
Record of Early Tertiary palynotaxa from Siang District, Arunachal Pradesh, India

S. K. M. Tripathi & Trilochan Singh

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Palynotaxa, viz., *Ctenolophonidites*, *Laktapollis*, *Tricolporopollis*, *Pellicieropollis* and *Incrotonipollis*, have been recovered from the sediments exposed near Rengging along the Siang River, on Yinkiyong-Gobuik road, and near Dalbing in the Yamne Valley in Siang District, Arunachal Pradesh. Recovery of these palynotaxa provides additional evidence for the occurrence of Early Tertiary sediments in Arunachal foot-hills and Lesser Himalaya.

Key-words—Palynology, Palaeocene-Eocene, Eastern Himalaya (India).

S. K. M. Tripathi, Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 007, India.
Trilochan Singh, Wadia Institute of Himalayan Geology, General Mahadeo Singh Road, Dehradun 248 001, India.

सारांश

अरुणाचल प्रदेश (भारत) में स्यांग जनपद से प्रारम्भिक तृतीयक युगीन परागाणुवर्गकों का अभिलेख

सूर्यकान्तमणि त्रिपाठी एवं त्रिलोचन सिंह

अरुणाचल प्रदेश में स्यांग जनपद में यमने घाटी में दालबिंग के पास तथा यिन्कियांग-गोबुइक रोड पर स्यांग नदी के साथ-साथ रेन्गिंग के समीप अनावरित अवसादों से टीनोलोफोनिडाइटिस, लकियापोलिस, ट्राइकोल्पोरोपोलिस, पेल्सियरोइपोलिस एवं इनक्रोटोनिपोलिस नामक परागाणुवर्गक उपलब्ध हुए हैं। इन वर्गकों की उपस्थिति से अरुणाचल प्रदेश के गिरिपादों एवं लघुहिमालय में प्रारम्भिक तृतीयक युगीन अवसादों की विद्यमानता के और प्रमाण मिले हैं।

DIVERSE views have been expressed regarding the occurrence of Lower Tertiary sediments in Arunachal Pradesh. Based on seismic studies Bhandari *et al.* (1974) indicated the presence of Lower Tertiary sediments in Arunachal Pradesh. Acharyya *et al.* (1975) and Ray and Acharyya (1976) inferred the possibility of presence of Palaeogene sediments along the frontal zone in the eastern Himalaya. Jain and Dutta (1978) described dinoflagellate and spore/pollen assemblage from a limestone boulder at the contact of Gondwana and Upper Tertiary exposures in the sub-Himalayan region near Likabali, Siang District. These authors could not determine whether these sediments are *in situ* or the drifted ones, but highlighted the significance of marine Lower Tertiary palynofossil recovery and suggested the possibility of an eastern extension of the Eocene sea. Tripathi *et al.* (1979), however, for the first time identified 1,150 m thick Eocene sequence at the right bank of Siang River near

Rengging in Siang District. Floral and faunal evidences provided additional support for the presence of Lower Tertiary sediments in Arunachal foot-hills and Lesser Himalaya (Tripathi *et al.*, 1981a, b; Singh & Singh, 1983; Prasad & Dey, 1986; Singh & De, 1987).

Tripathi *et al.* (1981a) reported a rich microfaunal assemblage from Rengging along the Siang River and assigned Upper Palaeocene to Lower Eocene age to these sediments. Tripathi *et al.* (1981b) further discovered a rich floral assemblage of Lower Eocene near Geku in Siang District comprising dicot leaves. Later, Singh and Singh (1983) discovered another Eocene outcrop about 19 km south-east of Yinkiyong near Dalbing Village in Yamne Valley and recovered a rich microfaunal assemblage comprising mainly of foraminifera and a few gastropods and bivalve shells of late Early Eocene age. Subsequently, Tripathi and Singh (1983) recorded the occurrence of *Nummulites*-bearing

limestone bands at Dalbing and also near the Gobuik Village.

