PALYNOLOGY OF MIOCENE ROCKS AROUND MAIBONG, ASSAM

B. D. MANDAOKAR

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 007, India

Abstract

Palynological assemblage recovered from Miocene rocks exposed near the Maibong Railway Station consists of 23 genera and 38 species mostly comprising the pteridophytic and gymnospermous pollen. The assemblage is closely comparable to other Miocene assemblages of Meghalaya indicating a tropical to sub-tropical, warm and humid climate during the time of deposition.

Introduction

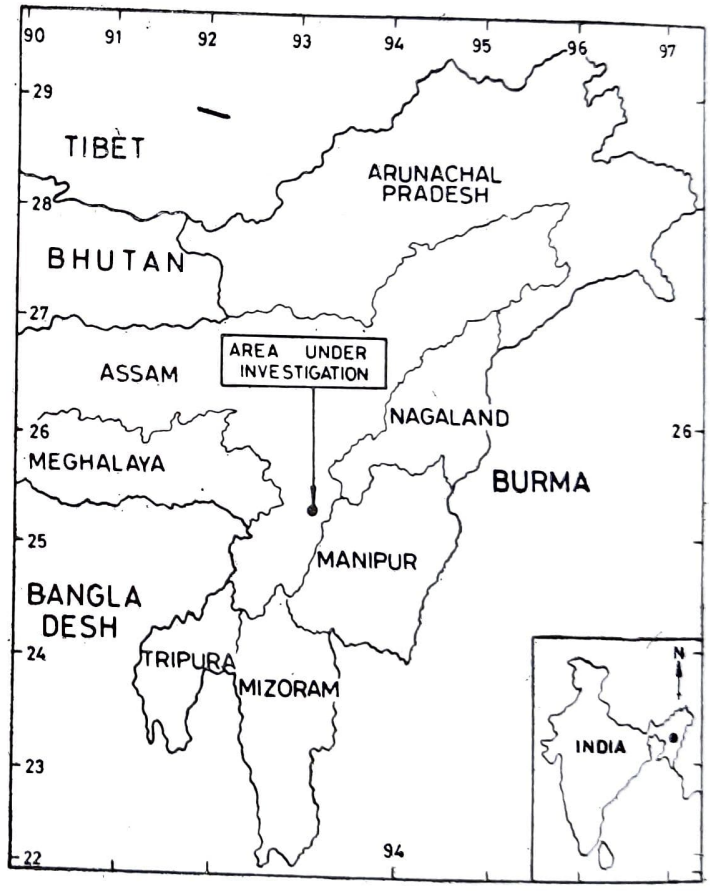
Palynological studies of surface and sub-surface Tertiary sediments of north-east India were carried out by Baksi (1962, 1972, 1974), Banerjee (1964), Dutta and Sah (1970), Sah *et al.* (1971), Sah and Singh (1977), Salujha *et al.* (1972) and others. Most of these workers confined themselves to the lower Tertiaries and as a result the knowledge of the Upper Tertiary palynofossil is meagre. To remove this discrepancy, Lower Miocene rocks exposed on the northern side of the Maibong Railway Station, in North Cachar Hills were palynologically investigated.

Material and methods

One hundred samples comprising shale, claystone and clay were macerated out of which 44 samples turned to be productive. The location of the samples has been shown in Map 1. The slides were prepared in Polyvinyl alcohol and mounted in Canada balsam. The slides have been deposited in the repository of the Birbal Sahni Institute of Palaeobotany, Lucknow.

General geology

The geological succession of the Tertiary succession of Assam as has been proposed by Evans (1932, 1964) is given in Table 1.



Map 1

Qualitative analysis

The palynological assemblage consists of 39 genera and 58 species, out of which 16 genera and 20 species are reworked from Lower Tertiary, Upper Mesozoic and Permian sediments.

