Journal of the Palaeontological Society of India
Volume, 52(2), December 2007: 159-162

ISSN 0522-9630

A NEW PALM LEAF FROM THE INDUS SUTURE ZONE, LADAKH HIMALAYA, INDIA

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ABSTRACT

A new palm leaf *Amesoneuron ladakhensis* n.sp. of Arecaceae, collected from near Tsokar in eastern Ladakh at a height of about 15,000 ft, is described from the Hemis Formation (middle–late Eocene) of the Indus Suture Zone, Ladakh Himalaya (India). The finding is important due to paucity of the palaeobotanical data from Ladakh.

Keywords: *Amesoneuron*, Arecaceae, Ladakh, middle-late Eocene

INTRODUCTION

The Indus-Tsangpo Suture Zone which is about 2500 km long, demarcates the Himalaya from Tibet. In tectonic interpretation, the zone coincides with the subduction zone responsible for closing of the oceanic gap of the Tethys as a result of the collision of the Indian plate against the Tibetan block of the Eurasian plate. It is separated from the Karakoram Tethys in the north by the South Karakoram (Nubra-Shyok) Thrust and from the Himalayan Tethys by the Zanskar Thrust in the south. The marine flysch and continental deposits are lying side by side there. In this zone, the molasse horizons are divisible into the southern Hemis Formation and the northern Kargil Formation. The age of the former ranges from the middle to late Eocene, while that of the latter varies from the late Oligocene to middle Miocene inspite of the fact that there is a lack of consensus on the issue of the age-range for want of age-diagnostic fossil remains (Sahni and Bhatnagar, 1962; Shanker *et al.*, 1974; Lakhanpal *et al.*, 1984; Sahni *et al.*, 1984; Mathur and Juyal, 2000; Prasad *et al.*, 2005).

A few well-preserved fan shaped leaf impressions belonging to *Livistona, Trachycarpus* and other palms are known from the Tertiary of Ladakh . They have been described by many workers from different localities (Sahni and Bhatnagar, 1962; Tewari, 1964; Lakhanpal *et al.*, 1983; Lakhanpal *et al.*, 1984; Paul *et al.*, 2007). It is very interesting to note that no dicot leaf has yet been recorded from there, though a dicot wood of *Prunus* has been described from the younger Kargil Formation by Guleria *et al.* (1983). During a recent field trip to explore the area further, we came across a large fragmentary

