

LOWER EOCENE FISHES FROM BARMER, SOUTH WESTERN RAJASTHAN, INDIA

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Well preserved fish remains have been collected from the Fuller's Earth deposits of Lower Eocene (Ypresian) age occurring not far from the villages of Kapurdi and Bothia, district Barmer, Rajasthan. Three species, *Scombroclupea murlii* sp. nov. (Clupeidae), *Palimphyes misrai* sp. nov. (Euzaphlegidae) and *Eobothus singhi* sp. nov. (Bothidae) are described. The fish recovered from the basal part of the Fuller's Earth sequence are shallow water marine forms and are associated with a variety of crustaceans. These deposits, mostly marine, are characterised by shallow water conditions and are intercalated with some non-marine sediments bearing plants.

INTRODUCTION

Fossil fishes have been known from the early Tertiary of Rajasthan for over a century. In 1970-71, a systematic collection was made from the Fuller's Earth deposits of Barmer district situated near the south-western border of Rajasthan. There are two principal localities—one situated about 2 km. N 10°W of the water reservoir of Kapurdi (lat. 25° 54'30" : long. 71°23'30") and the other about 2½ km. S 40° W of Tube well no. 3 at Bothia (lat. 25° 55'00" : long. 71° 22'00").

The stratigraphic position and age of the Fuller's Earth of Rajasthan is a matter of some controversy, though the deposits are now generally regarded as Lower Eocene (Ypresian). La Touche (1897) was the first to study the sequence of limestones. Fuller's Earth and lignites occurring in the region of Bikaner and Jaisalmer, and to recognise the beds as Eocene on the basis of certain species of *Nummulites*. On the same basis, Vredenburg (1908) correlated the limestones as equivalent to the beds of the Laki type-section of Sind, West Pakistan. Later, Mukherjee (1949) working on pelecypods and echinoderms collected by Crookshank (1948) from Bikaner determined the age as Middle Eocene. A similar conclusion was reached by Lakhampal (1964) on the basis of macrofloral remains. However, Singh (1957, 1969, 1970) in a comprehensive study of the micro- and mega-foraminiferal assemblages, established stratigraphic subdivisions of the Eocene outcrops of Bikaner and Jaisalmer, and assigned the Fuller's Earth to the Lower Eocene (Ypresian), a view also held by the present authors.

The Fuller's Earth sequence overlies extensive lignite seams, questionably of Palaeocene age, and extends over a distance of some 270 km. between Barmer in the southwest to Kolayat in northern Rajasthan. The Fuller's Earth beds constitute a sequence of alternating marine calcareous clays, limestones and sandstones and are intercalated with some freshwater lacustrine deposits with plant remains. The

sediments were deposited in wide, shallow coastal lagoons situated on the eastern border of the Laki Sea, and intermittently connected with it.

Knowledge of the fish fauna of the Fuller's Earth deposit was so far confined to the presence of some well preserved remains of a clupeoid fish (Barooah 1950) and a shark *Odontaspis macrata striata* (White 1952). The present collection comprises of over 20 fairly well preserved teleost remains including one complete specimen besides an isolated shark tooth, associated with a variety of crustacean remains. The teleosts themselves are diversified. Their dimensions range from 2.3 cm. to the largest which is 35 cm. in length.

TAXONOMIC DESCRIPTION

Super Order	—	TELEOSTEI
Order	—	CLUPEIDA
Sub Order	—	CLUPEOIDEI
Family	—	CLUPEIDAE
Genus	—	<i>Scombroclupea</i> , Kner (1863)
Species	—	<i>Scombroclupea murlii</i> sp. nov.

Etymology—The species has been named after Mr. Murli Singh Chauhan, Kapurdi, for his valuable help during our field trips to Barmer.

Holotype—A more or less complete fish impression with damaged skull, Lucknow University Vertebrate Palaeontology (LUV) no. 12001.

Repository—Museum of the Geology Department, Lucknow University.

Type locality—Kapurdi Fuller's Earth mine, 2 km. N 10°W of Kapurdi village water reservoir on the Barmer-Jaisalmer road.

Type strata—Fuller's Earth.

Material—One more or less complete fish impression, slightly damaged anteriorly; two other well preserved specimens lacking the anterior part of the skull and dorsal and ventral fins.