Prasad and Dey (1986) recorded Eocene palynotaxa from Lesser Himalayan sediments exposed near Dalbing and Yinkiyong, in Siang District. Singh and De (1987), while giving an account of the Lower Tertiary rocks of Siang District, discussed about the occurrence of Eocene sediments near Rengging, Dalbing, Gobuik and Garu villages.

The present palynological studies were undertaken to corroborate the information about the occurrence of Lower Tertiary sediments in Arunachal Pradesh.

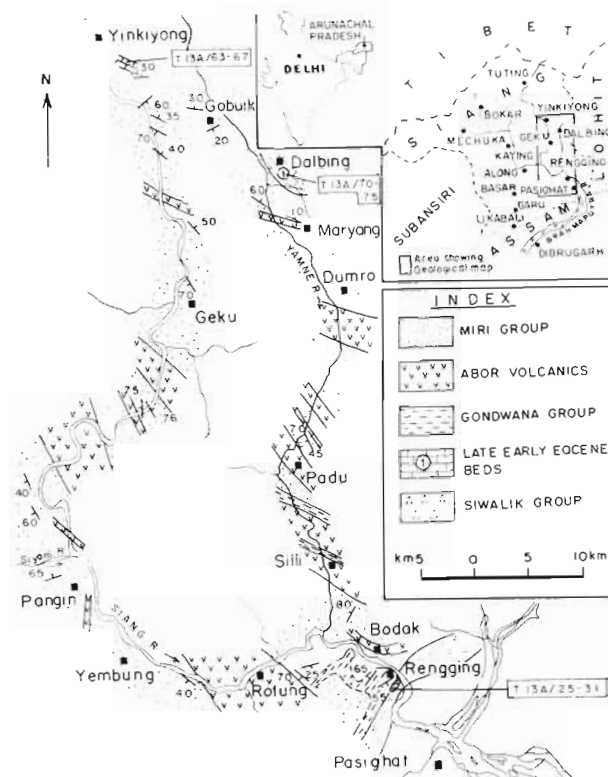
GEOLOGY OF THE AREA

The generalised tectono-stratigraphic succession in Siang District consists of the following stratigraphic belts from south to north: Siwalik Group, Gondwana Group, Abor Volcanics, Miri Group, and Bomdila Group. Besides, Lower Tertiary sediments also occur in this area, which occupy a peculiar position at two different localities. The first one lies in the frontal parts of the Lesser Himalaya along the Main Boundary Fault in a tectonic belt near Rengging, and the other one lies much north in the Lesser Himalaya in a tectonic window near Dalbing.

The Lower Tertiary sediments occurring along the Main Boundary Fault are exposed at the right bank of the Siang River in a small outcrop nearly 2.4 km south-east of Rengging. This outcrop can be approached through a motorable-track which starts on the right side near 10 km stone point on Pasighat-Pangin road. Larger foraminiferids and palynomorphs of Early Eocene age, alongwith some Permian forms have been recovered from it. Lithologically also, it shows wide variety of sediments ranging from sandstone, shale, arenaceous limestone, calcareous sandstone to basic rocks. It is, thus, evident that this outcrop relates to a tectonic-melange zone.

The other occurrence of Lower Tertiary sediments in a tectonic window, on the other hand, shows undisturbed sequence. This is exposed much north from Main Boundary Fault in Lesser Himalaya, near Dalbing Village in Yamne Valley. The fossiliferous exposure near Dalbing is located on a hillock on the other side of the Yamne River. To reach Dalbing one has to get down from Yinkiyong-Maryang road (near 39 km stone) to Yamne River, and climb up the hillock following a foot track.

The lithology of Lower Tertiary sediments in this section consists of light greenish-grey calcareous slates interbedded with dark grey



Text-figure 1—Geological map of the area showing sample locations.

argillaceous limestone (sometimes arenaceous) containing calcite veins, bluish-grey to greyish slaty shales and sandstones. The shales are sometimes sandy and at places calcareous. These rocks are metamorphosed to a low grade and as a result the slates have become phyllitic shales. The fossiliferous slates and limestone have yielded a rich assemblage of larger foraminiferids, a few gastropods and bivalve shells, and a rich palynological assemblage too.

