

Stop 15: Kaugatuma and Lõo coastal outcrops

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The Pridolian exposures on Saaremaa Island are mostly represented by small coastal cliffs. On the western coast

of the Sõrve Peninsula, the Kaugatuma Regional Stage is exposed in several places.

Kaugatuma cliff and coastal outcrop near the cliff

Location: Latitude 58.12036°N, longitude 22.19053°E; Sõrve Peninsula, Saare County, Estonia.

Stratigraphy: Pridoli, Äigu Beds of the Kaugatuma Fm, Kaugatuma RS.

Status: Cliff is under protection; no hammering, but loose material may be collected.

More information: <https://geoloogia.info/en/locality/10078>

The Kaugatuma cliff (after Einasto 1990) is an about 2.5 m high outcrop (Fig. 15.1) on the western coast of the Sõrve Peninsula, a few kilometres south of its northern neck and about 100 m from the coastline. The cliff is the historical stratotype of the Kaugatuma Regional Stage. The section represents the middle part of the Äigu Beds of the Kaugatuma Formation. The rocks of two different sedimentary facies can be seen in the regressive succession from the base of the section (Fig. 15.2):

0.5+ m – greenish-grey nodular argillaceous wackestone, mainly containing skeletal debris of echinoderms and brachiopods but also ostracods, trilobites, gastropods, bryozoans and fish fragments. The layer was formed in normal marine open-shelf conditions.

1.5+ m – yellow-grey coarse-grained wavy-bedded crinoidal limestone containing skeletal debris of variable grain size. Some bedding plains show erosion marks. Large colonies of *Syringopora blanda* Klaamann (about 30 cm in diameter) are found. The layer was formed in normal marine fore-reef conditions.

The cliff also contains several vertebrate fossils. *Nostolepis striata* Pander, *Gomphonchus sandelensis* (Pander), *Poracanthodes porosus* Brotzen and *Thelodus parvidens* Agassiz occur in the lower part of the section, and *Nosto-*

lepis gracilis Gross is found in the upper part. Most of the chitinozoans of the Kaugatuma cliff represent long-ranging species; only *Salopochitina filifera* (Eisenack) is characteristic of the upper Äigu Beds.

Outcrop on the beach near the Kaugatuma cliff is palaeontologically the most interesting part of the Kaugatuma section. It is the horizontal exposure of rocks on the beach at the northern end of the cliff (at the water line). The beach exposure is one of the world's richest Pridoli crinoid localities (Vinn 2014). The outcrop is about 0.5–0.6 m high and 60–70 m long. The section is represented by yellow-grey, coarse-grained,



Fig. 15.1. Kaugatuma cliff. Photo: Olle Hints, 2021.

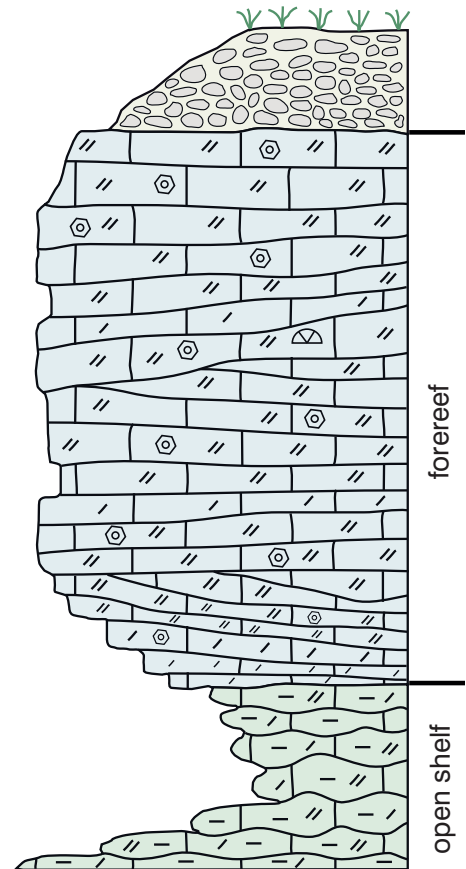


Fig. 15.2. Kaugatuma cliff section after Einasto (1990), from Vinn (2014).

