

A NEW SPECIES OF *MYLIOBATIS* AND SOME SHARK TEETH FROM THE MIDDLE EOCENE OF KUTCH, WESTERN INDIA.

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ABSTRACT

A new species of ray, *Myliobatis tewarii* sp. nov., based on a dental plate from Harudi (68°41' 15" : 23°30' 20") and some shark teeth belonging to *Carcharias tricuspidatus*, *Lamna* sp., *Galeocerdo cuvieri* and *Galeocerdo aduncas* from Harudi and Nareda (68°41' : 23°39' 10") in Kutch, western India are described.

Associated teleost fishes, tomistomin crocodiles, archaocete and odontocete whales, foraminifers, ostracodes and molluscs indicate Middle Eocene age (Babia Stage) to the fossil-bearing bed.

INTRODUCTION

During the years 1970—'73, a large number of vertebrate fossils were collected by the author from Tertiary beds in Kutch district, western India. Vertebrate fossils collected from the Eocene beds include fishes, turtles, crocodiles, primitive cetaceans, sirenians and a doubtful moeritheriid (Sahni and Mishra 1975). The fishes are represented in the collection by both large specimens as well as microremains. The dominant fishes are large siluroids. The elasmobranchs are represented by four genera of sharks and one genus of the rays. In the present paper four species of sharks and a new species of ray have been described.

The elasmobranchs were obtained from Babia Stage (Middle Eocene) from the Ossiferous gypseous shales at Harudi (68°41'15" : 23°30'20" ; L. U. 2003) and the Ossiferous limestones at Nareda (68°41' : 23°39'10" ; L. U. 2005). Of sharks, about forty teeth and few vertebrae were collected which are more abundant at Nareda than at Harudi. Of *Myliobatis*, only one dental plate was collected from Harudi. Isolated teeth and spines of *Myliobatis* were also collected both from Harudi and Nareda.

PREVIOUS WORK

Lydekker (1886) was first to describe fish remains from Eocene of Kutch when he described dental plate of a ray, *Myliobatis curvipalatus* from the 'Nummulitics' (Eocene) of Kutch (exact locality was not mentioned). This is the first record of rays in the Indian sub-continent. Since then for about three quarter of a century there has been no record of fossil vertebrates from Kutch.

Rao (1956) described a skull of siluroid, *Arius kutchensis* from Lower Eocene of Naredi. Mishra, Choudhary and Khare (1973) recorded in an abstract the sharks from Eocene of India, including *?Scoliodon* from Lower Eocene

of Naredi, and *Notidanaus primigenius*, *Carcharias tricuspidatus*, *Lamna* sp., *Galeocerdo cuvieri* and *Galeocerdo aduncas* from Middle Eocene of Harudi and Nareda in Kutch (out of these, four species are described in the present paper). Satsangi and Mukhopadhyay (1975) recorded siluroid skulls belonging to *Arius* from Eocene of Babia Hill and Panandhro. Sahni and Mishra (1975) described the ray *Myliobatis* sp., siluroids *Arius kutchensis*, *Fajumia menoni*, *Fajumia misrai*, *Socnopaia horai*, and a holostean *Pycnodus* sp. from Middle Eocene of Harudi, Nareda and Godhatad. Of these, a dental plate of the ray (L. U. V. P. 11078) described under *Myliobatis* sp. from Middle Eocene of Harudi has been found by the author (Mishra 1975, unpublished thesis) to belong to a new species and the same has been described in the present paper.

SYSTEMATIC DESCRIPTION

Class	Chondrichthyes
Subclass	Elasmobranchii
Order	Batoidea
Suborder	Myliobatoidea
Family	Myliobatidae
Genus	<i>Myliobatis</i> CUVIER 1817

Myliobatis tewarii sp. nov.

(Plate I—1a-1b)

Myliobatis sp. Sahni and Mishra 1975, Mon. Pal. Soc. India, 3 : pp. 6-7, pl. 1, fig. 1.

Etymology : For Prof. B. S. Tewari, Department of Geology, Punjab University, Chandigarh.

Holotype : L. U. V. P. 11078, a dental plate, only known specimen.