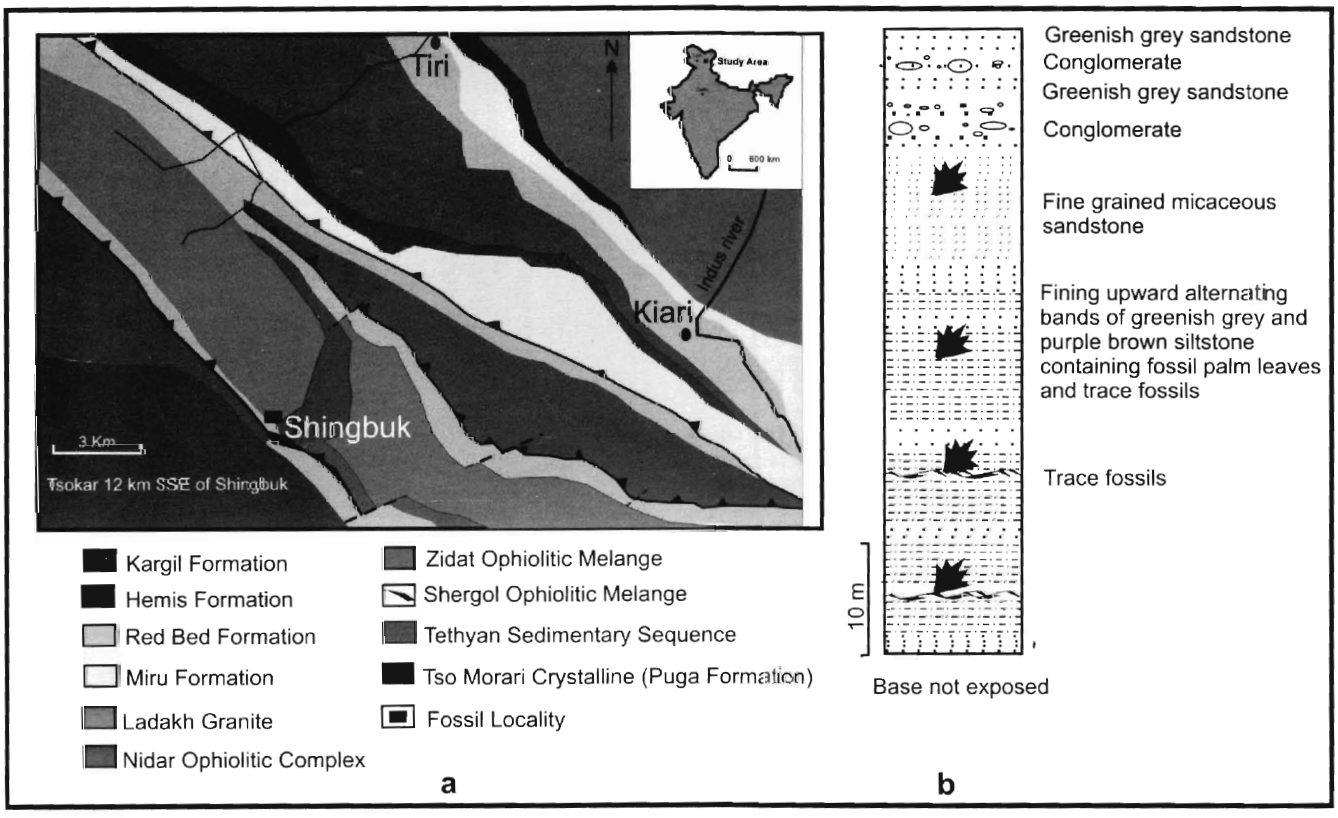

Fig. 1. a. Geological map of eastern Ladakh showing the fossiliferous locality; b. Litholog of the area (modified after Paul *et al.*, 2007).

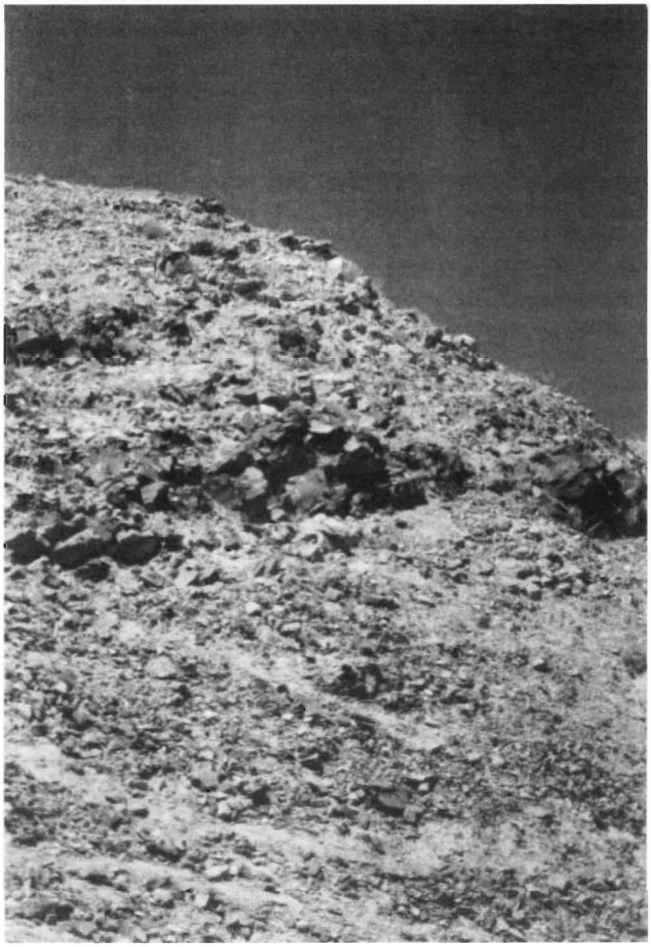

Fig.2. A view of the fossil locality.

palm leaf with a distinct mid-vein. The leaf was collected from near Shingbuk (35°27′N; 77°59′E), about 12 km NNW of Tsokar, eastern Ladakh (Figs. 1-2). The type specimen has been deposited in the museum of the Birbal Sahni Institute of Palaeobotany, Lucknow (India).

