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The onset of the Great Ordovician Biodiversification Event

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Rocks and the Rise of Ordovician Life

PROGRAMME WITH ABSTRACTS

2021 Virtual Annual Meeting of IGCP 653

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Rocks and the Rise of Ordovician Life – Filling knowledge gaps in the Early Palaeozoic Biodiversification

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We studied organic-walled microfossils from the boundary interval of Královdvor and Kosov formations (Katian–Hirnantian) at the Levín locality. We discovered that scolecodonts were much more diverse and abundant in these strata than previously thought and that the samples were also rich in chitinozoans with at least 15 taxa present. The recovered jawed polychaete fauna contains at least 17 species from 13 genera. The assemblage is taxonomically similar to the previously studied coeval Gondwanan faunas. Taxa with labidognath and prionognath type of maxillary apparatuses predominate in samples, whereas placognath and ctenognath taxa are relatively rare, which is in contrast to the Baltic polychaete faunas. Polychaetaspids predominate the Levín assemblage, followed by other families such as ramphoprionids, paulinitids, and atraktoprionids. The studied interval in the Levín section is represented by a succession of thin-bedded silty shales with various degree of bioturbation and practically devoid of shelly fossils. Reduced diversity and abundance of scolecodonts was recorded in the uppermost part of the Královdvor Formation, which correlates with lower intensity of bioturbation and finer silt fraction. The reported discovery shows wide geographical distribution and diversity of jawed polychaetes before and during the Hirnantian glaciation and mass extinction.

Keywords: Ordovician, Katian, Hirnantian, scolecodonts, jawed polychaetes, Prague Basin

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Links between bioerosion and oversized benthic fossils: insights from the Upper Ordovician of Estonia, Baltica

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Abstract

Baltica was possibly the birthplace of bioerosion. Rapid diversification of bioeroding animals took place during the Late Ordovician and was related to the availability of various substrates including shelly fossils. The lower boundary of the Upper Ordovician marks also the beginning of a major increase in the diversity of bryozoan endobionts. In this study we explore the idea that the diversity and abundance of bioerosional trace fossils were enhanced by larger size of shelly fossils.

We analysed the size of selected common shelly fossils, together with the distribution of bioerosional traces, based on large paleontological collections and previous research in Estonia. Within the Upper Ordovician, two time intervals stand out for oversized or even gigantic fossils. Firstly, in the Kukruse and Haljala stages, middle Sandbian, huge trepostome bryozoans are common and include some of the largest colonies known from the Ordovician worldwide. Secondly, in the Vormsi and Pirgu stages, late Katian, oversized bryozoans, corals, gastropods, bivalves, and brachiopods are well known. Rugose and tabulate corals reach gigantic size in the next, Porkuni Stage, Hirnantian. In the Baltic region nine bioeroding ichnogenera are known from the Sandbian and six from the Katian, with distinct diversity peaks in the Kukruse-Haljala and Vormsi stages. On the other hand, Keila to Nabala stages

are characterized by smaller average size of body fossils as well as less diverse bioerosional traces. Thus, in the pre-Hirnantian Upper Ordovician, there may be a link between the diversity of bioerosional traces and the size of body fossils.

The large body size of marine invertebrates has been explained by colder climate, elevated oxygen levels, high taxonomic diversity or other causes. We, too, cannot pinpoint a single factor controlling the large body size of benthic shelly fossils in Estonian succession. Most likely it was a coincidence of multiple factors, including water chemistry, oxygen availability, stability of the sea level and increasing phytoplankton availability. Regionally, low sedimentation rate, water circulation, coastal upwelling and input of nutrients from pyroclastic material may have supported larger body size – and enhanced bioerosion. However, for some long-lasting gastropod and brachiopod genera, the large size may be a result of gradual evolution rather than the environment. No bioerosional trace fossils have hitherto been reported from the Porkuni Stage, Hirnantian, suggesting that the end-Ordovician extinction had strong effect on various bioeroding taxa.

Keywords: Late Ordovician, bioerosion, trace fossils, Baltoscandia, shelly fossils, gigantism

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Hirnantian freshwater palynomorphs from Saudi Arabia: phylogenetics and paleoecology

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Abstract

Non-marine deposits of Lower Paleozoic age are somewhat rare when compared to Devonian and younger sedimentary sequences. In fact, it can be difficult to establish the non-marine character of a sedimentary deposit based on lithic characters alone. Palynological recovery can be helpful in this regard if a sample contains elements whose non-marine provenance can be established. Here we review a deposit from the Hirnantian of Saudi Arabia which is characterized by an overwhelming abundance of sphaeromorph acritarchs, but which contains significant numbers of *Moyeria* Thusu, which is known to belong to the photosynthetic euglenids (Euglenaceae). The palynoflora also contains a variety of acritarchs, whose biological affinities are unknown. Intriguingly, however, there are literally no typical acanthomorph acritarchs in the palynoflora. Almost all euglenids today are freshwater in distribution, so we can now use the presence of *Moyeria* as indicator of freshwater provenance. This assumption facilitates the interpretation of some interesting taxa as being of possible freshwater origin. These include examples of hypnozygotes of Zygnematophycean algae (*Gelasinicysta* Head) in addition to coenobial Hydrodictyaceae and some poorly preserved examples of vegetative Scenedesmaceae. Thus, both phylogenetic branches of the green algae, chlorophyta and charophyta are represented in the assemblage. The Hirnantian