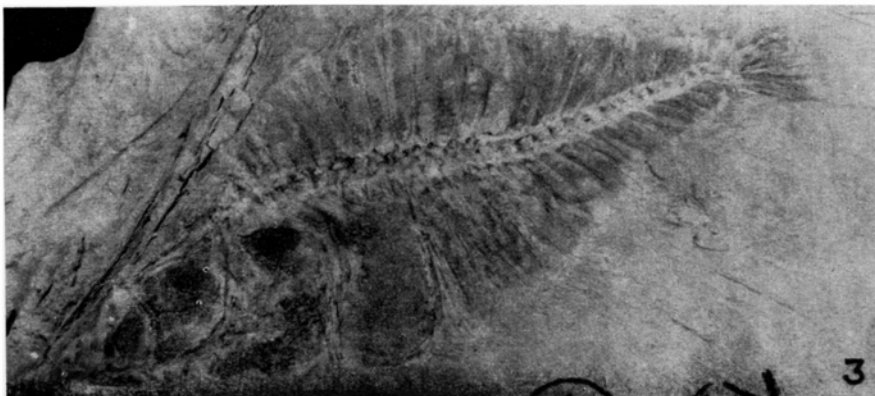
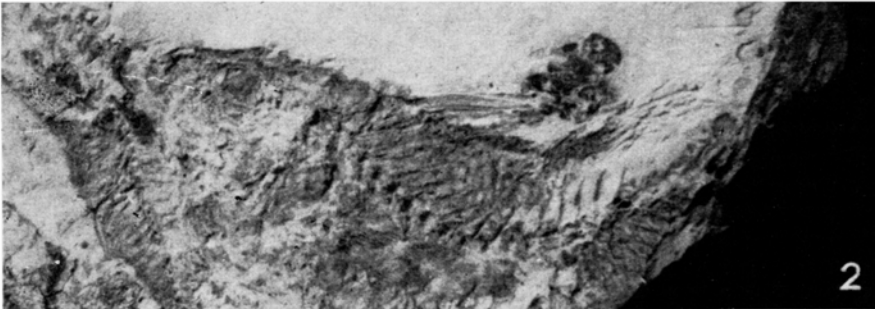
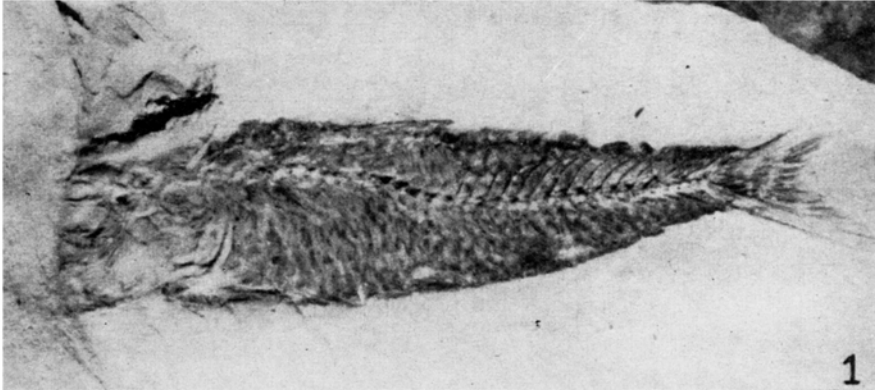
Diagnosis—The body is elongate and compressed; maxilla robust and arched. Two supra-maxillary bones are present; mandible prominent. Gape does not extend behind the anterior border of the orbit. Pre-operculum and operculum are deep and narrow. Branchiostegal rays 10 in number. Vertebrae 35, of which 20 are caudal. Pectorals are small and inserted above the ventral border. Pelvics originate opposite to the dorsal fin. The anterior part of the dorsal fin arises at the middle of the dorsal side; anal fin slightly extended but followed posteriorly by a few well spaced post-anal fin rays; caudal fin separate and deeply forked. None of the fin rays are large. Scales are of moderate size.

Measurements—The estimated body length is 60 mm; body height 12 mm; head length 12 mm. Height of the skull is 12 mm; orbit oval; longitudinal ocular diameter 6 mm. and vertical diameter 3 mm.

Comparison—The specimen closely resembles the type species *Scombroclupea macrophthelma* from the Upper Cretaceous of Mt. Lebanon, Syria (Heckel 1849), but is readily distinguishable on the basis of its much smaller size, i.e., 60 mm. instead of 170 mm. It is a more slender species as the body length is 5 times greater than

body height, instead of 4 times. There is lesser number of vertebrae, 35 instead of 40; smaller number of dorsal fin spines, 10 instead of 15; and larger number of pectoral fin rays, 15 instead of 12.

It is smaller by about 50 per cent in length than *Scombroclupea gaudryi* from the Upper Cretaceous of Mt. Lebanon, Syria (Pictet and Humbert 1866). The body



FIGS. 1, 3. 1, *Scombroclupea murlii*, sp. nov., $\times 2.1$; 2, *Palimphyes misrai*, sp. nov., $\times 1.4$;
3, *Eobothus singhi*, sp. nov., $\times 1.3$.

length to height ratio of both the species is the same, being five. The number of pectoral fin rays is larger, being 15 instead of 12.