Diagnosis : Dental plate small, consisting of eight rows of median teeth alongwith two rows of lateral teeth on either side. This is in contrast to the presence of three rows of lateral teeth in *Myliobatis goniopleurus* from Eocene

of England (Woodward 1889) or only one row of lateral teeth in *M. curvipalatus* from Eocene of Kutch (Lydekker 1886). Crowns of teeth thin. Median teeth hexagonal, seven times as broad as long with a flat coronal and convex basal surface. Lateral teeth rhombic in outline, the external laterals smaller than the internal ones.

Further distinguished from *M. curvipalatus* in having a smaller size, thinner crowns and the median teeth without a median depression. Distinguished from all the known specimens of *Myliobatis* from Miocene of India in having a smaller size and thinner crowns.

Description : L. U. V. P. 11078 is the only dental plate of *Myliobatis* in the collection. The dental plate is small and consists of closely united antero-posterior row of eight median teeth and two rows of lateral teeth on either side. Only five teeth of the median row are complete. The median teeth are transverse, hexagonal in shape and seven times as broad as long. Inner lateral teeth adjacent to median teeth are diamond-shaped, small and nearly as broad as long. The outer lateral teeth are smaller than the inner and are longer than broad. The crowns of teeth are thin. The dorsal surface of the plate is flat while the basal surface is convex. The coronal surface of the plate is ornamented with very small tubercles. The root is marked basally by straight antero-posterior ridges and furrows.

The dental plate of *M. curvipalatus* from Eocene of Kutch (Lydekker 1886) is at least four times larger than that of the new species. *M. tewarii* sp. nov. is further distinguished from *M. curvipalatus* in having two rows of lateral teeth instead of one, thinner crowns and median teeth with flat coronal and convex basal surfaces. The

most specific characteristic of *M. curvipalatus* is a central depression in median teeth which is not present in the new species.

The transverse section of the dental plate shows a nearly flat upper surface and convex basal surface with a crenulated margin. The lateral teeth are situated nearly at the level of median teeth but have thinner crowns and roots. The transverse section of *M. tewarii* sp. nov. resembles with that of *M. goniopleurus* (Woodward 1889) but it has two rows of lateral teeth instead of three.

In the thinness of the dentition the new species resembles *M. toliapicus* from Eocene of England (Woodward 1889) but it has smaller median teeth with a width/length ratio of 7 : 1 than 6 : 1 as in *M. toliapicus*.

The present species differs from all the other *Myliobatis* species known from Miocene of India in having smaller median teeth and thinner crowns.

Remarks : The myliobatoid teeth and spines are not common in the Eocene strata of Kutch, and the dental plates are even rarer because the median and lateral teeth in a dental plate easily get detached during fossilisation and are mostly found isolated. The only other dental plate of *Myliobatis* known from India is that of *M. curvipalatus* from Eocene of Kutch.

In the Table given below the distribution of fossil *Myliobatis* in India and adjacent countries is given.

The family Myliobatidae (Eagle rays) is represented presently in India by genera *Aetobatus* and *Myliobatis*. *Myliobatis* is represented by the species *M. nichofi*, *M. milvus* and *M. maculatus* and found along the east and west coasts, at the mouth of Ganges and in Chilka lake.

Sl. No.	Name of species	Material	Locality	Age	Reference
1.	<i>Myliobatis tewarii</i> sp. nov.	a dental plate	Harudi, Kutch	Middle Eocene	This paper
2.	<i>M. curvipalatus</i>	a dental plate	Kutch	Eocene	Lydekker (1886)
3.	<i>Myliobatis</i> sp.	teeth & spines	Harudi & Nareda, Kutch	Middle Eocene	Sahni and Mishra (1975)
4.	<i>Myliobatis</i> sp.	median teeth & caudal spines	Balasore	Miocene	Hora (1940)
5.	<i>Myliobatis</i> sp.	spine	Mayurbhanj	Miocene	Ghosh (1959)
6.	<i>Myliobatis</i> sp.	median & lateral teeth & spines	Lakhpur, Matanomadh and Pipar, Kutch	Lower Miocene	Sahni and Mishra (1975)
7.	<i>Myliobatis</i> sp.	spines	Burma	Miocene	Noetling (1901)
8.	<i>Myliobatis sinhaleus</i>	teeth	Ceylon	Miocene	Deraniyagala (1969)
9.	<i>Myliobatis</i> sp.	teeth & spines	Piram Island	Pliocene	Srivastava (1973) and Prasad (1974)

It thrives in a mean annual isotherm of 20°C attaining a length from 0.6 to 1.5 m. It is a littoral, bottom-dwelling fish.

