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

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Stop 3: Madise escarpment

Oive Tinn

Location: Latitude 59.29083°N, longitude 24.12194°E; Harju County, NW Estonia.
Stratigraphy: Sandbian, Haljala Regional Stage, Kahula Formation.
Status: No hammering of the outcrop, but fossil collecting is allowed.
More information: https://geoloogia.info/en/locality/10030

The Madise outcrop is a 500 m long and ca 3.5 m escarpment in the Madise village, near the Mattias' (St. Matthiew's) church of Harju-Madise, exposing Sandbian argillaceous limestones and marls. At present, the escarpment is located about 0.6 km from the sea, but it formed as a coastal cliff during an earlier developmental stage of the Baltic Sea, known as Littorina Sea – a brackish water reservoir which existed 7500 to 4000 BP (Alar Rosentau, pers. comm).

The Madise escarpment is the stratotype of the Madise Member, the middle part of the Kahula Formation, Haljala Regional Stage. Historically, the Haljala Regional Stage was separated into the Jõhvi and Idavere stages, but due to relatively minor faunal differences and problems distinguishing the two units in subsurface sections in central and southern Estonia, the new unit – Haljala Regional Stage – was proposed by Jaanusson (1995). The former Idavere and Jõhvi stages can be used in the rank of substages (Hints 1997).

In northern and central Estonia, the upper part of the Haljala Regional Stage and the lower part of the Keila Regional Stage comprise a complex of beds with cyclically alternating content of terrigenous material – the Kahula Formation (Ainsaar 1993). The Madise outcrop (Fig. 3.1, 3.2) opens about 1 m of marls and marly limestone of the Pagari Member at the base and the overlying more calcareous limestones (wackestones and packstones) of the Madise Member.

The argillaceous rocks of the Kahula Formation are rich in shelly faunas, and many fossils can also be found in the Madise section (Fig. 3.3, 4.8). Among these are trilobites (representatives of genera *Asaphus*, *Atractopyge*, *Autoloxolichas*, *Cybelella*, *Hemisphaerocoryphe, Illaenus*, *Reraspis*, *Toxochasmops*); some of the oldest rugose corals worldwide (*Primitophyllum*, *Lambephyllum*); sponges (*Carpospongia*), gastropods (*Subulites*, *Salpingostoma*, *Megalomphala*, *Lophospira*, *Lesueurilla*, *Kokenospira*, *Holopea, Cymbularia*, *Bucania*, *Brachytomaria*), brachiopods (*Alichovia*, *Vellamo, Porambonites, Platystrophia*, *Orthisocrania*, *Leptaena*, *Cyrtonotella*, *Clitambonites* etc.), echinoderms (*Hemicosmites*, *Hoplocrinus*) and bryozoans (*Diplotrypa*, *Trigonodictya*, *Tarphophragma*). Also, calcareous algae (*Cyclocrinites*, *Mastopora*) and several ichnofossils (*Arachnostega*, *Conichnus*, *Cochlichnus*, *Palaeophycus*, *Sanctum*) have been collected from the Madise escarpment.

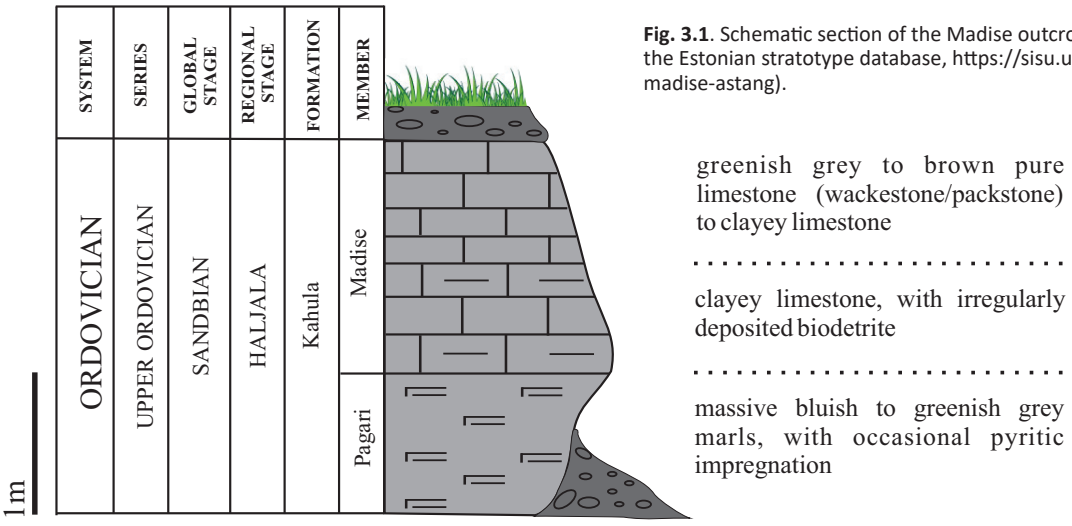

Fig. 3.1. Schematic section of the Madise outcrop (modified from the Estonian stratotype database, https://sisu.ut.ee/stratotuup/o-madise-astang).

