

# Lower and Middle Ordovician bio- and chemostratigraphy of the Aizpute-41 drill core, Latvia

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The Ordovician Period was a crucial time interval in Earth's history characterised by the transition from a greenhouse world to an ice age, witnessing a rapid diversification of marine life, the start of terrestrialisation and the end-Ordovician mass extinction. Ordovician sea-surface temperature reconstructions are mainly based on oxygen isotope thermometry, notably deriving from conodont apatite ( $\delta^{18}\text{O}_{\text{cono}}$ ). In Baltoscandia, which is known for its well-preserved geochemical archives, the  $\delta^{18}\text{O}_{\text{cono}}$  record through the Ordovician Period is being established. However, the data from deeper shelf settings of the basin are still very scarce, and the trends within the basin are poorly constrained. Moreover, the bulk of paleontological data comes from shallow shelf sections, and less information is available from the distal part of the Baltoscandian basin. Here, we present the first results of our study on the Aizpute-41 drill core from western Latvia, which characterises the deep shelf settings in the eastern part of the Baltoscandian basin and was selected as a reference section for an ongoing research project. We studied biostratigraphy of four groups of microfossils (conodonts, chitinozoans, ostracods and scolecodonts) and carbon stable isotope chemostratigraphy ( $\delta^{13}\text{C}_{\text{carb}}$ ) in the nearly 100-m-thick Lower and Middle Ordovician succession of the core, corresponding to the Hunneberg to Uhaku regional stages, and comprising the Zebre, Kriukai, Baldone, Segerstad and Taurupe formations.

The conodont fauna appeared abundant and diverse in all samples studied, often with several thousands of conodonts per kg of rock. The material allowed the establishment of a precise biostratigraphic framework, starting from the *Paroistodus proteus* Zone, and followed by zones and subzones recognised previously elsewhere in Baltoscandia, up to the *Pygodus anserinus* Zone.

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A rich chitinozoan record starts in the Taurupe Fm, where *Laufeldochitina striata* Zone is established. The base of the Upper Ordovician can be identified by the *Laufeldochitina stentor* Zone and *Eisenackitina rhenana* Subzone. Additionally, the global index graptolite *Nemagraptus gracilis* has been identified in the Aizpute samples. Scolecodonts were rare in the section, showing that the deeper shelf settings were generally unfavourable for jaw-bearing polychaetes. They first appeared in the Taurupe Fm, where nine species were recorded. The ostracod record begins in the Zebre Fm, showing remarkable diversity and several distinct assemblages, partly older than previously recorded in Estonia and Latvia, and thus complementing the view on the development of the early ostracod faunas in the Baltic area.

The Early and Middle Ordovician  $\delta^{13}\text{C}_{\text{carb}}$  record shows relatively invariable values in the Dapingian and early Darriwilian part of the Aizpute core, followed by the Mid-Darriwilian Excursion (MDICE) and then a declining trend towards the "Kukruse Low", being closely similar to previous records from other Baltoscandian sections.

Collectively, these data provide new insights into an integrated Baltic regional stratigraphy and form the basis for the next steps – including establishing a high-resolution SIMS-based  $\delta^{18}\text{O}_{\text{cono}}$  record through the Early and Middle Ordovician for regional paleotemperature reconstruction and comparison across Baltoscandia and worldwide.

**Keywords:** Ordovician, Baltica, conodonts, chitinozoans, oxygen isotopes, stratigraphy.