SYSTEMATIC DESCRIPTION

Family **Arecaceae**

Genus ***Amesoneuron*** (Goeppert) Read and Hickey, 1972

Amesoneuron ladakhensis n. sp.
(Figs. 3-4)

Material: The study is based on a satisfactorily preserved specimen which is in the form of an impression.

Derivation of name: Named after Ladakh, the area of occurrence.

Description: Leaf incomplete without apex and base, strap shaped; preserved lamina length 22.5 cm; maximum width 3.7 cm; margin appearing to be entire, without any spine; texture chartaceous-coriaceous; venation parallel; mid-vein distinct but sunken, stout, slightly curved upwards; secondary veins of two orders, moderately thick, about 1-3 mm apart, running parallel to each other on either side of the mid-vein, cross-bars absent; finer veins ill preserved and observed at places in between two secondary veins, closely placed, about 0.5 mm apart.

Holotype: Specimen No. BSIP 39312.

Horizon: Hemis Formation.

Locality: Shingbuk near Tsokar, eastern Ladakh, Jammu and Kashmir, India.

Age: Middle-Late Eocene.

Comparison: The characteristic features of the fossil, viz. thick, strap-shaped lamina with a distinct mid-rib and lower orders of parallel veins indicate its affinities with family Arecaceae (Read and Hickey, 1972). However, similarities in the external morphological characters in the modern palm taxa and fragmentary nature of the fossil make it difficult to assign the specimen to any modern genus. According to Read and Hickey (1972), "Since it is very difficult to identify specimens of modern palms accurately from their leaves alone, no attempt should be made to place fossil palm fragments in genera of modern palms unless unquestionably identifiable with them." These authors have given a key to place the fragmentary palm leaves to various genera. After going through the key, it was found that the present fossil could be placed under the genus *Amesoneuron* (Goeppert) Read and Hickey (1972). A number of species of this genus have been reported from various localities of India and are as follows: *Amesoneuron borassoides* Bonde (1986) from the Deccan Intertrappean beds (Upper Cretaceous) of Chhindwara District, *A. deccanensis* Guleria and Mehrotra (1999) and from the Deccan Intertrappean beds of the Seoni District and the Tura Formation (late Palaeocene) of the Garo Hills (Mehrotra, 2000), *A. sahnii* Guleria *et al.*