Age—Lower Eocene.

Order — PERCIDA
 Sub Order — TRICHIUROIDEI
 Family — EUZAPHLEGIDAE
 Genus — PALIMPHYES, AGASSIZ, 1844.
 Species — *Palimphyes misrai* sp. nov.

Etymology—The species has been named after Prof. Ramesh Chandra Misra, Geology Department, Lucknow University.

Holotype—An almost complete fish impression. LUVP no. 12004.

Repository—Museum of the Geology department, Lucknow University.

Type locality—Bothia Fuller's Earth mine. 2½ km. S40°W of Bothia Tube well no. 3, on the Barmer-Jaisalmer road.

Type strata—Fuller's Earth.

Material—Almost complete fish impression except for the damaged tail.

Diagnosis—The body is 4 times as long as high; mouth proximal. The upper jaw does not reach the vertical from the eye centre. Eye large, oval; ocular diameter about 1/3 of the head length. Number of vertebrae about 30. First dorsal fin with long, stout, spiny rays; second dorsal with soft fin rays; distance between dorsal fins exceeds the basal length of the first dorsal. Anal fin with first four long, stout, spiny fin rays and the rest with soft rays; it begins slightly behind the vertical from the anterior rays of the second dorsal. The pectorals are soft rayed, narrow and exceptionally long to reach the base of the anal.

Measurements—The estimated body length is 80 mm; body height 21 mm. Head length is 18 mm., height 18 mm. The vertical ocular diameter is 3 mm. and longitudinal diameter 5 mm; length of first dorsal spine 12 mm; length of first anal spine 10 mm; length of pectorals 15 mm. The base of first and second dorsals is 6 mm. and 5 mm., respectively.

Comparison—The form is distinguishable from the type species *Palimphyes elongatus* from the Oligocene of Switzerland (Blainville 1818) on the basis of smaller number of vertebrae, 32 instead of 38, and fewer spines in the first dorsal fin, namely, 6 instead of 10. The specimen differs from *Palimphyes palaeocenicus* from the Upper Palaeocene of Turkhmenistan (Daniltshenko 1968) in being smaller in length by about 25 per cent and in possessing fewer vertebrae, 32 instead of 36. The number of fin rays is smaller in both the dorsals, being 6 instead of 10 in the first dorsal and 12 instead of 16 in the second; pectoral fin rays are also fewer, being 13 instead of 16.

Age—Lower Eocene.

Order — PLEURONECTIDA
 Sub Order — PLEURONECTOIDEI
 Family — BOTHIDAE
 Genus — *Eobothus*, Eastman, 1914
 Species — *Eobothus singhi* sp. nov.

Etymology—The species has been named after Dr. Suresh Narain Singh, Geology Department, Lucknow University.

Holotype—More or less complete fish impression. LUVP no. 12005.

Repository—Museum of the Geology department, Lucknow University.

Type locality—Kapurdi Fuller's Earth mine, 2 km. N10°W from Kapurdi village water reservoir on Barmer-Jaisalmer road.

Type strata—Fuller's Earth.

Material—More or less complete impression of the fish except for the damaged skull.

Diagnosis—The body is moderately elongated. Head is large. Both eyes are situated on the left side. Body is more than 2.5 times as long as high, body height being greater than the head length. Cleft of the mouth is wide, large and terminal; the lower jaw protrudes forward. Fin rays are segmented. Caudal fin wide, defined and not fused with the anal or dorsal fins and roundly truncated. The pelvic fins are not connected with the anal. Dorsal fin covers the dorsal side with at least 40 rays. Pectorals are small. The number of vertebrae is 28, 19 of which are caudal. The body is covered with small cycloid scales.

Measurements—The estimated body length is 85 mm ; body height 33 mm. Length of the skull is 28 mm. while the height is 23 mm.

Comparison—The specimen bears a close resemblance to the type species *Eobothus (Rhombus) minimus* from the Eocene of Uzbekistan and Italy (Agassiz 1842) except for the larger number of vertebrae, of which there are 28 instead of 20; smaller number of caudal fin rays, 11 instead of 24 and fewer number of dorsal fin rays.

Age—Lower Eocene.

CONCLUSIONS

The collection consists of varied fish remains, belonging to the families Clupeidae, Euzaphlegidae and Bothidae. *Scombroclupea* is the most common form, followed by *Palimphyes* and *Eobothus* which occur in more or less equal frequency.

The fishes from the Fuller's Earth are marine and are associated with diversified invertebrates such as echinoids, crustaceans, pelecypods and gastropods.

The age of the horizon has been determined, among others, by Singh (1969, 1970) on the basis of micro- and mega-foraminiferal assemblage as Lower Eocene (Ypresian), and is consistent with our conclusions.

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