MORPHOLOGICAL OBSERVATIONS ON SOME SPORES AND POLLEN GRAINS FROM THE PALAEOCENE SUBSURFACE ASSEMBLAGES OF GARO HILLS, MEGHALAYA

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ABSTRACT

The present paper deals with the morphological observations on some spores and pollen grains recovered from the Nongwalbibra Palaeocene subsurface assemblages of Garo Hills, Meghalaya. One new genus *Garotriletes* gen. nov., and 3 new species, viz., *G. assamicus* sp. nov., *G. incompositus* sp. nov., and *Paleosantalaceaepites giganticus* sp. nov. have been described and illustrated. Critical comments on the morphology of some other palynomorphs have also been made. Geology of the area has been briefly reviewed and stratigraphical significance of the previously described assemblages commented upon.

INTRODUCTION

THE present paper deals with the morphological observations on 9 genera and 12 species, of which 1 genus and 3 species are new. The new genus *Garotriletes* gen. nov. is represented by 2 species, viz., *G. assamicus* sp. nov. and *G. incompositus* sp. nov. *Garotriletes* gen. nov. is well-represented in the Palaeocene assemblages and is distinguishable from the comparable genera by the presence of ornamented exine and globular thickening at each ray-end on the proximal face of the spore. The globular thickenings seem to have morphological similarity with those described in the genus *Dandotiaspora*. The nature of these thickenings has been commented upon in the latter part of the text. A new taxon *Paleosantalaceaepites giganticus* sp. nov. has also been established.

The palynomorphs described in this paper have been recovered from bore-hole samples of the Nongwalbibra area possibly equivalent of the Tura Formation. In 1965, one of the authors (H.P.S.) received about 17 subsurface coal samples from a number of boreholes sunk in this area. These samples were sent by the then Director, Geology and Mining, Assam region for palynological investigations. The stratigraphic significance of the palynomorph assemblages recovered from these samples was described in detail by Singh *et al.* (1976). During the course of this investigation some palynomorphs possessing distinct morphological features were observed. Morphological characters of these spores and pollen grains are described here in detail. Artificial system of classification of fossil spores and pollen grains as proposed by Potonié (1960) has been followed. Microslides of spores and pollen grains have been deposited in the repository of the Museum, Birbal Sahni Institute of Palaeobotany, Lucknow.

GEOLOGY OF THE AREA

The Tura Formation outcrops in Garo Hills, Meghalaya. It contains good reserves of Tertiary coal. This coal occurs in the form of three seams, interbedded with sandstones and mottled clays. The Tura Formation rests unconformably on the denuded surface of Pre-Cambrian granite and gneisses in greater part of Garo Hills excepting in the south-eastern extremity where Upper Cretaceous sediments conformably underline the base of this formation. The Siju Limestone Formation occurs on top of the Tura Formation.

The coal deposits of this area were considered to be of different ages by different workers. Earlier geologists such as Oldham (1863), Medlicott (1874), Latouche (1882, 1887), Medlicott and Blanford (1893), Pinfold (1919), Evans (1932) and Krishnan (1966) believed them to be of Cretaceous age while Fox (1936-1938), Jacob (1949), Ghosh (1954) and Pascoe (1963) advocated Tertiary age. Palaeontological and palynological contributions made on this formation by Samanta (1960), Biswas (1961), Baksi (1962), Quddus (1963), Banerjee (1964) and Ghosh (1969)

are also worth mentioning. They have ascribed a Lower to Middle Eocene age for the Tura Formation.

PALYNOSTRATIGRAPHICAL INFORMATION

Recently Sah and his co-workers have carried out extensive palynostratigraphic investigations on this formation and have amply demonstrated the credibility of fossil spores and pollen grains in resolving the problems of stratigraphic correlation and age determination. Biostratigraphically, they have recognized four palynological zones with in the Tura Formation (Sah & Singh, 1974).

Further, they add that it is a time transgressive lithofacies in Garo Hills, therefore, its lower and upper limits enclose a considerable time span ranging from Palaeocene to Lower Eocene age. The present specimens have been described from the stratigraphic interval representing the *Dandotiaspora telonata* and *Palmidites plicatus* Cenozones of the subsurface samples possibly equivalent to similar cenozones of the Tura Formation in the Nongwalbibra area and hence Palaeocene in age.

SYSTEMATIC DESCRIPTION

Genus — *Dandotiaspora* Sah, Kar & Singh, 1971

Type Species — *Dandotiaspora dilata* (Mathur) Sah, Kar & Singh, 1971.