Table 1

Age	Group	*Geosynclinal sediments* Surma valley	Upper Assam, Naga Hills	Shelf sediments
Recent and Pleistocene		Alluvium and high level terraces	Alluvium and high level terraces	Alluvium and high level terraces
			Unconformity	
Pliocene	Dihing	Not subdivided 400	Not subdivided 900	Dhekiajuli bed 1800
			Unconformity	
Miopliocene	Dupitila	Upper Dupi Tila 2800 Lower Dupi Tila 500	Namsang Bed 800	Namsang bed 600
			Unconformity	
Miocene	Tipam	Girujan clay 1500 Tipam sandstone 1600	Girujan clay 1800 Tipam sandstone 1600	Girujan clay 600 Tipam sandstone 900
	Surma	Bokabil 1500 Bhuban 4000	Not subdivided 900	Not subdivided 200
			Unconformity	
Oligocene	Barail	Renji 1000 Jenum 1200 Laisong 240	Tikak Parbat 600 Baragolai 3300 Naogaon 2200	Not subdivided 1200
Eocene	Disang	Over 1500	Probably over 3000	Jaintia Kopili Alternation 500 Sylhet Limestone 500 Therria 100

The tertiary succession in Assam

The different plant groups represented in the assemblage are given below:

I. Miocene forms

a) Pteridophytic spores
15 genera, 25 species
b) Gymnospermic pollen
5 genera, 9 species
c) Angiospermic pollen
1 genus, 2 species
d) Fungal remains
2 genera, 2 species

II. Palaeocene Reworked Forms

a) Pteridophytic spores
3 genera, 6 species
b) Angiospermic pollen
4 genera, 7 species

III. Mesozoic Reworked Forms

a) Pteridophytic spore
1 genus, no recognizable species
b) Bisaccate pollen
2 genera, 3 species

IV. Palaeozoic Reworked Forms

a) Pteridophytic spore
1 genus, 1 species
b) Monosaccate forms
5 genera, 4 species

Palynofloral Assemblage (Check-list of the Palynoflora

Trilele spore

Cyathidites australis Couper 1953
Cyathidites minor Couper 1953
Todisporites major Couper 1958
Deltoidospora halli Miner 1935
Dictyophyllidites laevigatus Kar 1985
Dictyophyllidites dulcis Kar 1979
Intrapunctisporis intrapunctis Krutzsch 1959
Intrapunctisporis apunctis Krutzsch 1959
Dandotiaspora plicata Sah *et al.* 1971
Lycopodiacidites cerebrus Kar & Kumar 1986
Lycopodiumsporites globatus Kar 1985
Pteridacidites vermiverrucatus Sah 1967
Pteridacidites meghalayaensis Kar & Kumar 1986
Pteridacidites verrucus Salujha *et al.* 1972
Striatriletes susannae (van der Hammen) Kar 1979
Striatriletes multicostatus Kar & Saxena 1981
Striatriletes paucicostatus Kar 1985
Eximispora tuberculata Salujha *et al.* 1972
Verrutriletes grandis Salujha *et al.* 1972

Monolete Spore

Laevigatosporites lakiensis Sah & Kar 1969
Laevigatosporites cognatus Sah & Kar 1969
Pilamonoletes excellensus Kar (MS)
Polypodiaceaesporites levis Sah 1967
Polypodiaceaesporites tertiarus Sah & Dutta 1968
Polypodiaceaesporites major Saxena 1978

Gymnospermous pollen

Podocarpidites ellipticus Cookson 1947
Podocarpidites cognatus Kar 1979
Podocarpidites densicorpus Kar 1985
Podocarpidites khasiensis Dutta & Sah 1970
Podocarpidites clarus Sah 1967
Pinuspollenites tenuicorpus Singh & Sarkar 1984
Pinuspollenites crestus Kar 1985
Piceapollenites excellensus Kar 1985
Cedripites nudis Sah & Kar 1969
cf. *Araucariacites* sp.