MATERIAL AND METHOD

Samples for the present palynological work were collected from the three sections, viz., (i) Siang River Section near Rengging, (ii) Yinkiyong-Gobuik Road Section, and (iii) Dalbing Section (Text-fig. 1).

Lithology of the collected samples is as below:

SECTION	SAMPLE NO.	LITHOLOGY	PRO-DUCTIVE (+)
Siang River	T13A/25	Calcareous Sandstone	+
Section near	T13A/26	Grey Shale	+
Pasighat	T13A/27	"	+
	T13A/28	"	+
	T13A/29	"	+

	T13A/30	Sandstone	
	T13A/31	"	
Yinkiyong-	T13A/63	Black Slate	
Gobuik	T13A/64	Purplish/pink slate	+
road	T13A/65	Black slate	
section	T13A/66	"	
	T13A/67	"	
Dalbing	T13A/70	Bluish-grey Slaty Shale	
section	T13A/71	Bluish-grey Sandstone	+
	T13A/72	Bluish-grey Shale	+
	T13A/73	Greenish-grey Slaty Shale	
	T13A/74	Greyish Slaty Shale	
	T13A/75	Calcareous Slate	
	T13A/76	Olive green Phyllitic Shale	+
	T13A/77	Bluish-grey Slate	+
	T13A/78	Greyish Sandy Shale	+
	T13A/79	Greyish Gritty Sandstone	
	T13A/80	Greyish Sandy Shale	+
	T13A/81	Calc. Greenish Slate	
	T13A/82	Sandy Shale	+
	T13A/83	Olive Green Shale	+
	T13A/84	Grey Sandy Shale	+
	T13A/85	Grey Calc. Shale	
	T13A/86	Grey Shale	
	T13A/87	Grey Slate	
	T13A/88	Calc. Slate	
	T13A/89	"	
	T13A/90	Greenish-grey Slate	
	T13A/91	Shale	
	T13A/92	"	
	T13A/93	"	+
	T13A/94	"	+
	T13A/95	Greenish-grey Limestone	
	T13A/96	Shale	+
	T13A/97	"	

Fresh samples were collected from these sections for the recovery of palynofossils. Nearly 100 gm of each sample was manually crushed followed by treatment with HF, HCl and HNO₃ depending upon the lithology of individual sample. Residues of macerated samples were treated with 5-10% KOH and the concentrated material of the productive samples were mixed with polyvenyle alcohol and then mounted in Canada Balsam. The samples and prepared slides have been deposited in the Museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATIC PALYNOLOGY

Genus—*Tricolporopollis* Dutta & Sah 1970

Tricolporopollis matanamadhensis (Venkatachala & Kar) Tripathi & Singh 1985
Pl. 1, fig. 4

Occurrence—Dalbing Section, Siang District, Arunachal Pradesh.

Previous record—Lower Eocene of Kutch (Venkatachala & Kar, 1969).

Genus—*Laktapollis* Venkatachala & Kar 1969

Laktapollis ovatus Venkatachala & Kar 1969
Pl. 1, figs 1, 2

Occurrence—Dalbing Section, Siang District, Arunachal Pradesh.

Previous record—Eocene of Kutch (Venkatachala & Kar, 1969; Kar, 1978; Kar & Saxena, 1981).

Genus—*Pelliceroipollis* Sah & Kar 1970

Pelliceroipollis langenheimii Sah & Kar 1970
Pl. 1, figs 6, 7

Occurrence—Siang River Section near Rengging, Siang District, Arunachal Pradesh.

Previous record—Lower Eocene of Kutch (Sah & Kar, 1970).

