

Stop 14: Kaarma quarry

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Location: Latitude 58°20'17"N, longitude 22°28'30"E; Saare County, Estonia.
Stratigraphy: Gorstian, Paadla RS, Sauvere and Himmiste beds.
Status: Active quarry; please follow safety instructions. Sampling and fossil collecting are welcome.
More information: <https://geoloogia.info/en/locality/12672>

The Kaarma quarry is located 12 km north of the town of Kuressaare, next to the Uduvere-Saia road. An interval of lagoonal microlaminated argillaceous dolostones

of the Paadla Formation (Paadla RS, Ludlow) is exposed in this quarry.

Description of the section

According to Einasto (1990), the exposed section can be divided into three parts with eight distinctive beds. The upper part (Fig. 14.1, bed 1) is yellowish-grey vuggy massive secondary dolostone containing imprints of gastropods, bivalves, leperditiid arthropods (*Hermannina*), bryozoans, calcareous algae (*Solenopora*), brachiopods, small tabulate corals and encrusted stro-

matoporoids. In the southeastern part of the quarry, this bed is only partly dolomitized and contains up to 0.15 m thick lenses and wedging-out interbeds of skeletal grainstone with several wavy discontinuity surfaces.

The middle part of the section (beds 2–7) comprises the typical wavy microlaminated argillaceous “Kaarma dolo-