Angiospermous pollen

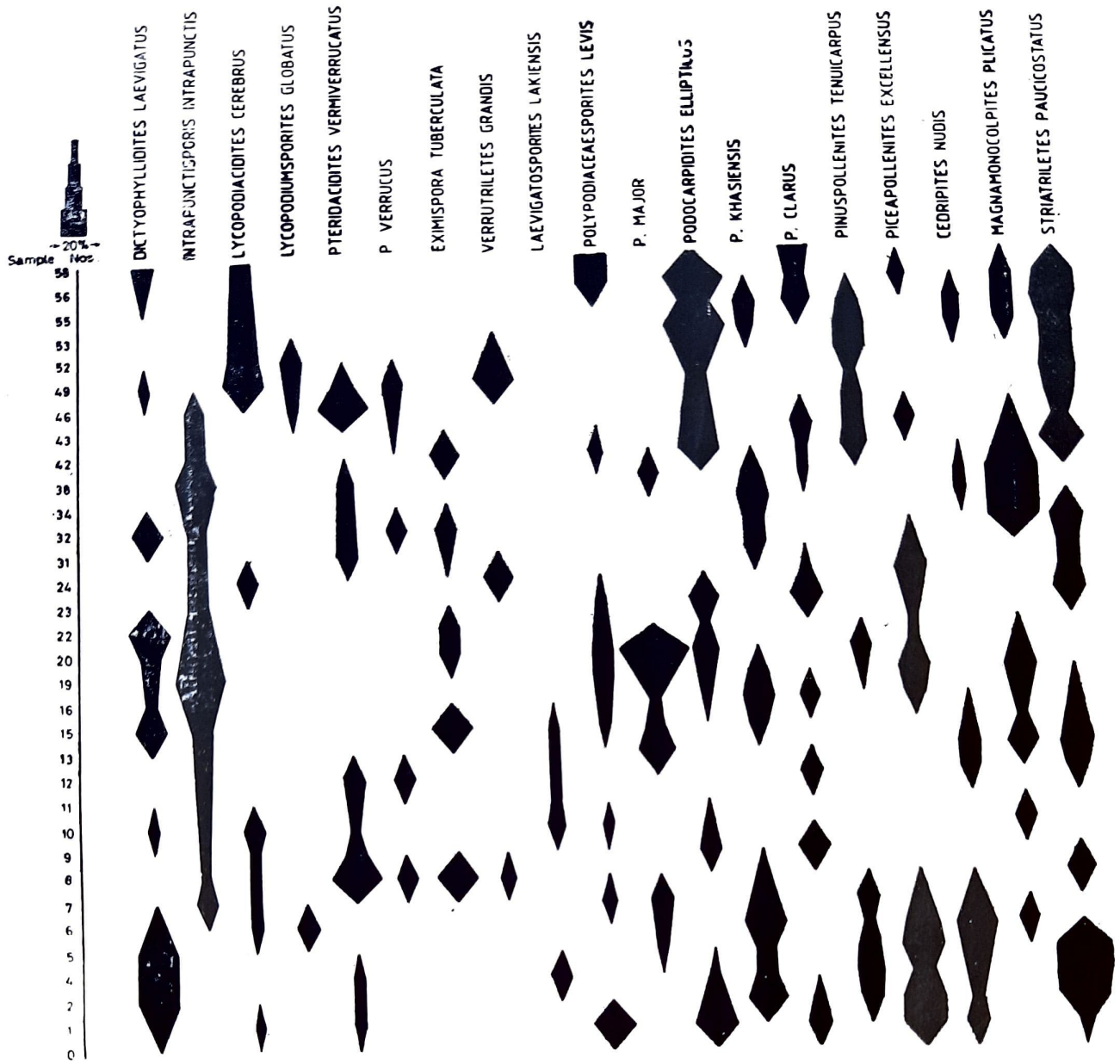
Magnamonocolpites plicatus Kar 1985
Magnamonocolpites miocenicus Kar 1985

Fungi

Phragmothyrites eocaenicus (Edwards, 1922) Kar & Saxena 1976
Cucurbitariaceites bellus Sah *et al.* 1971