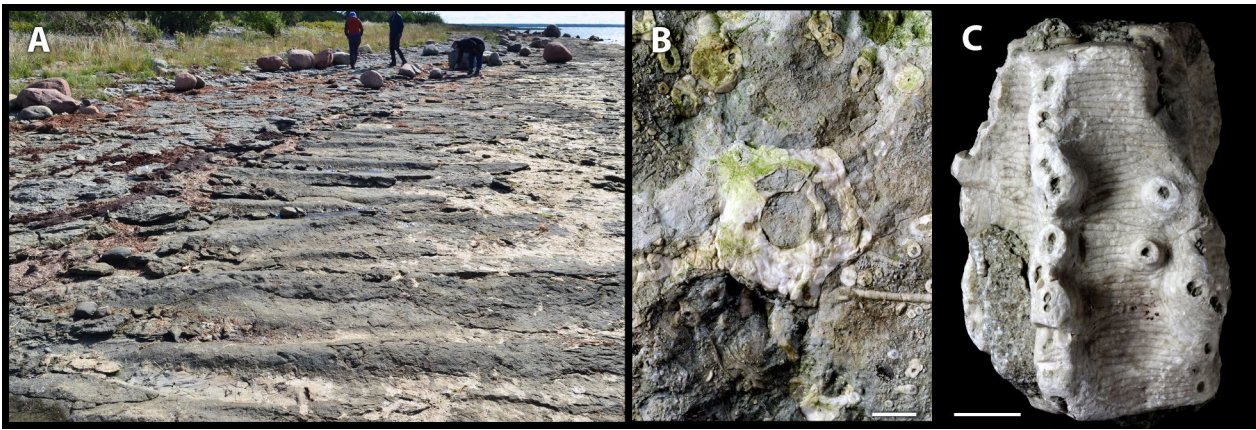


Fig. 15.3. **A** – ripple marks at the Kaugatuma-Lõo ripple-mark coast, Kaugatuma Regional Stage. **B, C** – beach near the Kaugatuma cliff, Kaugatuma Regional Stage. Scale bars 5 mm. **B** – crinoid grainstone, GIT 403-308; **C** – holdfast of *Enallocrinus* sp., GIT 405-302.

wavy-bedded crinoidal limestones formed in active hydrodynamic conditions and containing overturned stromatoporoids. The section also contains greenish-grey argillaceous limestones and marls formed in a relatively calm shallow-water marine environment. The marl and argillaceous limestone layer is extremely rich in fossils and contains abundant *in situ* buried large crinoid hold-

fasts of *Enallocrinus* sp.; (Fig. 15.3), open shelf fore-reef *in situ* buried tabulate corals, and stromatoporoids. The other important fossil groups are brachiopods, rugosans, cephalopods, and trilobites. The larger fossils of the argillaceous layer are often heavily encrusted with bryozoans, auloporids, microconchids, cornulitids, and *Anticalyptrea* tubeworms.

Lõo cliff

Location: Latitude 58.096291°N, longitude 22.174472°E; Sõrve Peninsula, Saaremaa, Estonia.

Stratigraphy: Põidoli, Äigu Beds of the Kaugatuma Fm, Kaugatuma RS.

Status: Cliff is under protection; no hammering, but loose material may be collected.

More information: <https://geoloogia.info/en/locality/10032>

The Lõo Cliff (after Märss 2003) is situated on the western coast of the Sõrve Peninsula, near the Lõo lighthouse, about 2 km to the south of the Kaugatuma cliff. The Lõo cliff is about 1 m high and is overgrown by grass and brushwood, making it hardly visible. The cliff is the type locality for the Lõo Beds of the Kaugatuma RS. The

rocks of the cliff are similar to those seen in the upper part of the Kaugatuma cliff – crinoidal limestones with colonies of the coral *Syringopora blanda* Klaamann. In addition to these unbroken tabulate corals, which are preserved in the growth position, many other corals, brachiopods, ostracods, and fish scales occur.

Kaugatuma-Lõo ripple-mark coast (after Einasto 1990)

Location: Latitude 58.11389°N, longitude 22.18408°E; Sõrve Peninsula, Saaremaa, Estonia.

Stratigraphy: Põidoli, Äigu Beds of the Kaugatuma Fm, Kaugatuma RS.

Status: Cliff is under protection; no hammering, but loose material may be collected.

