

ISOS-14 Field Guide

The Ordovician of Estonia

Edited by Olle Hints and Ursula Toom

14th International Symposium on the Ordovician System, Estonia, July 19-21, 2023

Pre-conference Field Excursion: The Ordovician of Estonia, July 15-18, 2023



ISOS-14 Field Guide: The Ordovician of Estonia

Edited by Olle Hints and Ursula Toom

14th International Symposium on the Ordovician System, Estonia, July 2023

Pre-conference Field Excursion: The Ordovician of Estonia; July 15-18, 2023

The conference and field excursion are supported by:
IGCP Project “Rocks and the Rise of Ordovician Life”
University of Tartu
Tallinn University of Technology
Geological Survey of Estonia
Estonian Museum of Natural History



Recommended reference to this publication:

Ainsaar, L. 2023. Stop 11: Aru-Lõuna (Kunda-Aru) quarry. In: Hints, O. and Toom, U. (eds). *ISOS-14 Field Guide: The Ordovician of Estonia*. TalTech Department of Geology, Tallinn, p. 65–68.

© 2023 Authors. This publication is distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0>), if not indicated otherwise.

Electronic copy available at: <https://geologia.info/reference/47491>

Printed by Alfapress OÜ

ISBN 978-9916-80-008-9 (printed)

ISBN 978-9916-80-009-6 (pdf)

Tallinn, 2023

Stop 14: Ruhnu drill core, SW Estonia

Marko Kabel

Location: Latitude 57.80316°N, longitude 23.24135°E; Ruhnu Island, SW Estonia.

Stratigraphy: Complete Ordovician succession from the Tremadocian to Hirnantian.

Status: Reference section, drilled for oil and gas prospecting in 1972.

More information: <https://geoloogia.info/en/locality/972>

The Ruhnu (500) core was drilled in 1972 on Ruhnu Island (Pöldvere 2003). It is one of the deepest boreholes in Estonia, with a total length of 787.4 m. The primary purpose of the drilling was prospecting for oil and natural gas. This attempt failed, and only Cl-Ca-Na type mineral groundwater (salinity 17 g/l) was found in the lower and middle Cambrian sediments. The Quaternary cover in the area is about 8 m. Below that, the Eifelian Narva Formation occurs. The thickness of the Devonian is 138.3 m, and the Silurian strata are about 454.9 m thick, reaching a depth of 601 m. The boundary between the Ordovician and Silurian systems most likely correlates with a level within the Öhne Formation. Thus, the Ordovician succession is ca 106 m thick. The Ordovician succession in this

area corresponds to the relatively deeper-water environments, which are characteristic of South Estonia, Latvia and Sweden.

The Ordovician succession in Ruhnu drillcore has been heavily sampled and analysed for palaeontology, geochemistry and geophysics. Many tens of research papers have been published using the data from the Ruhnu core and making it one of the key Ordovician–Silurian sections in Baltoscandia.

The section is well characterised palaeontologically, and numerous brachiopods, conodonts, chitinozoans, graptolites, agnathan and fish microremains, ostracods and other fossils have been collected.

References

- Pöldvere, A. (ed). 2003. Ruhnu (500) drill core. Estonian Geological Sections Bulletin 5. Geological Survey of Estonia, Tallinn. <https://fond.egt.ee/fond/egf/9313>