Pelliceroipollis sp.
Pl. 1, fig. 3

Description—Pollen almost circular in shape, 54 μm in polar view, tricolporate. Ectoaperture short, 10-12 μm long, ends pointed, 5-7 μm wide at equator. Endoaperture elliptic, equatorially elongated, almost as wide as ectoaperture. Exine tectate, 2 μm thick, baculate. Bacula heads very small and form negative reticulum in surface view.

Remarks—*Pelliceroipollis* sp. differs from *P. langenheimii* Sah & Kar 1970 in shape and in lacking a thickening around the pore.

Occurrence—Siang River Section near Rengging, Siang District, Arunachal Pradesh.

Genus—*Ctenolophonidites* van Hoeken-Klinkenberg emend. Salard-Cheboldaeff 1977

Ctenolophonidites costatus (van Hoeken-Klinkenberg) van Hoeken-Klinkenberg 1966
Pl. 1, fig. 12

Occurrence—Dalbing Section, Siang District, Arunachal Pradesh.

Genus—*Ligulifloraedites* Kar 1985

Ligulifloraedites pilatus Kar 1985
Pl. 1, figs 5, 8

Occurrence—Dalbing Section, Siang District, Arunachal Pradesh.

Previous record—Early Eocene of Panandhro lignite, Kutch (Kar, 1985).

