OCCURRENCE OF XENACANTHID FRESHWATER SHARK TEETH IN THE MUDSTONE LITHOFACIES OF NILKANTH, PAURI, GARHWAL HIMALAYA

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ABSTRACT

Small, isolated dermal denticles which could be attributed to the freshwater sharks, xenacanthid elasmobranch, were found incorporated in the mudstone lithofacies of Nilkanth in Pauri, Garhwal Himalaya. These fossils occur in association with other faunal elements indicating their exotic admixture. The overall evidence indicates the ancient river influence prior to the final phase of the Himalayan Orogeny.

INTRODUCTION

THE xenacanthid is regarded as an "exotic" group of elasmobranch sharks that diverged very early from the main lines of their radiation. In fact, the members of this group are amongst the very few elasmobranch fishes believed to have lived almost exclusively in fresh water environments[1].

Distinguishing features of the xenacanthid teeth include their samll size the triangular shape of root margins and relatively few prominent cristae on each principal cusp[2]. The fossil remains of these forms thus bear great environmental significance to the rocks in which they are found.

Small-sized teeth that could be attributed to such xenacanthid fishes were recently located by the authors from the mudstone lithofacies of Nilkanth, Pauri, Garhwal Himalaya (Lat, 30°4'47" N; Long. 78°20'35" E). Lithology, fossil content and environmental significance of these rocks are already worked out by the authors[3,4]. The purpose of this report is to document additional information on the varieties of exotic fossils that are incorporated in the mudstone lithofacies as earlier predicted by us. A secondary aim is to bring the xenacanthid fauna to the notice of the specialists, so that it may receive more detailed study.

Record of xenacanthid fossil teeth:

Xenacanthid remains are well known from Carboniferous and Permian deposits of Europe, the midwestern and Appalachian regions of the United States and the eastern Canada[1]. Recently, such finds are reported from the Upper Pennsylvanian Sydney Basin of Nova Scotia[2]. Xenacanthids have also been recovered from the Late Permian of Soviet Union, but have not been further identified[5]. Occurrence of Late Triassic xenacanthids are known from England[6], Germany[7], Texas[2] and from the Maleri Formation of India[8]. The overall palaeogeographic distribution of xenacanthid supports the ancient configuration of the continents and their occurrence is therefore predicted in the rocks of South America, Africa and Antarctica[2].

Identification

Spines and cranial fragments are generally considered as the most diagnostic elements for xenacanthid taxonomy. However, well-preserved teeth have also found importance in such studies of shark identification[2].

The specimens recorded in our study are isolated teeth with dermal denticles, but neither cranical nor spine fragments were found. For this reason and for the lack of our expertise, systematic measurements for the purpose of taxonomic identification have not been attempted. Our specimen was identified by comparison with specimens that are already reported and illustrated. Amongst these the combination of characters suggested by different authors is mainly considered[1,2].

The Nilkanth forms have prominent ribbed structure and intact enamalloid cover. They show close resemblance to the Upper Pennsylvanian xenacanthids from the Morien Group of Sydney Basin, Nova Scotia[2]. Their main features include cuspidate type of denticles characterized by the presence of long central cusp curved in a dorsal posterior direction exhibiting strong to moderate ribbing. These ribbs are curved backward and exhibit secondary cusps,

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also ribbed, but which are commonly shorter than the main central cusp. A neck region separates the base from the cusps. All these features are prominently indicated in the scanning electron micrographs (figures 1 and 2).

DISCUSSION

The mudstone lithofacies which incorporates the xenacanthid remains is the youngest lithological unit in Nilkanth, Pauri, Garhwal Himalaya[4]. The characteristic features of this rock unit are: (i) its abrupt orientation, style of accumulation and termination over the older rock units including the Krol-Tal-Subathu Formation; (ii) lack of stratification or primary sedimentary structures in them; (iii) ill-sorted nature of the matrix drawn from most of the older units, and (iv) presence of reworked maga and microfossils[4]. The recognition and field identification of this rock unit is a controversial issue. According to the present authors[4] the origin of this unit is connected with the final phase of the Himalayan Orogeny which took place sometime during the later part of the Subathu depositional event.

Recently, a new palaeotectonic model has been invoked to explain the fossil diversity in the Tal rocks of the Himalaya[9]. According to this model the Tal Formation although jurassic to Cretaceous in age, incorporates fossils of widely varying ages in the same locality, same horizon and in the same bed. This is due to the exotic nature of the fossil-bearing fragments transported to their present sites in the form of tectonic melanges by Pre-Tertiary rivers in the Tal Gulf[9].

The occurrence of xenacanthid fossils in the mudstone lithofacies in the light of the above proposals now appear appreciably important. The freshwater nature of these fossil forms and their close resemblance to the upper Pennsylvanian xenacanthid varieties leave no doubt about their being disintegrated through the original matrix and then subjected to dispersal with the river sediments. Whether such a phenomenon occurred repeatedly, or only once is difficult to predict. It is, however, our contention that the mudstone mileau which incorporates intermixes of older rocks and fossils had a long depositional history before it was subjected to the final phase of Himalayan Orogeny which was perhaps responsible for the redistribution and emplacement of this mileau in juxtaposition to the older rock units and to admix its faunal elements witht the other organic material that has ever since confused the geological workers.

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Figures 1 and 2. 1. Xenacanthid dermal denticle—lateral view. Unspecified genus (× 100). 2. Prominent ribbing in xenacanthid specimen (× 200).

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