Ruhnu (500) core interval 588-720 m

Series	Stage	Fm.	Depth 1:200	Lithology	Description/notes
O3-S1 Upper Ordovician-Llandovery	Juuru	Õhne	588.0		588,1-598,5 m – Calcareous marlstone, greyish-green and violetish-brown, with interbeds and nodules of slightly argillaceous limestone (grains <10%), texture: wavy, irregularly medium- to thin-bedded and medium- to thin-nodular.
			590.0		
			592.0		
			594.0		
			596.0		
			598.0		
				600.0	598,5-600,6 m – Cryptocrystalline limestone (grains <10%), light grey, slightly argillaceous with calcareous marlstone interbeds (20-40%), texture: wavy, irregularly nodular.
	O3 Upper Ordovician	Saaduse		600.6	600,6-601,0 m – Limestone, greyish-green, slightly to highly argillaceous, dolomitized. The wavy discontinuity surface is pyritized.
				602.0	601,0-603,0 m – Limestone (grains 10-50%, in some layers >50%), light grey, containing ooids, sandy, texture: cross- and micro- to thin-bedded. Content and diameter (mostly up to 1 mm) of carbonate ooids increases upwards. Well rounded quartz sand interbeds (thickness 0,5-2 cm) are present.
				604.0	603,0-609,5 m – Limestone (grains 10-25%), dark greenish-grey, with calcitic marlstone interbeds, clay content changes vertically, texture: wavy, medium- to thin-bedded or thick- to thin-nodular.
				606.0	In the upper part, irregular, up to 5 cm, bluish-grey limestone interbeds (more numerous in the upper part) contain carbonate clasts or pellets and quartz sand.
		Porkuni	Kuldiga	608.0	The discontinuity surface on the lower boundary is pyritized.
				610.0	609,5-617,1 m – Limestone (grains 10-25%), greenish-grey, slightly argillaceous, interbedded with calcareous marlstone (bioclasts <10%) containing skeletal fragments, texture: wavy, irregularly thin- to thick-bedded.
				612.0	The clay content increases upwards.
614.0					
616.0					
618.0				617,1-618,9 m – Calcareous marlstone, light greenish-grey, with nodules and clasts of highly argillaceous limestone (grains 10-25% and in some layers 25-50%), texture: massive, sometimes nodular. In the lower part skeletal fragments concentrate in layers. Burrows are filled with brown marlstone and rust-coloured iron compound.	
Pirgu		Jonstorp	620.0	619,1-621,6 m – Limestone (grains 10-25%), brownish-red, at some levels dark yellow, with calcitic marlstone interbeds (10-20%). The marl content changes vertically. Crinoids are dominating. Discontinuity surfaces are goethitized or not impregnated.	
			622.0	621,6-631,1 m – Limestone (grains 10-25%), argillaceous, brownish-red, with calcitic marlstone (bioclasts 10-25%) interbeds (40-50%, upper part 20%), texture: wavy, thin-nodular, lower 0,6 m medium-bedded or medium-nodular.	
			624.0	The clay content decreases upwards.	
			626.0		
	628.0				
	630.0		Flat iron ooids occur on the lower boundary.		
O3 Upper Ordovician	V	Fjälcka	631.0	631,1-631,8 m – Limestone (grains <10%), greenish-grey and light-grey with limonitized spots, argillaceous, with shale-like marlstone interlayers (35%).	
			632.0	631,8-632,7 m – Limestone (grains 10-25% and 25-50%), in some layers cryptocrystalline, yellowish-grey.	
	Nabala	Saunja	634.0	632,7-638,0 m – Limestone (grains 10-25%, in the lower part 25-50%), light greenish-grey (upper 0,5 m violet spots), with calcareous marlstone interbeds (5-7%), texture: irregularly thin- to medium-bedded, some layers are thick-bedded.	
			636.0	Discontinuity surfaces are rust-coloured (limonitized?)	
	Rakvere	Mõntu	638.0	638,0-638,8 m – Limestone (grains <10% or 10-25%), light grey to greenish-grey, with calcitic marlstone (40%; bioclasts 10-25%) interbeds, texture: irregularly nodular. Discontinuity surfaces are pyritized.	
			640.0	638,8-640,50 m – Calcareous marlstone (bioclasts 10-25%), greenish-grey, with rare nodules of argillaceous limestone (20-30%; grains <10%), texture: massive and in some layers nodular.	
	Oandu	Mossen	642.0	640,5-645,7 m – Calcareous marlstone (bioclasts 10-25%), dark greenish-grey, dolomitized, in the lower part argillaceous, texture: wavy, indistinctly bedded, in some layers thin-nodular.	
			644.0	Contains angular fine quartz grains.	
	Keila	Elidene	646.0	645,7-647,1 m – Calcareous marlstone (bioclasts 10-25%), dark greenish-grey, dolomitized, with rare limestone nodules, texture: wavy, indistinctly bedded or nodular. Basal 0,5 m is greenish-grey, highly argillaceous limestone with calcareous marlstone interbeds.	
			648.0	647,1-650,1 m – Limestone (unsorted grains 10-25%, in some layers >50%), light grey and greenish-grey, argillaceous, with calcareous marlstone interbeds (30%) and greenish-yellow to light grey microbedded K-bentonite claystone (20 cm) on the lower boundary. Texture: wavy, thin- to medium-bedded or irregularly nodular.	
650.0			650,1-652,4 m – Limestone (grains 10-25%), light greenish-grey, argillaceous, in some layers microcrystalline with interbeds of calcareous marlstone (30-40%), texture: wavy, thin- to medium-bedded or irregularly nodular. Iron ooids are found.		
652.0					

Fig. 14.1. Ordovician succession in the Ruhnu 500 drill core, SW Estonia.

