



Ichnofossil from the Cambrian succession of Parahio Valley, Spiti Basin, India: Their stratigraphic and paleoenvironmental significance

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The Spiti Basin exposes an excellent section of Neoproterozoic- Cretaceous rocks in the Tethyan Himalaya of Himachal Pradesh. The diverse assemblage of ichnofossils is present in the Cambrian succession of Parahio Valley in the Spiti Basin. In the present study nineteen ichnofossils are reported from the Cambrian succession of Parahio Valley. The ichnofossils includes *Bergaueria*, *Chondrites*, *Cruziana*, *Didymaulichnus*, *Dimorphichnus*, *Diplichnites*, *Helminthorhaphe*, *Merostomichnites*, *?Monocraterion*, *Monomorphichnus*, *Nereites*, *Palaeopascichnus*, *Palaeophycus*, *Phycodes*, *Planolites*, *Rusophycus*, *Skolithos*, *Scolicia*, *Treptichnus* etc. along with annelid worm, burrow and scratch marks. The described ichnofossil assemblage indicates that the ichnocenosis is dominated by a high behavioral diversity ranging from suspension to deposit feeders. It seems that the ichnofauna present in the Cambrian succession of this section were mostly produced by trilobite and arthropods, whereas some of them were produced by crustacean, priapulid worm, polychaetes and polyphyletic vermiforms. The distribution pattern of ichnofossils shows increase in taxonomic and morphological diversity up in the section. It further indicates that the availability of nutrients significantly increased their abundance as well as spatial distribution during Cambrian.

The presence of *Chondrites*, *Treptichnus*, and *Phycodes* at the basal part of the Cambrian indicates shallow to deep environment with anaerobic condition. Whereas, the complex forms like *Rusophycus*, *Cruziana*, *Monomorphichnus* and *Nereites* represent shelf to slope environment. The appearance of *Skolithos* in the upper part reflects well oxygenated high energy condition. The environmental changes in the Parahio Valley during Cambrian period was distinctly marked by an anaerobic to aerobic condition and by a faunal change from endobenthic, soft - bodied, deposit feeders to epibenthic grazers. The present ichnofossils indicates that these sediments were deposited in shallow water marine environment with moderate to low energy conditions.

In the present study the Precambrian – Cambrian boundary could not be demarcated due to the paucity of body fossil, as well as microbiota in the lowermost beds. However, the presence of *Treptichnus* and *Phycodes* can be considered as a horizon marker for the beginning of Lower Cambrian in this section. The vertical to slightly inclined biogenic structures are commonly recognized from semi-consolidated substrate which are characteristic features of the nearshore/foreshore marine environment, with moderate to high energy conditions. The Cambrian succession of the Parahio Valley can be correlated with the other Cambrian succession of Kashmir, Zanskar and Lesser Himalaya as well as with the other well known sections of the world.

Key words: Spiti Basin, Parahio Valley, Cambrian, Ichnofossils.