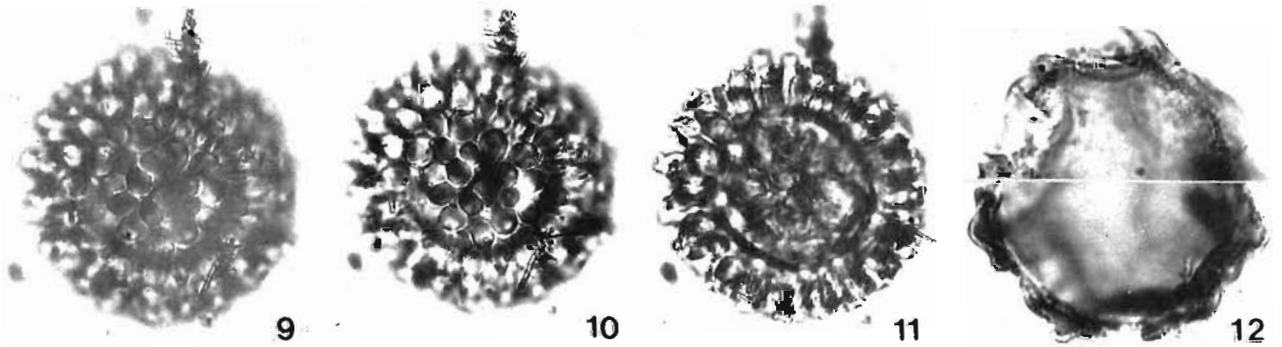
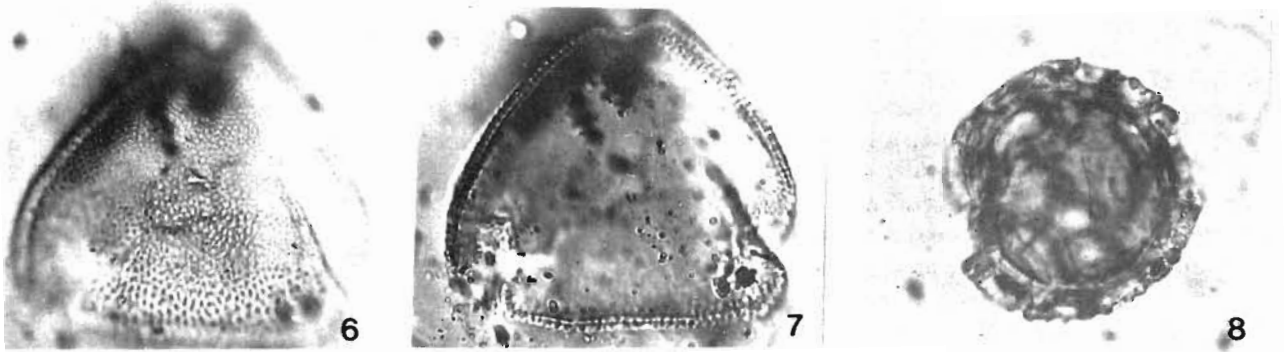
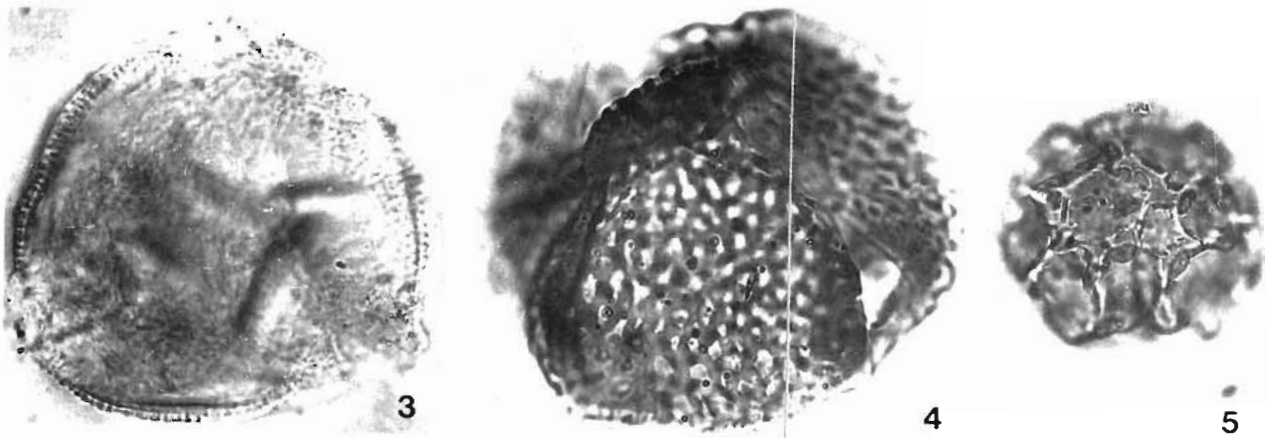
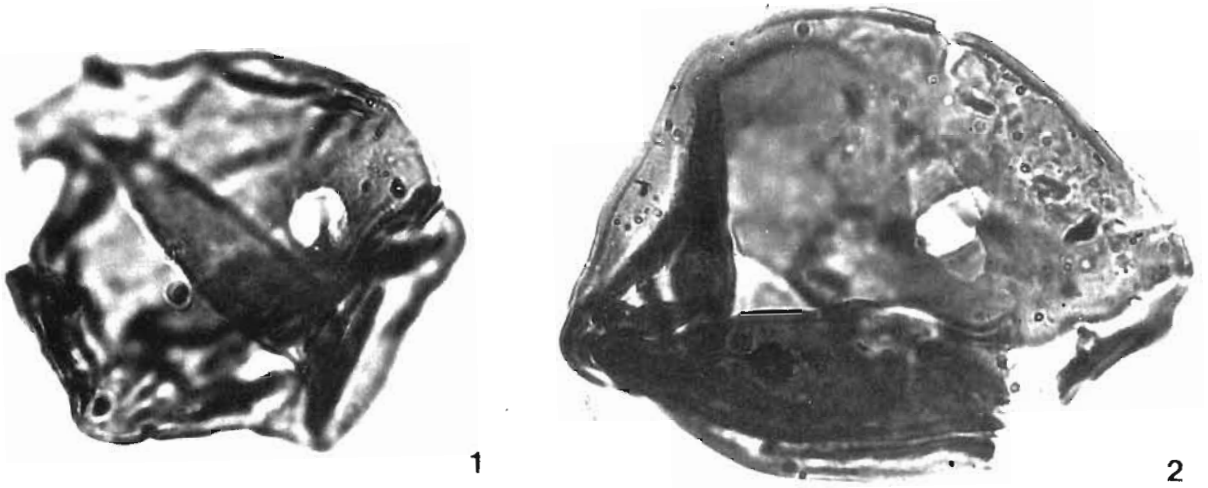


PLATE 1

Genus—*Incrotonipollis* Jansonius & Hills 1981*Incrotonipollis* sp.