Palaeocene Reworked Forms

Dandotiaspora telongata Sah *et al.* 1971
Dandotiaspora pseudoauriculata Sah *et al.* 1971
Dictyophyllidites kyrtomatus Kar & Kumar 1986
Dictyophyllidites cherrapunjensis Kar & Kumar 1986
Cheilanthoidospora monoleta Sah & Kar 1974
Cheilanthoidospora reticulata Sah & Kar 1974



Text-figure 1

Neocouperipollis bulbospinosus (Venkatachala & Kar 1969) Kar & Kumar 1986
Neocouperipollis echinatus (Venkatachala & Kar 1969) Kar & Kumar 1986
Neocouperipollis baculatus (Venkatachala & Kar 1969) Kar & Kumar 1986
Spinizonocolpites echinatus Muller 1968
Graminidites granulatus Kar 1985
Stephanocolpites granulatus Venkatachala & Kar 1969

III. *Mesozoic Reworked Forms*

Foveotriletes sp.
Podosporites tripakshi Rao 1943
Klausipollenites decipiens Jansonius 1962
Klausipollenites vestitus Jansonius 1962

IV. *Palaeozoic Reworked Forms*

Striatopodocarpidites sp.
Indotriradites korbaensis Tiwari 1964
Cannanoropollis obscurus (Lele) Bose & Maheshwari 1966
Cannanoropollis malabarensis Potonié & Sah 1958
Densipollenites indicus Bhardwaj 1962
Plicatipollenites gondwanensis Lele 1964
Parasaccites sp.

Quantitative analysis

The spores and pollen were counted up to one hundred to know the quantitative constituents of the assemblage (Text-figure 1). The assemblage is dominated by pteridophytic spores representing 83%, gymnospermous pollen share 12% and angiospermic pollen are hardly found within the counted specimens (1%) and the fungal remains are occasionally met with (3%).

Comparison with other Miocene palynofloral assemblages

The Neogene rocks of north east India have been a subject of considerable interest owing to their rich potentiality for fossils. During the last two decades significant contribution on the Tertiary palynostratigraphy of Meghalaya, Assam, Bengal, Kutch and south India have been done. A comparison of the present assemblage with known assemblage of equivalent age of above area has been attempted below.

Assam and Meghalaya

The third and fourth palynological zones proposed by Baksi (1962) for Simsang River section, Garo Hills, Meghalaya resemble the present one by the presence of *Striatriletes* (=*Parkeriaceaesporites*), *Cyathidites*, *Todisporites* (=smooth trilete spores of *Leiotriletes*), *Polypodiaceaesporites*, *Neocouperipollis* (=spinose monocolpate) and some other forms.

Palynofloral assemblage recorded by Banerjee (1964) from the Garo Hills is also similar to the present assemblage as both have *Magnamonocolpites* (=*Monocolpites*), *Pinuspollenites*, *Podocarpidites*, *Piceapollenites* (=*Saccites*), *Todisporites*, *Cyathidites*, *Deltoidospora* (=*Scabratriletes*), *Lycopodiacidites* (=*Retitriletes*), *Polypodiaceaesporites* (*Psilamonoletes*) and *Stephanocolpites*.

Bengal Basin

Baksi (1972, 1974) divided the subsurface Cretaceous and Tertiary palynofossils into seven zones. Of these, fourth and fifth zones which are Oligocene and Miocene in age respectively resemble this assemblage by the presence of *Cyathidites*, *Todisporites*, *Deltoidospora*, *Polypodiaceaesporites* and *Striatriletes*.

Kutch Basin

Kar (1985) proposed three palynological zones for Khari Nadi Formation (Miocene). Of these, the lower and upper cenozones, *viz.*, *Cordosphaeridium cantharellum* and *Operculodinium israelianum* cenozones do not resemble the present one as they are rich in phytoplanktons. *Striatriletes susannae* Cenozone somewhat approximates the Maibong assemblage by possessing *Striatriletes* and *Podocarpidites* only. The other significant genera are uncommon in the two assemblages.