Locality : Harudi (68°41'15" : 23°30'20" ; L. U. 2003).

Horizon : Ossiferous gypseous shales of Babia Stage, Middle Eocene.

Order Selachii
Suborder Galeoidea
Family Carcharinidae
Genus *Carcharias* RAFINESQUE 1810

Carcharias tricuspoidatus DAY 1888
 (Plate I—2)

Material : L. U. V. P. 11113 and 3 unnumbered teeth.

Description : The teeth are large and high. Crown is erect, higher than root, directed inward, narrow, awl-shaped and pointed. Margins of the tooth are unserrated and sharp. Inner face of the crown is concave and outer face is convex. A small denticle is found on either side of the main cusp (one denticle is broken in L. U. V. P. 11113 figured here). A few longitudinal striations are present on inner face of the crown.

The root is broader than high, extending beyond enamelled surface. Root is swollen and bifid in middle giving a bilobed structure on the internal side. In the middle of groove there is a hole for median nerve. Lower margin of the root is highly curved giving two widely divergent branches.

Locality : Nareda, Kutch.

Horizon : Ossiferous limestones of Babia Stage, Middle Eocene.

Family Isuridae
Genus *Lamna* CUVIER 1817

Lamna sp.
 (Plate I—3a & 3b)

Material : L.U.V.P. 11109 and two unnumbered isolated teeth.

Description : Teeth are of medium size, erect and nearly as high as broad. Crown is erect, high, broader at base and pointed at apex. Edges of the crown are sharp cutting and without serrations. The external face of the crown is flat while the internal face is very little convex. On the posterior side of the main cusp there is a small denticle having the shape of the main cusp, i.e. pointed, unserrated and sharp edges. On the anterior side of the main cusp there are two denticles, one towards the main cusp is bigger than the outer one which is very small.

Root of the tooth is broad, low, thicker than crown, slightly curved and with a median longitudinal cleft on its internal side.

Locality : Nareda, Kutch.

Horizon : Ossiferous limestones of Babia Stage, Middle Eocene.

Family Carcharinidae
Genus *Galeocerdo* MULLER AND HENLE 1837
Galeocerdo cuvieri LE SUER 1822
 (Plate I—4a & 4b)

Material : L.U.V.P. 11110 and one more unnumbered teeth.

Description : The tooth is large, oblique, subtriangular and broader than high (base is little broken in the specimen). Posterior margin of the cusp is convex in upper part but after a deep notch becomes straight towards base. Anterior margin of the cusp is convex and sloping towards base. Both the edges are sharp and coarsely serrated, very finely so near the top of crown; the crown has coarser serrations towards the base, especially on the posterior margin basal to notch. The primary serrations are themselves finally serrated secondarily especially in the basal part. Internal face of the crown is convex and bear longitudinal striations which do not reach apex, External surface of crown is smooth and flat.

The root is broader than high. Internal side of root is convex having a shallow groove in the middle in which there is a hole for median nerve. External surface of root bears a shallow groove in upper sector running antero-posteriorly.

Locality : Nareda, Kutch.

Horizon : Ossiferous limestones of Babia Stage, Middle Eocene.

Galeocerdo aduncas AGASSIZ 1843
 (Plate I—5)

Material : Isolated teeth : L.U.V.P. 11111 and 13 unnumbered teeth from Nareda and L.U.V.P. 11107 from Harudi.

Description : The teeth are of medium size and oblique. The crown is usually compressed. Apex of crown is pointed. Anterior margin of crown is sloping and convex with fine serrations which are smaller towards apex. Posterior margin is with a notch. The posterior edge above the notch is short and sharply directed backwards with fine serrations ; margin below the notch is sloping with large serrations. Secondary serrations are not found. External face of the crown is flat while the internal face is convex.

The root is low but broad and thick in the middle. A median cleft is present on the internal side with a hole for median nerve.

Measurements of shark teeth :

Name of species	Specimen no.	Height of tooth	Breadth of tooth	Height of crown
<i>Carcharias tricuspidatus</i>	L.U.V.P. 11113	2.4 cm	1.2 cm (measured)	1.65 cm
<i>Lamna</i> sp.	L.U.V.P. 11109	1.05 cm	1.0 cm	0.6 cm
<i>Galeocerdo cuvieri</i>	L.U.V.P. 11110	2.35 cm	2.1 cm (measured)	2.0 cm
<i>Galeocardo aduncas</i>	L.U.V.P. 11111	0.85 cm	1.5 cm	0.6 cm

Remarks : The shark genera *Carcharias*, *Lamna* and *Galeocerdo* are common in many Cainozoic marine formations of world and the fossil teeth found in Kutch are similar to those described from other areas.