Dandotiaspora dilata (Mathur) Sah, Kar & Singh, 1971 .

Pl. 1, figs. 10, 15

Remarks — The specimen studied and figured here is very interesting in the sense that it shows globular thickenings at the ray-ends on the proximal side. This character is apparent in all other specimens of this species observed from this assemblage. Sah *et al.* (1971) state that the genus *Dandotiaspora* is characterized by having globular thickenings on the distal face of the spore and each thickening is located opposite to the end of each Y-ray. Contrary to this, our observations on the specimens of *D. dilata* reveal that each globular thickening is ± located at the end of each Y-ray on the proximal face of the exine. As such our observations suggest that a detailed study of the *Dandotiaspora* should be carried out so as to understand the nature and distribution of the thickenings. It seems likely that the labra is thickened all along the Y-mark and is sharply dilated into a ± circular configuration at the end of each Y-ray.

Genus — *Lycopodiumsporites* Thiergart, 1938

Type Species — *Lycopodiumsporites agathoecus* (Potonié) Thiergart, 1938.

Lycopodiumsporites parvireticulatus Sah & Dutta, 1966

Pl. 1, fig. 4

Remarks — The specimens recorded in the present material are bigger than those described by Sah and Dutta (1966). They possess foveolate ornamentation on both the surfaces. Foveolae are larger at the periphery, becoming smaller and fewer in number towards the pole.

Genus — *Garotriletes* gen. nov.

Type Species — *Garotriletes assamicus* sp. nov.

Generic Diagnosis — Spores triangular-subcircular. Trilete, Y-ray extending three fourth to full equator. Exine thin or thick, foveolate-reticulate. Globular thickening present at each ray-end on the proximal side.

Comparison — The genus *Garotriletes* resembles *Lycopodiumsporites* Thiergart (1938), *Foveosporites* Balme (1957) and *Microreticulatisporites* Potonié & Kremp (1954) in shape, size and ornamentation but is distinguishable from the latter three due to the presence of globular thickening at the ray-ends. *Sestrosporites* Dettmann (1963) differs from the present genus by the presence of inter-radial thickening along the trilete mark. Organizationally, *Garotriletes* is very closely comparable to *Dandotiaspora* but differs from the latter by having foveo-reitculate ornamentation of the exine.

Derivation of Name — Named after Garo Hills, Meghalaya from where this genus is first reported.

Garotriletes assamicus sp. nov.

Pl. 1, figs. 3, 8

Holotype — Pl. 1, fig. 3; Slide no. 5125.

Locality — Nongwalbibra, Garo Hills, Meghalaya.

Horizon — Tura Formation, Palaeocene.

Specific Diagnosis — Size range 45-60 μ, holotype 54 μ, amb broadly triangular, apices rounded, inter-radial sides convex. Y-mark distinct, Y-rays straight, extending more than 3/4 spore radius. Exine 2-2·5 μ thick, foveoreticulate. One globular thickening present at each ray-end on the proximal face of the exine.

Garotriletes incompositus sp. nov.

Pl. 1, figs. 2, 5

Holotype — Pl. 1, fig. 2; Slide no. 5127.

Locality — Nongwalbibra, Garo Hills, Meghalaya.

Horizon — Tura Formation, Palaeocene.

Specific Diagnosis — Size range 42-68 μ, holotype 60 μ, amb deltoid, apices rounded, inter-radial sides straight to concave. Y-mark distinct, Y-rays straight, extending up to the equator. Exine 3-4 μ thick, foveolate on both surfaces, foveolae decrease in size from the periphery towards the centre on the proximal side. Incipient thickening present at the ray-ends.

Comparison — The present species differs from *Garotriletes assamicus* sp. nov. in having comparatively thicker exine, characteristic deltoid shape and incipient globular thickening developed at the end of each Y-ray.

Genus — *Monolites* (Erdtman) Potonié, 1956

Type Species — *Monolites major* (Cookson) Potonié, 1956.

Monolites mawkmaensis Sah & Dutta, 1966

Pl. 1, fig. 9

Description — See Sah and Dutta (1966).

Remarks — The present specimen is comparatively bigger in size and its monolete mark is not clear due to the presence of a prominent fold along the longer axis of the spore.

Monolites sp.

Pl. 1, fig. 12

Description — Oval to broadly rounded spore, 102-86 μ. Monolete, laesura straight, extending 2/3 the longer axis. Exine thick, laevigate to infrastructured.

