

A new fossil locality in the Late Permian Zewan Formation reveals evidence of marine chondrichthyan in Kashmir Himalaya

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Abstract

In recent years, the Permo-Triassic rocks of Kashmir have attracted considerable attention due to their intriguing preservation of fossil assemblages and relatively continuous sedimentary sequences, offering key insights into the end-Permian mass extinction event and subsequent biotic recovery. Among these, the Mandakpal section on the southern limb of the Vihi Syncline has remained comparatively understudied, despite its rich fossil assemblages and apparently continuous Permo-Triassic sequence, similar to the well-studied Guryul Ravine. In this study, the Mandakpal section is re-investigated through detailed fieldwork, lithological characterization, and fossil sampling. Multiple fossiliferous horizons were identified, including beds rich in productid brachiopods and pectinid bivalves. Notably, a partially preserved Meckel's cartilage of a chondrichthyan fish, possibly representing an eugeneodontiform, is documented from the Upper Permian limestone and shale beds of the Zewan Formation. This represents the first non-dental chondrichthyan fossil record from the Permian of Kashmir, highlighting the exceptional preservation potential of these rocks. In addition, the occurrence of *Ophiceras* ammonoid beds and the bivalve *Claraia* in the overlying strata confirms the presence of the earliest Triassic (Scythian) at Mandakpal, marking a clear Permo-Triassic transition within the section. The Mandakpal section represents an important locality for regional biostratigraphic correlation, documenting vertebrate fossils, and can contribute to future research aimed at more precise demarcation of the Permian-Triassic boundary in the Tethyan belt, thereby refining our understanding of biotic turn over and environmental disruptions during earth's most severe extinction event.

KEYWORDS

eugeneodontiform, Kashmir, Meckel's cartilage, Permo-Triassic, Tethys Himalaya