Discussion

A comparison of the Maibong assemblage with the present plant communities exhibits that it has families like Parkeriaceae (*Striatriletes*), Cyatheaceae (*Cyathidites*), Matoniaceae (*Dictyophyllidites*), Polypodiaceae (*Polypodiaceaesporites*, *Polypodiisporites*), Lycopodiaceae (*Lycopodiumsporites*), Podocarpaceae (*Podocarpidites*), and Pinaceae (*Pinuspollenites* and *Piceapollenites*. The gymnospermous pollen in the assemblage perhaps were deposited in the basin from the adjacent high land whereas the pteridophytic flora were growing nearby. Most of these pteridophytes grow in warm and humid condition in tropical, sub-tropical countries indicating thereby that during Miocene, Maibong also enjoyed a similar climate.

Acknowledgements

The author is thankful to Dr B.S. Venkatachala, Director, BSIP for providing the facilities and to Dr R. K. Kar for critically going through the manuscript and useful suggestions. Sincere thanks are also due to Mr. N. Kannan for typing the manuscript.

References

Baksi, S. K. (1962). Palynological investigation of Simsang River Tertiaries, South Shillong Front, Assam. *Bull. geol. Min. metall. Soc. India*, **26**: 1-22.

Baksi, S. K. (1972). On the palynological biostratigraphy of Bengal Basin. *Proc. Sem. Palaeopalynol. Indian Stratigr. Calcutta*, **1971**: 188-206.

Baksi, S. K. (1974). On the Oligocene palynological biostratigraphy of Assam-Bengal region, India. *Symp. Stratigr. Palynol. Spl. Publ., B. S. I. P., Lucknow*; **3**: 106-116.

Banerjee, D. (1964). A note of the Mioflora from

Surma (Miocene) of the Garo Hills, Assam. *Bull. geol. Min. Metall. Soc. India*, **29**: 1-10.

Bharadwaj, D. C. (1962). The miospore genera in coal of Raniganj Stage (Upper Permian), India. *Palaeobotanist*, **9**: 68-106.

Bose, M. N. & Maheshwari, H. K. (1966). Palaeozoic Sporae dispersae from Congo. VII, Coal Measures near Lake Tanganyika, South of Albertville. *Annls. Mus. r. Afr. cent.* Ser. 8, *Sci. geol.*, **57**: 1-173.

Cookson, I. C. (1947). Plant microfossils from the lignite of Kerguelen archipelago Rep. B. A. N. Z. *Antarctic. Res. Exped.* Ser. A, **2**: 127-142.

Couper, R. A. (1953). Upper Mesozoic and Cainozoic spore and pollen grains from New Zealand. *Bull. N. Z. geol. Surv. Palaeont.*, **22**: 1-77.

Couper, R. A. (1958). British Mesozoic microspore and pollen grains: A systematic stratigraphic study. *Palaeontographica*, **103 B**: 75-179.

Dutta, S.K. & Sah, S.C.D. (1970). Palynostratigraphy of the Tertiary sedimentary formation of Assam. *Palaeontographica*, **131 B**: (1-4): 1-62.

Evans, P. (1932). Tertiary succession in Assam. *Trans. Min. Geol. Inst. India*, **27**: 155-260.

Evans, P. (1964). The tectonic framework of Assam. *J. geol. Soc. India*, **5**: 80-96.

Jansonius, J. (1962). Palynology of Permian and Triassic sediments, Peace River area, Western Canada. *Palaeontographica*, **110 B**: 35-98.

Kar, R. K. (1979). Palynostratigraphy of Maniyara Fort Formation (Oligocene) in the district of Kutch, western India. *Geophytology*, **7** (1): 121-122.

Kar, R. K. (1985). The fossil flora of Kachchh-II. Tertiary palynostratigraphy. *Palaeobotanist*, **34**: 1-279.

Kar, R. K. & Kumar, M. (1986). Palaeocene palynostratigraphy of Meghalaya, India. *Pollen Spores*, **28** (2): 177-218.