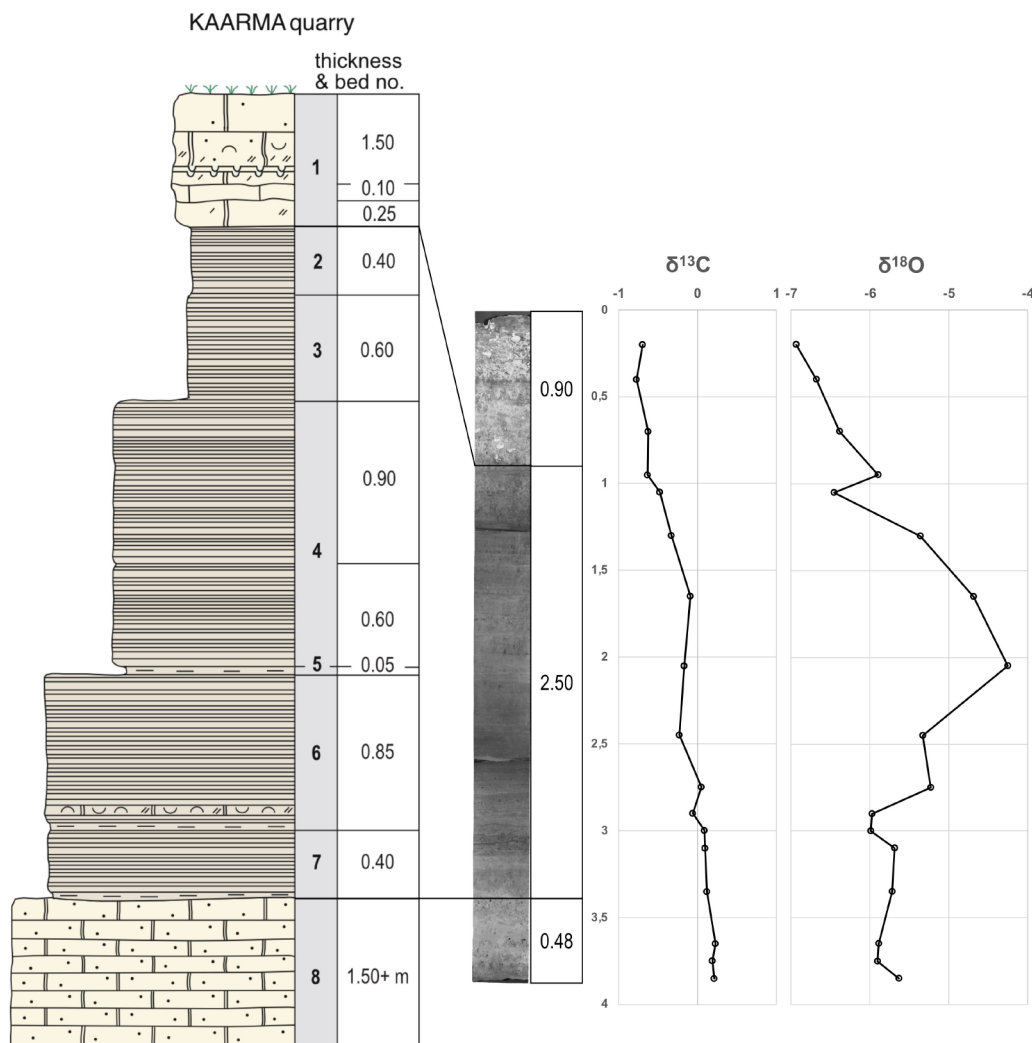


Fig. 14.1. Kaarma quarry section with new isotopic data. Lithological column by Rein Einasto (1990), photo column by Tiia Tuuling (1987).



Fig. 14.2. Extraction of dimension stone in the Kaarma quarry. Photo: Olle Hints, 2021.

mite" with distinct irregular lamination and microcycles. The total thickness of the Kaarma lagoonal dolostone is up to 3.8 m in the Kaarma quarry. A bed of argillaceous dolostone (bed 5) is subdividing the lower massive

Biostratigraphy

According to Einasto (1990), the Kaarma lagoonal dolostone represents the upper part of a mesocyclite, tentatively attributed to the junction of the Sauvere and Himmiste beds of the Paadla RS. The Paadla RS is including the interval of the global Mid-Ludfordian Lau carbon isotope excursion and the Lau/Kozlowskii extinction event (Männik 2014). The prominent Lau isotope excursion marks a global cooling or glacial event. It has been described within the *Ozarkodina snajdri* Conodont Biozone (Fryda *et al.* 2021), which is largely missing in

Chemostratigraphy

We analyzed 17 samples from rock plates collected by Tiia Tuuling (1987; TUG 82 in Tartu University collection) for stable C and O isotopic composition in the laboratory of the Department of Geology, University of Tartu. The bulk rock $\delta^{13}\text{C}_{\text{carb}}$ values show an upward decreasing trend by 1‰ through the interval, whereas $\delta^{18}\text{O}$ values are 2–3‰ higher in the middle part of the lagoonal sediments compared to the surrounding beds. Both values are in the range of normal marine lower Palaeozoic carbonates. The data show no evidence for the Mid-Ludfordian Lau isotope excursion or another distinct trend of the global carbon isotope curve.

Practical use of the Kaarma dolostone

The Kaarma dolostone can be well processed and is weather-resistant; therefore, it has been widely used as a building and carving stone since medieval times. Examples include the Kuressaare castle, many churches and manor houses in Saaremaa, as well as modern buildings and monuments all over the country (Perens 2012).

blocks of this rock. The Kaarma dolostone is very poor in fossils. Moulds of gastropods, bivalves and leperditiids are found at only some levels. The microlaminated structure of dolostone is disturbed by distinct bioturbation, showing limited life activity in this saline lagoonal environment. Rare thin intervals with dissolved traces of shelly fossils might have been formed by occasional storm events. The dolostone contains about 5–22% insoluble residue, mainly siliciclastic clay and silt, with authigenic pyrite admixture (Einasto 1962; Tuuling 1987). The basal part of the section (bed 8) is represented by brownish-grey

medium-bedded dolostone, which originally might have been pelletal limestone (Einasto 1990).

Estonian sections due to the stratigraphic gap (Männik 2014). However, the exact stratigraphic position of the Kaarma lagoonal beds in relation to the Lau event, is not clear; it has been shown both below (Männik 2014) and above (Männik 2015) the *O. snajdri* Conodont Biozone. Recent analysis of faunas (conodonts, vertebrates) in this interval suggests that Sauvere and Himmiste beds are of late Gorstian age (Männik *et al.* 2024) and older than the Lau event.



Fig. 14.3. Example of lagoonal dolostone from the Kaarma quarry, Paadla Regional Stage. Scale bar 1 cm. The topmost bed from the Kaarma quarry in cross-section, GIT 379-292.

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