



Bio- and sequence stratigraphy of the Guimal Formation (Early Cretaceous, Tethys Himalaya, India)

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The Jurassic to Cretaceous sequence of the Tethys Himalaya in Northern India is represented by the Spiti, Guimal, Chikkim and Fatu La Formation. Cretaceous deposits of Ladakh were studied in detail by GARZANTI (1992). A summary on the Cretaceous development and formations of Spiti is given by BHARGAVA & BASSI (1998). However detailed biostratigraphic data of Upper Mesozoic sediments of the Spiti area are missing until now. The presented contribution deals with sequence stratigraphy on the re-measured Guimal Formation (Lower Cretaceous) and a biostratigraphic update derived from a new recorded ammonoid fauna of the investigated section near Chikkim (Spiti).

The age of the Guimal Formation in Spiti was assessed using ammonoids (UHLIG 1910, KRISHNA 1983) of the Lochambel Beds (Upper Spiti Formation) and foraminifera of the Chikkim Fm (KOHLI & SASTRI 1956; BERTLE & SUTTNER accepted).

The Guimal Formation consists of brown coloured sandstones and dark shales. Five cycles could be distinguished within a total thickness of about 350 m. Each of them starting with black shales grading into fine grained sandstones. The top of the sandstones is composed of coarse grained matrix with intercalated shell layers (bivalves). The following cycle starts above this 'bivalve-layer'. Thickening upward of the beds as well as coarsening upward of its components is observed in each cycle. The sandstones show a high content of quartz and yield glauconite grains and limonitic clasts. In the lower part of the sandstones of cycle 2 and 5, ammonoids occur.

The ammonoid fauna indicates Early Cretaceous age. It comprises well preserved 'normal' planspiral shells, but astonishingly also criocone ammonoid shells are obtained. Ammonoids seem to be part of a fairly unknown cephalopod fauna and are still under investigation. Due to the rare material their determination is difficult. Similar types are described from the Cretaceous of the Mount Jolmo Lungma Region (CHAO KING-KOO 1976). The accurate fauna and its exact age will be published at the end of this year.

The Guimal Formation is overlain by the Chikkim Formation. The base of the Chikkim Fm starts with a relatively sharp contact of well bedded fine micritic carbonates to the strongly weathered grey calcareous shales of the uppermost Guimal Formation. It is defined by occurrence of *Planomalina buxtoni* (Gandolfi) and *Rotalipora appenninica* (Renz) indicating that the Guimal Formation was deposited before the Early Albian.

The observed cycles of the Guimal Formation most probably hint to sea-level changes. Dark to black shales may indicate an environment reduced in oxygen of hemi-pelagic to pelagic deposits on the Indian shelf. The transition into quartz-rich sandstones with intercalated bivalve layers point at turbidite deposition of the latter layers. It is assumed that the accumulation of the ammonoid beds is due to turbiditic events.

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