Pl. 1, figs 9-11

Description—Pollen semicircular in shape, nonaperturate, 35 μm in size. Pollen densely covered with 6-8 μm long and 3-4 μm wide projections having truncated tips. Exine 9 μm thick.

Remarks—*Incrotonipollis* sp. differs from *Incrotonipollis burdwanensis* (Baksi *et al.*) Jansonius & Hills 1981 and *I. neywelli* (Baksi *et al.*) Jansonius & Hills 1981 in having less number of processes and being larger in dimension.

Occurrence—Yinkiyong-Gobuik Road Section, Siang District, Arunachal Pradesh.

STRATIGRAPHIC SIGNIFICANCE

Out of 40 rock samples collected from the above mentioned three sections only 17 proved productive. The palynoassemblage is constituted by 11 genera and 16 species and is represented by pteridophytic spores and angiospermic pollen grains. In the present paper only selected angiospermic palynotaxa have been described. These are: *Lakiapollis ovatus*, *Tricolporopollis matanamadbensis*, *Pelliceroipollis langenheimii*, *Ctenolophonidites costatus* and *Incrotonipollis* sp.

These palynotaxa have earlier been recorded from the Lower Eocene sediments of Kutch, Meghalaya, Bengal and south India basins (Venkatachala & Kar, 1969; Dutta & Sah, 1970; Sah & Kar, 1970; Kar, 1978; Kar & Saxena, 1981; Tripathi & Singh, 1985; Baksi *et al.*, 1979; Saxena *et al.*, in Press). Stratigraphic significance of these taxa in India and tropical Africa has been established by the palynological work carried out in these parts by above mentioned workers and Germeraad *et al.* (1968), Thanikaimoni *et al.* (1984) and Venkatachala *et al.* (1989). However, stratigraphic ranges of some of the presently recovered palynotaxa in Lower Tertiary sediments of Siang District deserve special attention.

Ctenolophonidites costatus ranges from Middle Eocene to Upper Eocene (Venkatachala *et al.*, 1989; Saxena & Khare, in Press), *Lakiapollis ovatus* and *Tricolporopollis matanamadbensis* from Palaeocene to Upper Eocene (Venkatachala & Kar, 1969; Tripathi & Singh, 1985) whereas, *Pelliceroipollis langenheimii* is restricted to the Lower Eocene (Sah & Kar, 1970; Venkatachala *et al.*, 1989). Thus the present assemblage confirms the occurrence of Early Tertiary sediments in Arunachal Himalaya.

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PLATE 1(All photographs enlarged Ca \times 1000)

- 1, 2. *Lakiapollis ovatus* Venkatachala & Kar; Slide no. BSIP 10438; Coordinates: 98.3 \times 10.6
3. *Pelliceroipollis* sp.; Slide no. BSIP 10440; Coordinates: 112.3 \times 12.5
4. *Tricolporopollis matanamadbensis* (Venkatachala & Kar) Tripathi & Singh; Slide no. BSIP 10438. Coordinates: 99.7 \times 11.4
- 5, 8. *Ligulifloraedites pilatus* Kar; Slide no. BSIP 10439; Coordinates: 113.4 \times 10.6
- 6, 7. *Pelliceroipollis langenheimii* Sah & Kar; Slide no. BSIP 10441; Coordinates: 102.5 \times 10.3
- 9-11. *Incrotonipollis* sp.; Slide no. BSIP 10433; Coordinates: 103.5 \times 11.2
12. *Ctenolophonidites costatus* (van Hoeken-Klinkenberg) van Hoeken-Klinkenberg; Slide no. BSIP 10435; Coordinates: 102.6 \times 8.7

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