In India, *Carcharias* is known from Bagh Beds (Upper Cretaceous) of Amba Dongar, Gujarat (Verma 1965), Cretaceous of South India (Egerton 1845) and from Miocene of Kutch and Mayurbhanj (Mehrotra, Mishra and Srivastava 1973), Kathiawar (Das Gupta 1916, Saxena 1973), and Burma (Noetling 1901). *Lamna* is known in India only from Bagh Beds (Upper Cretaceous) of Amba Dongar (Verma 1965) and from Lower Eocene of Salt Range (Hora 1937) and from Miocene of Burma (Stuart 1910). *Lamna* sp. from Kutch differs from *Lamna* sp. from Salt Range in having a smaller size, two denticles on anterior side, and denticles with pointed apex. Teeth of *Galeocerdo* are common in Miocene of Kutch, Kathiawar, Burma and Ceylon.

With the commencement of Tertiary period sharks became very prolific, but from Indian subcontinent only a few reports are known from Eocene. Hora (1937) described *Lamna* sp. from Lower Eocene of Salt Range. Mishra, Choudhary and Khare (1973) recorded in an abstract *Scylliorhinus* sp. from Lower Eocene of Barmer, *Notidanus primigenius* from Subathu Series (Lower Eocene) of Jammu, *Scoliodon* from Lower Eocene of Kutch, and *Galeocerdo cuvieri*, *G. aduncas*, *Lamna* sp., *Carcharias tricuspidatus* and *Notidanus primigenius* from Middle Eocene of Kutch. Later Khare (1976) described *Notidanus primigenius* from Subathu Series of Jammu.

With the exception of *Lamna*, the other Middle Eocene sharks from Kutch still inhabit the Indian Ocean. *Lamna* though widespread in boreal to warm temperate belts of both hemisphere, is not known from tropical seas. It is an active, strong-swimming fish in a depth range from the surface to 70-80 fathoms, preying largely on other sharks and squids. *Galeocerdo* is found in both inshore and off-shore conditions in tropical and subtropical seas. The fish is omnivorous, eating crabs, birds, sea turtles, other sharks and sea-lions ; It is also a scavenger.

Carcharias is found both in tropical and temperate waters. Although pelagic, it is also found sometimes near the coast. It is a sluggish fish living mostly on or close to the bottom of sea. It feeds upon smaller fishes, crabs, squids and lobsters.

Locality : Nareda and Harudi, Kutch.

Horizon : Ossiferous limestones of Babia Stage (Nareda) and Ossiferous gypseous shales of Babia Stage (Harudi), Middle Eocene.