Comparison — The present species differs from all the known species of the genus by its appreciably larger size.

Genus — *Proxapertites* v.d. Hammen, 1956

Type Species — *Proxapertites operculatus* v.d. Hammen, 1956.

Proxapertites marginatus (Venkatachala & Kar) Singh, 1975

Pl. 1, fig. 6

Remarks — The pollen grains of this species are characterized by having punctate ornamentation. Puncta are mostly developed along the equatorial region and are absent on the central part in the present specimen.

Genus — *Paleosantalaceaepites* (Biswas) Dutta & Sah, 1970

Type Species — *Paleosantalaceaepites dinoflagellatus* (Biswas) Dutta & Sah, 1970.

Paleosantalaceaepites giganticus sp. nov.

Pl. 1, figs. 13, 14

Holotype — Pl. 1, fig. 14, size 82 μ. Slide no. 5129.

Horizon — Tura Formation, Palaeocene.

Type Locality — Nongwalbibra, Garo Hills, Meghalaya.

Diagnosis — Pollen grains subcircular to oval, 80-102 μ in size. Tricolporate, colpi long, extending from end to end of the pollen, generally associated with folds on one side. Zonorate, ora distinct, ranging between 2-3 μ in size, lalongate. Exine up to 8 μ thick, laevigate and undifferentiated.

Comparison — The present species differs from all the known species of the genus by its larger size and thicker exine.

Genus — *Keilmeyerapollenites* Sah & Kar, 1974

Type Species — *Keilmeyerapollenites eocenicus* Sah & Kar, 1974.

cf. *Keilmeyerapollenites* sp.

Pl. 1, fig. 11

Description — Pollen grain circular to roundly polygonal, 70 μ in diameter. Pentacolporate, colpi long, extending the full

diameter. Ora small, lolongate. Exine 3-4 μ thick, non-tegellate, wall differentiated, sexine thicker than nexine. Ornamentation retipilate to retipilariate, pila 1-2 μ long, forming negative reticulum in surface view.

Remarks — Sah and Kar (1974, p. 173) instituted the genus *Keilmeyerapollenites* to include retipilate, tricolporate pollen grains belonging to the family Guttiferae. The present grain broadly compares with *Keilmeyerapollenites eocenicus* Sah & Kar, 1974. The obscure compression of the tetrad condition of the pollen grain does not permit its assignment under the present species.

Genus — *Inaperturopollenites* (Thomson & Pflug) Potonié, 1958

Type Species — *Inaperturopollenites dubius* Thomson & Pflug, 1953.

Inaperturopollenites sp.

Pl. 1, fig. 7

Description — Subcircular to roundly polygonal spore, 56 μ in diameter. Alete. Exine thin, psilate, covered with many secondary folds.

Comparison — The present species differs from *Inaperturopollenites dubius* Thomson & Pflug, 1953 in having comparatively much larger size and more number of folds.

Genus — *Retipilonapites* Ramanujam, 1966

Type Species — *Retipilonapites arcotense* Ramanujam, 1966.

Retipilonapites sp.

Pl. 1, fig. 1

Description — Pollen grain subcircular, 56 μ in diameter. Nonaperturate, sculptured with pila, pila 3-4 μ long and 1·5-2·5 μ broad, closely placed. Exine up to 5 μ thick, well-differentiated. Sexine thicker than nexine, non-tegellate simulating pseudoreticulate ornamentation in surface view.

Comparison — The present species differs from *Retipilonapites arcotense* Ramanujam, 1966 in having baculate sculpture.

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EXPLANATION OF PLATE

(*All magnifications* × *Ca. 500*)

PLATE 1

1. *Retipilonapites* sp.; Slide no. 4130.
2. *Garotriletes incompositus* sp. nov.; Slide no. 5127 (Holotype).
3. *G. assamicus* sp. nov.; Slide no. 5125 (Holotype).
4. *Lycopodiumsporites parvireticulatus* Sah & Dutta, 1966; Slide no. 5129.
5. *Garotriletes incompositus* sp. nov.; Slide no. 5125.
6. *Proxapertites marginatus* (Venkatachala & Kar) Singh, 1975.
7. *Inaperturopollenites* sp.; Slide no. 5128.
8. *Garotriletes assamicus* sp. nov.; Slide no. 5126.
9. *Monolites mawkmaensis* Sah & Dutta, 1966; Slide no. 5125.
10. *Dandotiaspora dilata* Sah, Kar & Singh, 1971; Slide no. 5124.
11. cf. *Keilmeyerapollenites* sp.; Slide no. 5129.
12. *Monolites* sp.; Slide no. 5127.
13,14. *Paleosantalaceaepites giganticus* sp. nov.; Slide no. 5129 (Holotype).
15. *Dandotiaspora dilata* Sah, Kar & Singh, 1971; Slide no. 5124.

