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Late Ordovician jawed polychaete fauna from the Spiti Valley, northern India

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ABSTRACT

The final part of the Ordovician Period was characterised by major perturbations in climate, environments and ecosystems, as proved by numerous studies. These changes resulted in one of the biggest extinctions in Earth's history. Most research in early Palaeozoic biogeography is based on data derived from extensively studied localities in North America and Europe, and much less information is available from other parts of the world. Here, we present the first results of our study on Katian/Hirnantian scolecodonts from the Spiti region, India. This area was part of the Tethyan Himalaya of the Gondwana palaeocontinent, located at low palaeolatitudes. Various representatives of algae, bryozoans, corals, cephalopods, conodonts, ostracods and other groups have already been described from this region. Palaeontological data and facies analysis indicate shallow-water conditions within the subtropical–tropical realm. In addition, the specific carbon isotope ($\delta^{13}C_{carb}$) trend suggests that late Ordovician carbonate deposits in the region occurred during the pre-Hirnantian global warming interval, the so-called Boda Event. The migration pathways of bryozoan communities have shown that those from Spiti were very similar to the faunas of Laurentia, Baltica, Siberia and southern China during the early Late Ordovician. It is assumed that taxa originating in Laurentia, crossed the Tornquist Sea from Baltica to Avalonia, then to southern Europe, and subsequently extended along the shelf of northern Gondwana, including India and Australia.

The organic-walled microfossils of the Spiti region have previously received much less attention than the shelly faunas and conodonts. In the present study, we have focused on scolecodonts – the jaws of polychaete worms, a group that has been abundant since the Cambrian, playing an important role in various marine ecosystems. Polychaetes are a vital part of the food chain and play an essential role in organic matter decomposition and nutrient cycling processes within sediments. The jawed polychaetes are also known for their high resistance to ecological stress. In Spiti, scolecodonts are mainly found in silty limestones containing 60–70% of carbonate minerals. The majority of scolecodonts were recovered from the lithological units 8 and 13 of the studied section, representing well-stabilised shallow-shelf carbonate environments close to the top of a transgressive system tract in otherwise relatively nearshore to shoreline settings.

Our results show that at least seven jawed polychaete genera are present in the assemblage. A new endemic ramphoprionid species belonging to the genus *Megaramphoprion* has been recorded. Other taxa include representatives of *Oenonites*, *Mochtyella*, *Vistulella*, *Atraktoprion*, *Xanioprion* and paulinitids, which occur in both scolecodont-rich units. The same genera occur in coeval strata in Baltica and Laurentia. On the other hand, some genera such as *Pistoprion* and *Kalloprion* are missing in the Spiti samples and also in other Gondwanan collections. In Laurentia, the family Hadoprionidae is already present in the Late Ordovician, but in Gondwana it appears in the late Silurian. Paulinitids are common in late Katian and Hirnantian strata (*Amorphognathus ordovicicus* conodont Zone) in Laurentia and Gondwana, as well as in Baltica. Similarly to coeval Laurentian polychaete faunas, labidognath and prionognath taxa outnumber the species with a placognath-type jaw apparatus. The distinct and abundant genus *Pteropelta* in Baltica and Laurentia has so far not been recorded in the latest Ordovician of Gondwana.

In addition to scolecodonts, the studied organic-walled microfossil assemblage contains chitinozoans belonging to the genera *Acanthochitina*, *Conochitina*, *Spinachitina*, and possibly *Tanuchitina*. The diversity is lower than presented by previous authors and reported from other regions.

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