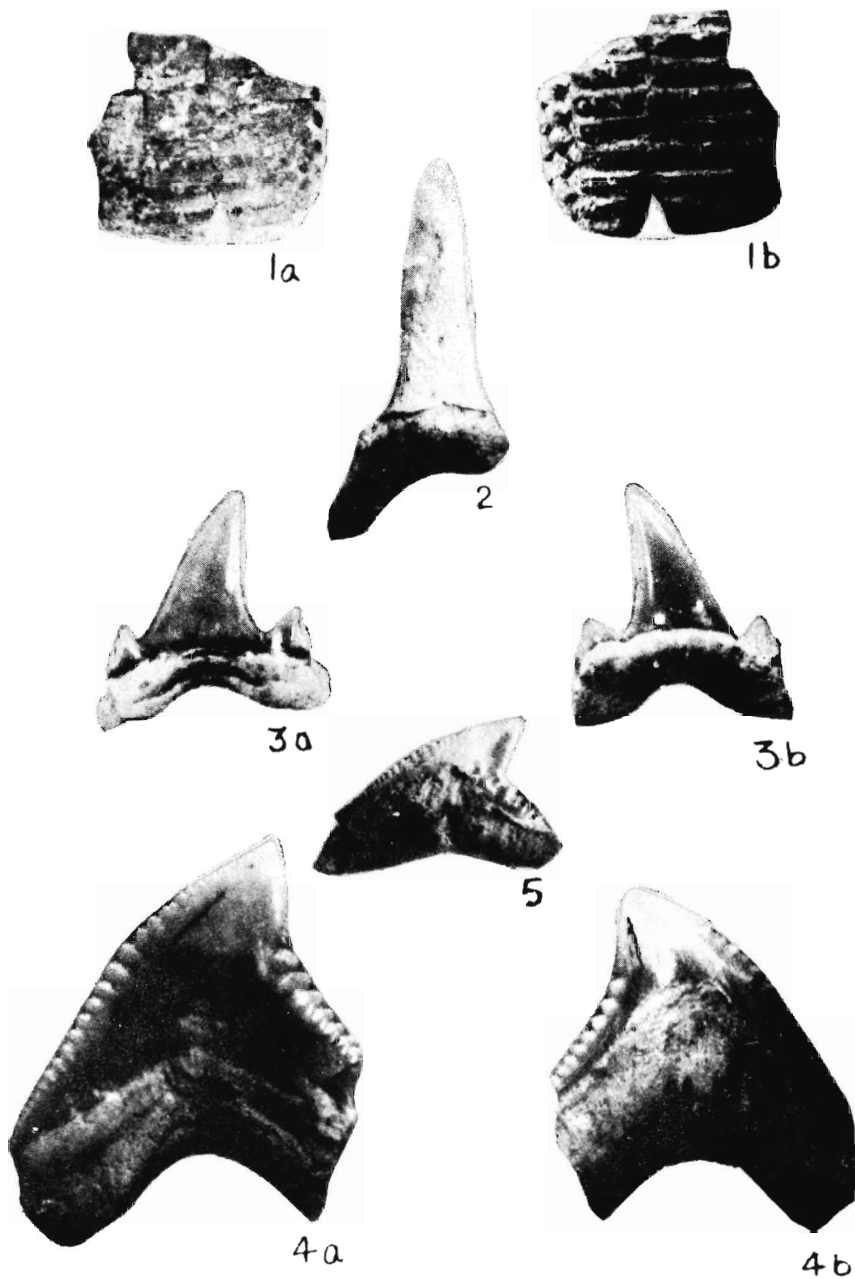
AGE OF THE FOSSIL-BEARING BED

The fishes described in the present paper range throughout Tertiary and are found even in present day seas. So, only on the basis of fishes described here it is not possible to assign any age to the beds but the associated fauna which includes both vertebrates and invertebrates indicate a Middle Eocene age to the fossil-bearing beds. The vertebrates include teleost fishes *Fajumia menoni*, *F. misrai*, *Socnopaea horai*, *Arius kutchensis* ; crocodile *Tomistoma tandoni* ; archaeocete whales *Indocetus ramani*, *Protocetus sloani*, *P. harudiensis* ; odontocete whale *Andrewsiphium kutchensis* and sirenian *Protosiren fraasi* (Sahni and Mishra 1975) ; the invertebrate fossils include foraminifers *Nummulites acutus*, *N. perforatus*, *Discocyclusina dispansa*, *D. javana*, *Alveolina elliptica*, *Dictyoconoides cooki* ; ostracodes *Cytherelloidea barkhanensis*, *Bairdia kutchensis*, *Paijenborchella trisulcata* ; pelecypods *Corbula subexarata*, *Meretrix (Callista) yawnensis* ; gastropod *Conus* sp., *Natica* sp. (Tandon 1971, 76).

The specimens described here are in the collection of the museum of Geology Department, Lucknow University, Lucknow.

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EXPLANATION OF PLATE

PLATE I

- 1a. *Myliobatis tewarii* sp. nov., L.U.V.P. 11078 (Holotype), coronal view of dental plate $\times 1.2$
- 1b. Basal view of the above $\times 1.2$
2. *Carcharias tricuspoidatus* Day, L.U.V.P. 11113, internal view of tooth $\times 2.1$
- 3a. *Lamna*, sp., L.U.V.P. 11109, external view of tooth $\times 3$
- 3b. Internal view of the above $\times 3$
- 4a. *Galeocerdo cuvieri* LeSueur, L.U.V.P., 11110, external view of tooth $\times 2.2$
- 4b. Internal view of the above $\times 2$.
5. *Galeocerdo aduncas* Agassiz, L.U.V.P. 11111, internal view of tooth $\times 2.2$