Kar, R. K. & Saxena, R. K. (1976). Algal and fungal microfossils from Matanomadh Formation, (Palaeocene) Kutch, India. *Palaeobotanist*, **23** (1): 1-15.

Kar, R. K. & Saxena, R. K. (1981). Palynological investigation of a bore core near Rataria, southern Kutch, Gujarat. *Geophytology*, **11** (2): 103-124.

Krutzsch, W. (1959). Einige neue Formagattungen und-Arten von Sporen und Pollen aus der mittleuropaischen Oberkreide und dem Tertiar. *Palaeontographica*, **105 B**: 125- 157.

Lele, K. M. (1964). Studies in the Talchir flora of India-3. *Stellatopollenites*: A new monosaccate pollen genus from the south Rewa Gondwana Basin. *Palaeobotanist*, **13** (1): 109-113.

Miner, H. L. (1935). Palaeobotanical examination of Cretaceous and Tertiary Coal. *Am. Midland. Naturalist*, **16**(4): 535-625.

Muller, J. (1968). Palynology of the Pedewan and Plateau Sandstone Formation (Cretaceous-Eocene) in Sarawak, Malaysia. *Micropalaeontology*, **14** (1): 1-37.

Potonié, R. & Sah, S. C. D. (1958). *Sporae dispersae* of the lignite from the Cannanore beach of the Malabar Coast of India. *Palaeobotanist*, **7**: 121-135.

Rao, A. R. (1943). Jurassic spore and sporangia from the Rajmahal Hills, Bihar. *Proc. Natn. Acad. Sci. India*, **13**: 181-197.

Sah, S. C. D. (1967). Palynology of an Upper Neogene profile from Rusizi Valley, Burundi. *Annls. Mus. r. Afr. Cent.*, ser 8°, *Sci. geol.*, **57**: 1-773.

Sah, S. C. D. & Dutta, S. K. (1968). Palynostratigraphy of the sedimentary formation of Assam: 2, Stratigraphic significance of spore and pollen in the Tertiary succession of Assam. *Palaeobotanist*, **16** (2): 177-195.

Sah, S. C. D. & Kar, R. K. (1969). Pteridophytic spores from the Laki Series of Kutch, Gujarat, India. *In:* Santapau, H. *et al.* (eds) *J. Sen Mem. Vol:* 109-122 Bot. Soc. Bengal, Calcutta.

Sah, S. C. D. & Kar, R. K. (1974). Palynology of Tertiary sediments of Palana, Rajasthan. *Palaeobotanist*, **21** (2): 163-188.

Sah, S. C. D., Kar, R. K. & Singh, R. Y. (1971). Stratigraphic ranges of *Dandotiaspora* gen. nov. in the Lower Eocene sediments of India. *Geophytology*, **1**: 54-63.

Sah, S. C. D. & Singh, R. Y. (1977). Status of palynology in Terriary stratigraphy of Assam and Gujarat. *Proc. IV Colloq. Indian Micropalaeontol. Stratigr., Dehradun*: 134-143.

Salujha, S. K., Kindra, G. S. & Rehman, K. (1972). Palynology of the South Shillong Front-Part-I The Palaeogene of Garo Hills. *Proc. Sem. Palaeo palynol. Indian Stratigr. Calcutta*, **1971**: 265-292.

Saxena, R. K. (1978). Palynology of the Matanomadh Formation in type area, north western Kutch, India (Part-I). Systematic description of pteridophytic spores. *Palaeobotanist*, **25**: 448-456.

Singh, H. P. & Sarkar, S. (1984). A Kasauli palynoflora from Banethi area of Himachal Pradesh, India. *Geophytology*, **14** (1): 40-54.

Tiwari, R. S. (1964). Miospore assemblage in some coals of Barakar Stage (Lower Gondwana) of India. *Palaeobotanist*, **13** (2): 168-224.

Venkatachala, B. S. & Kar, R. K. (1969). Palynology of the Tertiary sediments of Kutch-I: Spores and pollen from bore-hole no. 14. *Palaeobotanist*, **17** (2): 157-178.