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Ainsaar, L. 1993. On the stratigraphy of the Middle Ordovician Jõhvi and Keila Regional Stages in North Estonia. Geologija, 14, 109–117.

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Fig. 3.2. Overview of the Madise escarpment. Photo: Leho Ainsaar, 2008.

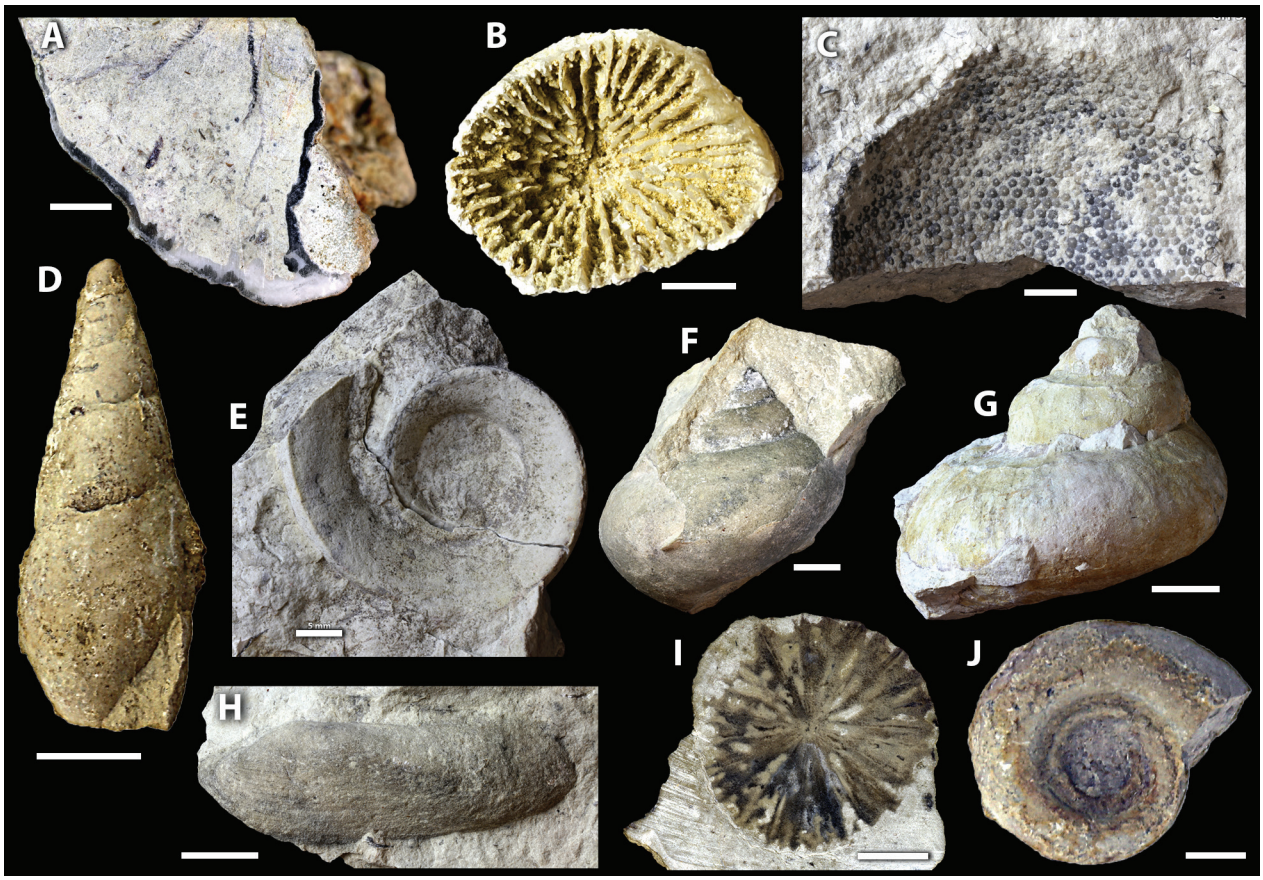

Fig. 3.3. Selected fossils from the Madise scarplet, Haljala Regional Stage (Sandbian). Scale bars: D, G–I – 1 cm; A–C, E, F, J – 5 mm. **A**–**B** – rugose corals; **A** – *Primitophyllum primum*, GIT 77-2; **B** – *Lambelasma dybowskii*, GIT 398-954. **C** – dasycladacean algae *Mastopora concava*, GIT 339-756. **D**–**G**, **J** – gastropods; **D** – *Subulites amphora*, TUG 72-222; **E** – *Lesueurilla marginalis spiralis*, GIT 404-456; **F** – *Lophospira* GIT 404-450; **G** – *Lophospira prisca*, GIT 404-449; **J** – *Megalomphala cycloides*, TUG 2-370. **H** – bivalve *Orthonota*, GIT 694-64-1; **I** – sponge *Carpospongia castanea*, GIT 413-100.