More information: <https://geoloogia.info/en/locality/13834>

Large east-west directed well-preserved Silurian ripple marks are exposed on a 200 m long seashore between the Kaugatuma and Lõo cliffs (Fig. 15.3), about 1 km south of the Kaugatuma cliff. These are observable only during the low stand of the sea level. Ripple marks are best preserved in a 30 cm thick interval of the section immediately underlying the basal part of the cliff. The

distance between the rounded crests is 40–60 cm (max up to 80 cm), with a height of up to 10 cm. Under the uneven discontinuity surface that forms the base of this ripple mark bed, up to 10 cm of dark grey unsorted skeletal packstone is exposed. The beds with ripple marks are bioturbated, and the planar trace fossil *Zoophycos* is well-preserved and common (Vinn & Toom 2015).

Fossils

The Kaugatuma outcrops are rich in fossils and have gained the interest of palaeontologists for almost 200

years. In the 19th century, E. Eichwald and Fr. Schmidt actively visited Saaremaa and published the first descrip-

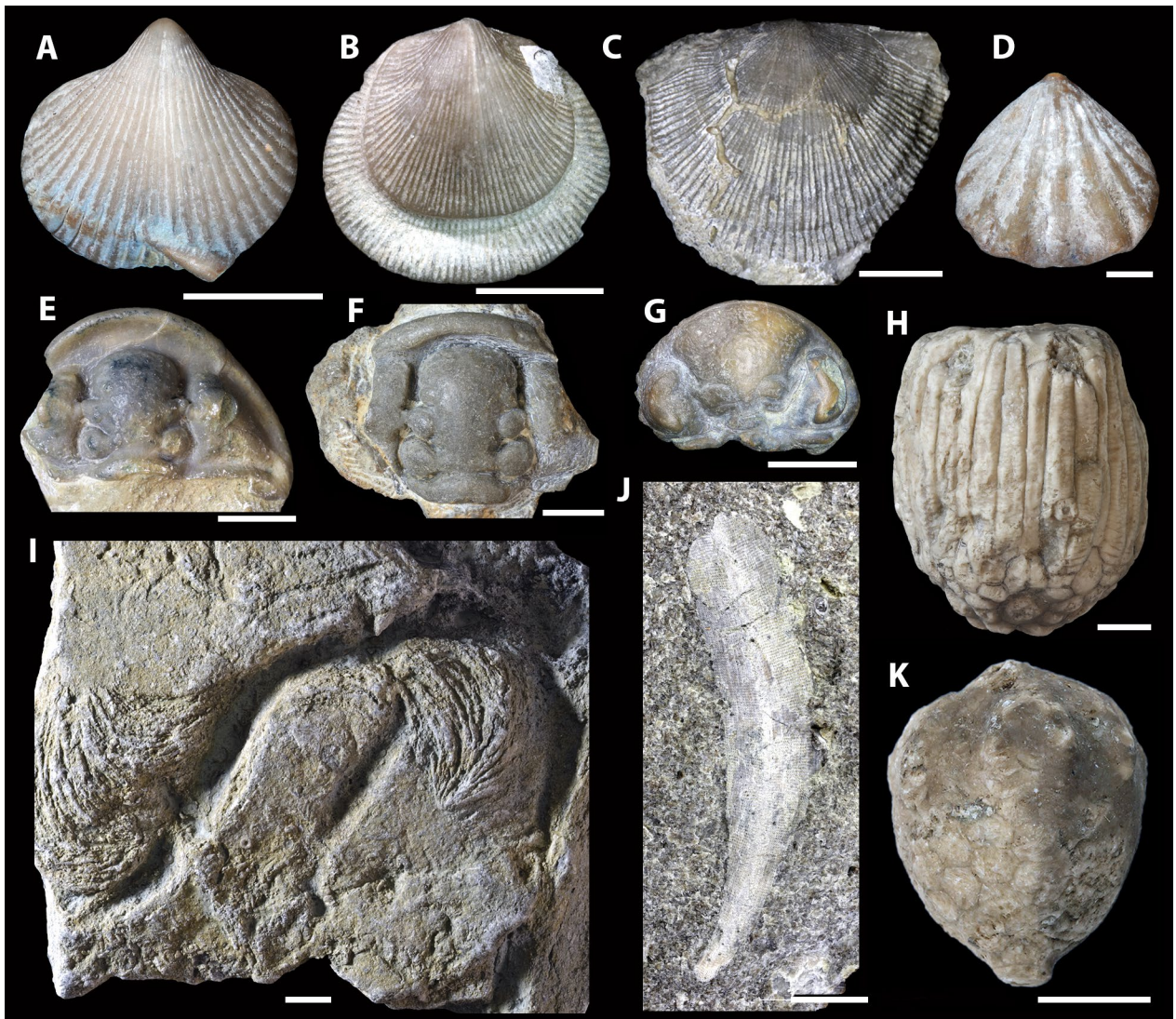


