIG. 4).

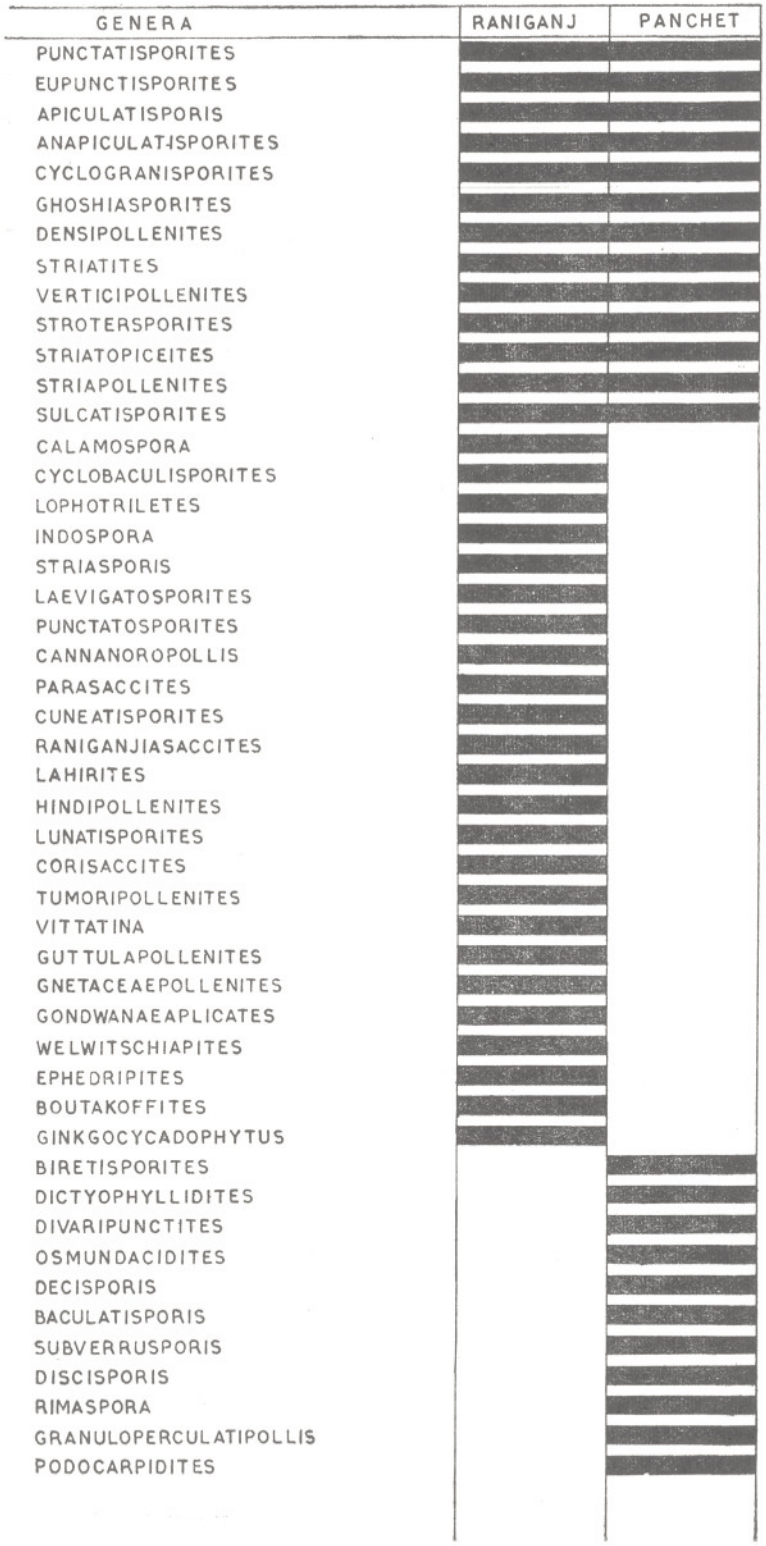
The Lower Panchet palynological assemblage resembles Raniganj in the presence of *Punctatisporites, Eupunctisporites, Apiculatisporites, Anapiculatisporites, Cyclogranisporites, Ghoshiasporites, Densipollenites, Striatites, Verticipollenites, Strotersporites, Striapollenites, Striatopiceites* and *Sulcatisporites* (TEXT-FIG. 5).

The Lower Panchet palynological assemblage is, however, quite distinct from Raniganj in the presence of genera like: *Biretisporites, Dictyophyllidites, Baculatisporites, Osmundacidites, Divaripunctites, Subverrusporis, Decisporis, Discisporis, Rimaspora* and *Granuloperculatipollis*. Of them, *Divaripunctites* and *Decisporis* are dominant in the assemblage (TEXT-FIG. 6).

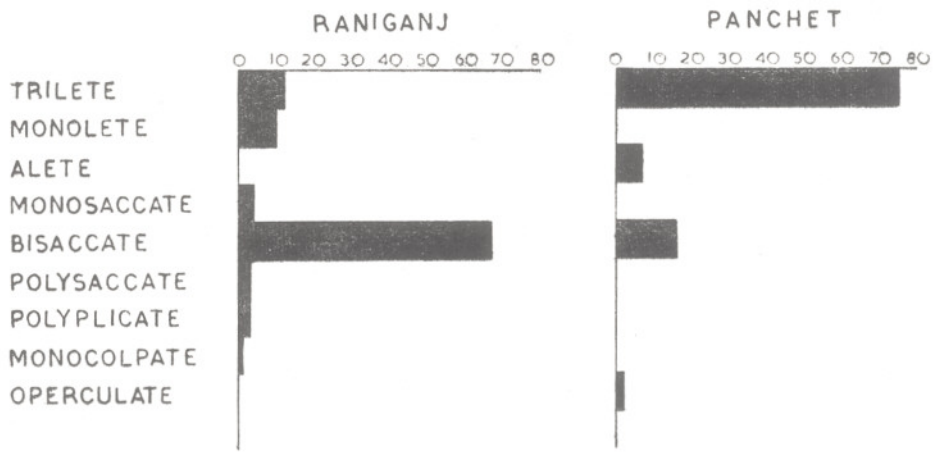
The dominance of trilete spores in Panchet has also been observed by Srivastava and Pawde (1962) in the bore-core drilled near Andal, West Bengal. They also pointed out that in Raniganj stage, striate bisaccate pollen grains are abundant and thus the palynological boundary between the two can easily be demarcated.




TEXT-FIG. 4 — Showing the percentage of different spore-pollen genera in bore hole RE 9 comprising Lower Panchet.




TEXT-FIG. 5 — Showing the presence and absence of different spore-pollen genera in Upper Raniganj and Lower Panchet.




TEXT-FIG. 6 — Showing the percentage of major groups in Upper Raniganj and Lower Panchet.

Satsangi *et al.* (1968) however, opined that in Panchet as well as in Raniganj the striate bisaccate pollen grains are in abundance but the two stages can be separated by the presence and absence of various genera.

It may be mentioned here that Hennelly (1958) also observed the dominance of trilete spores in the Permo-Triassic transition in New South Wales. Balme (1963) concluded that Lower Triassic palynological assemblage is quite different from Upper Permian in the abundance of trilete spores.

The present investigation supports the assumption of Srivastava and Pawde (1962) and reveals that the palynological boundary between Raniganj and Panchet can be marked by the dominance of striate bisaccate pollen in the former and trilete spores in the latter.

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