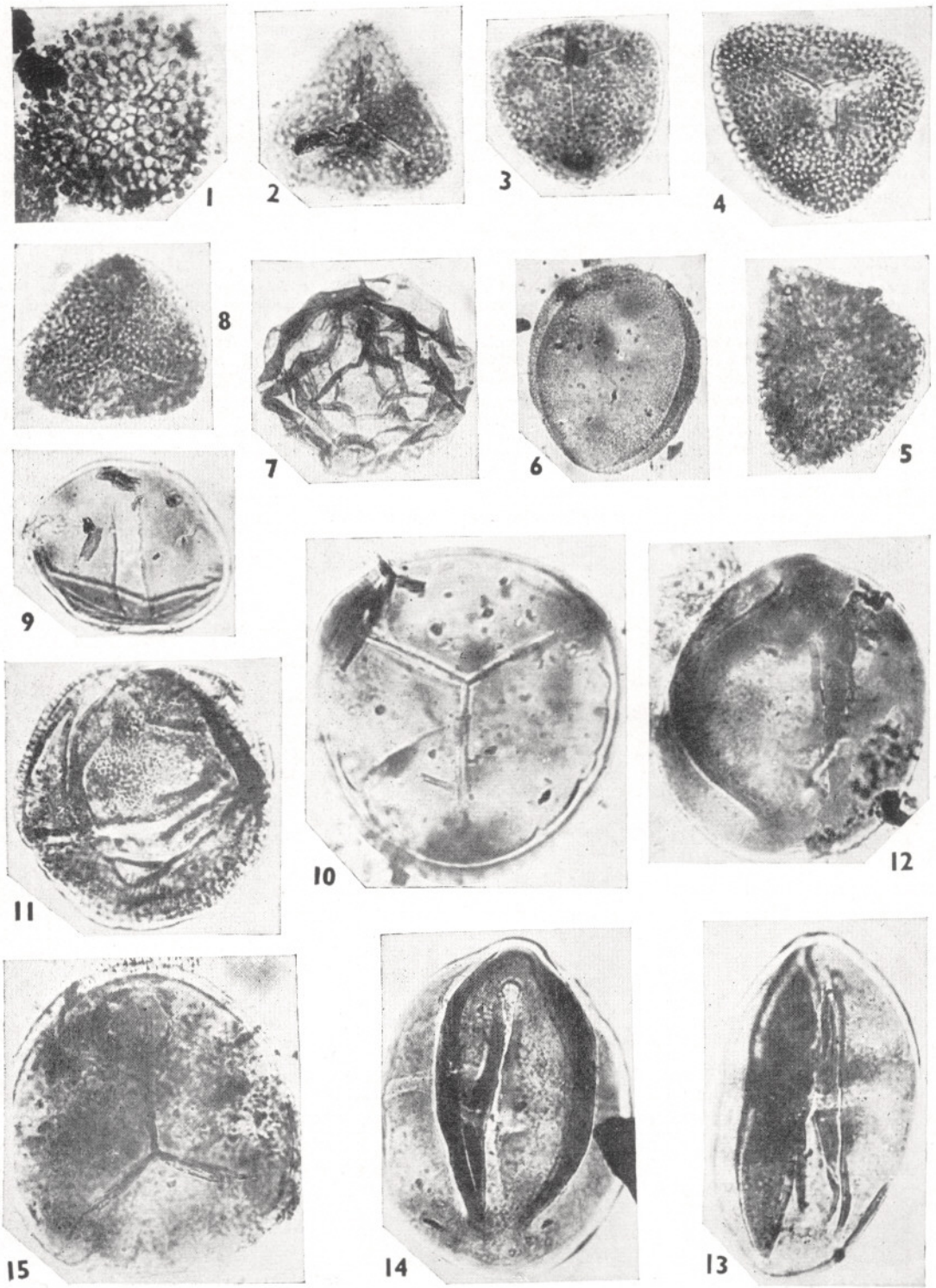

PLATE 1