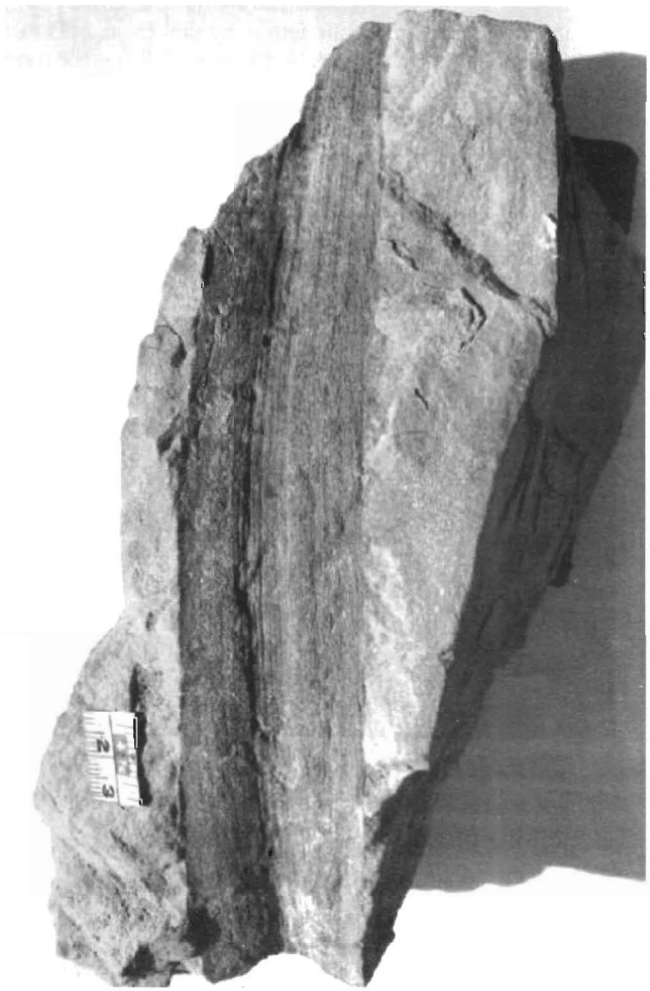

Fig.3. *Amesoneuron ladakhensis* n. sp - a new fossil leaf in reflected light, x 1.

Table 1: Comparison of the present fossil species with other species of *Amesoneuron* (Goeppert) Read and Hickey.

Name of the fossil species	Length and width	Shape	Margin	Venation	Mid-rib	Secondary and finer veins	Cross veins
A. borassoides Bonde, 1986	17.1 x 7.7 cm	-	-	Parallelodr-omous	- nt	Numerous, about 3.3 mm apart; finer veins present	+ nt, short, unbranched, areoles well developed
A. deccanensis Guleria & Mehrotra, 1999	10-19.5 x 1.5-4 cm	Strap shaped	Entire	Parallelodr-omous	Distinct, stout and straight	15-20, closely placed	- nt
A. sahnii Guleria *et al.*, 2000	10.2- 17.4 x 3.7- 4.4 cm	Fan palm, segments plicate	Entire	Parallelodr-omous	+ nt in each segment	+ nt	+ nt
A. manipurensis Guleria *et al.*, 2005	5.5- 9 x 1.3-3.5 cm	Strap shaped	Entire	Parallelodr-omous	+ nt, stout and Straight	+ nt, about 2 mm apart	- nt, but minute, oval protruberances arranged in a linear arrangement on secondary veins
Amesoneuron sp. Joshi & Mehrotra, 2007	10 x 1 cm	-	-	Parallelodr-omous	-	+ nt, closely placed	- nt
A. ladakhensis n. sp.	22.5 x 3.7 cm	Strap shaped	Entire	Parallelodr-omous	+ nt, stout and slightly curved upwards	+ nt, 1-3 mm apart	- nt

Fig. 4: *Amesoneuron ladakhensis* n. sp. - A line diagram of the fossil leaf.

(2000) from the Kasauli Formation (early Miocene) of Himachal Pradesh, *A. manipurensis* Guleria *et al.* (2005) from the late Eocene sediments of Manipur and *Amesoneuron* sp. Joshi and Mehrotra (2007) from the Lower Siwalik sediments (Miocene) of Arunachal Pradesh. The fossil being very long, is distinct from all of them (Table 1) and hence is being described here as a new species, *Amesoneuron ladakhensis*.

The importance of the fossil lies in the fact that it was collected from the height of about 15,000 ft. where trees are not found nowadays. This clearly indicates that the Himalayas were not as much in height during the middle-late Eocene as they are today.

ACKNOWLEDGEMENTS

The authors are thankful to the Director, Dr. N.C. Mehrotra, Birbal Sahni Institute of Palaeobotany, Lucknow for providing necessary facilities and permission to publish this work.

REFERENCES

Bonde, S.D. 1986. *Amesoneuron borassoides* sp. nov., a borassoid palm leaf from the Deccan Intertrappean bed at Mohgaonkalan, India. *Biovigyanam*, **12**: 89-91.

