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ABSTRACT

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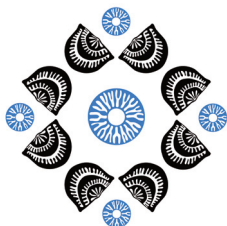
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Age of the Ordovician sedimentary succession in Lumparn Bay, Åland Islands, Finland

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Depression of the ancient Lumparn meteorite impact structure in the Åland Islands is partly infilled with the lower Palaeozoic sediments, lying presently below sea level. The Cambrian and Ordovician sedimentary cover is distributed in the area of 15 km², with a total thickness of up to 70 m. The Ordovician carbonate rocks of this site, known by the erratic boulders and by the drilling project in the late 1950s, are particularly interesting because of the isolated distant position of this outlier from other distribution areas of the Ordovician sediments preserved in the Baltoscandian Palaeobasin. Ordovician sections in the Lumparn Bay are composed of two distinct lithological units. The older, argillaceous wackestone-packstone unit has been traditionally named 'Orthoceras limestone' or 'Orthoceratite Limestone', and the younger micritic limestone unit is addressed as 'Östersjö Limestone' (or 'Baltic Limestone').

Here we present new data on ostracod biostratigraphy and stable carbon isotope chemostratigraphy derived from three old drillcores from the Tranvik area of the Lumparn Bay. The comparison of ostracod distribution with its succession in Estonia generally supports the previous Darriwilian and Sandbian age interpretations for the Orthoceras Limestone. Considering the ostracod distribution together with earlier acritarch and conodont datings, stable carbon isotopic data and limestone lithology, the Orthoceras Limestone unit might correspond to the Kunda, Aseri, Lasnamägi, Uhaku, Kukruse, Haljala, and Keila regional stages (RSs). The Östersjö Limestone comprises almost the entire Katian, corresponding to the Rakvere, Nabala, Vormsi and Pirgu RSs in the Baltoscandian stratigraphic chart. The uppermost sample yielded the most abundant and diverse assemblage of ostracods that suggests it to correspond to the Vormsi or lower-middle Pirgu (late Katian) RSs.

The global Middle Darriwilian Carbon Isotopic Excursion (MDICE) and Guttenberg Carbon Isotopic Excursion (GICE) as well as the Katian Rakvere and Saunja carbon isotopic excursions are recorded in the studied succession. The $\delta^{13}\text{C}_{\text{carb}}$ bulk rock curve of the Orthoceras Limestone shows a positive excursion up to 1‰ in the lower part of the interval followed by a negative excursion up to -1‰ in the middle part and another positive excursion reaching 2‰ in the upper part of the interval. This curve resembles well the carbon isotope curve from the Darriwilian and Sandbian in the core sections of the Hiiumaa Island, NW Estonia, and could be interpreted as the MDICE and the rising limb of the GICE.

The $\delta^{13}\text{C}$ curve of the Östersjö Limestone interval shows two positive excursions. The lower one comprises most likely the peak of the Rakvere Excursion (Rakvere RS) in Estonia, which is also supported by the ostracod data. The upper carbon isotopic excursion may represent the Saunja Excursion correlated with the upper part of the Nabala RS.

The ostracod biofacies characterized by faunal associations of both the Orthoceras and Östersjö limestone units, and the lithological succession of these units suggest more similarities with the Estonian Shelf facies (North Estonian Confacies) than Scandinavian Basin facies of the Baltoscandian Palaeobasin.