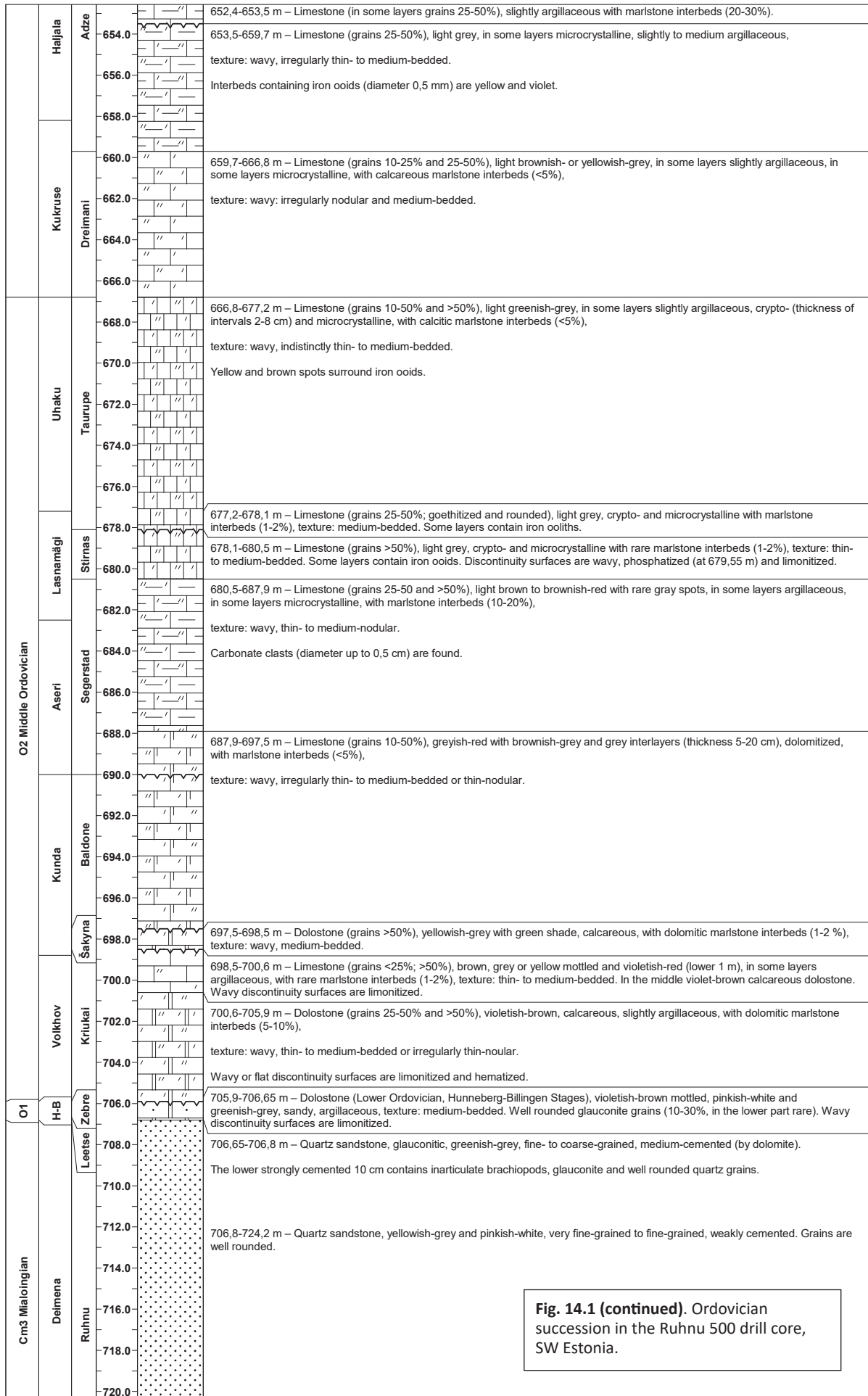


Fig. 14.1 (continued). Ordovician succession in the Ruhnu 500 drill core, SW Estonia.