Guleria, J.S. and Mehrotra, R.C. 1999. On some plant remains from Deccan Intertrappean localities of Seoni and Mandla districts of Madhya Pradesh, India. *Palaeobotanist*, **47**: 68-87.

Guleria, J.S., Srivastava, R. and Prasad, M. 2000. Some fossil leaves from the Kasauli Formation of Himachal Pradesh, Northwest India. *Himalayan Geology*, **21**: 43-52.

Guleria, J.S., Thakur, V.C., Virdi, N.S. and Lakhanpal, R.N. 1983. A fossil wood of *Prunus* from the Kargil (= Liyan Formation) of Ladakh, p. 187-193. In: *Geology of Indus Suture Zone of Ladakh* (Eds. Thakur, V.C. and Sharma, K.K.), Wadia Institute of Himalayan Geology, Dehradun.

Guleria, J.S., Hemanta Singh, R., Mehrotra, R.C., Soibam, I. and Kishor, R. 2005. Palaeogene plant fossils of Manipur and their palaeoecological significance. *Palaeobotanist*, **54**: 61-77.

Joshi, A. and Mehrotra, R.C. 2007. Megaremains from the Siwalik sediments of West and East Kameng Districts, Arunachal Pradesh. *Journal Geological Society of India*, **69**: 1256-1266.

Lakhanpal, R.N., Gyan, P., Thussu, J.L. and Guleria, J.S. 1984. A

fossil fan palm from the Liyan Formation of Ladakh (Jammu and Kashmir). *Palaeobotanist,* **31**: 201-207.

Lakhanpal, R.N., Sah, S.C.D., Sharma, K.K. and Guleria, J.S. 1983. Occurrence of *Livistona* in the Hemis Conglomerate horizon of Ladakh, p. 179-185. In: *Geology of Indus Suture Zone of Ladakh* (Eds. V.C. Thakur and K.K. Sharma), Wadia Institute of Himalayan Geology, Dehradun.

Mathur, N.S. and Juyal, K.P. 2000. Palaeontological evidence for the upheaval history of Western Himalaya during the Palaeogene. *Himalayan Geology,* **21**: 109-131.

Mehrotra, R.C. 2000. Study of plant megafossils from the Tura Formation of Nangwalbibra, Garo Hills, Meghalaya, India. *Palaeobotanist,* **49** : 225-237.

Paul, S.K, Ram-Awatar, Mehrotra, R.C., Sharma, A., Phartiyal, B., and Dorjey, C.P. 2007. A new fossil palm leaf from the Hemis Formation of Ladakh, Jammu and Kashmir, India. *Current Science*, **92**: 727-729.

Prasad, G.V.R., Bajpai, S., Singh, S. and Parmar, V. 2005. First cricetid rodent (Mammalia) from the Ladakh Molasse, northwestern Himalaya, India: Age implications. *Himalayan Geology*, **26**: 85-92.

Read, R.W. and Hickey, L.J. 1972. A revised classification of fossil palm and palm like leaves. *Taxon,* **21**: 129-137.

Sahni, A., Srikantia, S.V., Ganesan, T.M. and Wangdus, C. 1984. Tertiary fishes and molluscs from the Kuksho Formation of Indus Group, Near Nyoma, Ladakh. *Journal Geological Society of India*, **25**: 744-747.

Sahni, M.R. and Bhatnagar, N.C. 1962. Fresh water mollusca and plant remains from the tertiaries of Kargil, Kashmir. *Records of the Geological Survey of India,* **87**: 467-476.

Shanker, R., Padhi, R.N., Prakash, G., Thussu, J.L. and Wangdus, C. 1974. Recent geological studies in Upper Indus Valley and concept of Plate Tectonics. *Miscellaneous Publication of the Geological Survey of India,* **34:** 41-56.

Tewari, A.P. 1964. Upper Tertiary deposits of Ladakh Himalayas and correlation of various geotectonic units of Ladakh with those of the Kumaun- Tibet region. *Proceedings of the XXII International Geological Congress,* **11**: 37-58.

Manuscript Accepted July 2007