Fig. 15.4. Selected fossils of the Kaugatuma outcrops, Kaugatuma Regional Stage. Scale bars I, J – 1cm; A–C, E–H, K – 5 mm; D – 1 mm. **A–D** brachiopods; **A** – *Homoeospira baylei* (Davidson), GIT 130-159; **B** – *Dalejina hybrida* (J. de C. Sowerby), GIT 128-83; **C** – *Shaleria (Janiomya) ornatella* (Davidson), GIT 506-1992d; **D** – *Ancillotoechia bidentata* (Hisinger), GIT 173-63. **E–G** trilobites; **E** – *Calymene schmidti* Männil, GIT 187–29; **F** – *Calymene kaugatumaensis* Männil, GIT 187–22; **G** – *Eophacops helmuti* Männil, GIT 328-7; **H, K** crinoids; **H** – *Eucalyptocrinites tumidus* Ausich, Wilson & Vinn, GIT 405–243; **K** – *Saaremaacrinus estoniensis* Ausich, Wilson & Vinn, TUG 1395-3. **I** – planar trace fossil *Zoophycos* isp., GIT 362–47. **J** – bryozoan *Ptilodictya lanceolata* (Goldfuss), GIT 420-113.

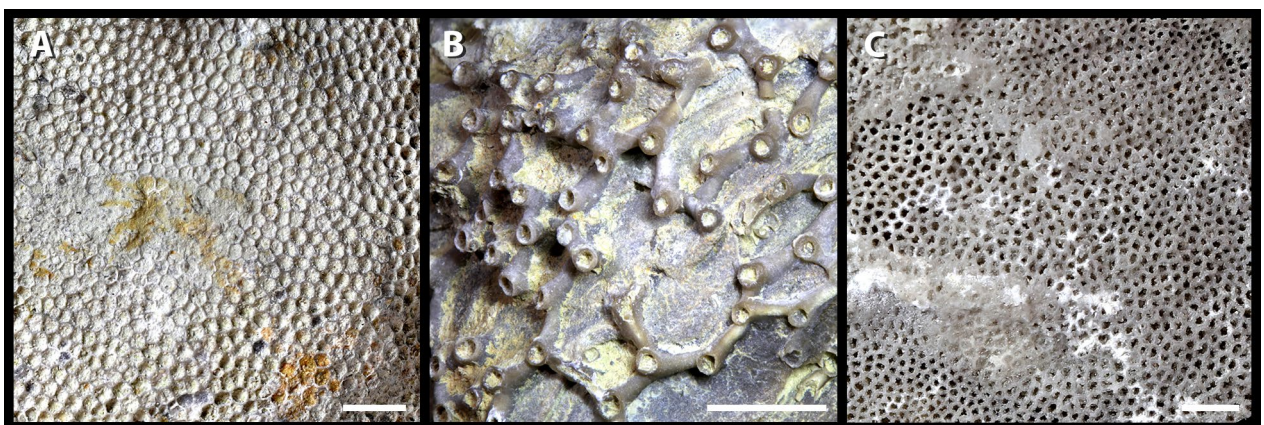


Fig. 15.5. Selected tabulate corals of the Kaugatuma cliff, Kaugatuma Regional Stage. Scale bars 5mm. **A** – *Favosites hisingeri* Milne-Edwards et Haime, GIT 90-40; **B** – *Aulopora amica* Klaamann, GIT 354-889-1; **C** – *Multisolenia reliqua* Sokolov, GIT 180-537.

tions and faunal lists (Eichwald 1854; Schmidt 1858) of outcrops. For now, more than 100 species are identified in Kaugatuma outcrops (Vinn et al. 2024). The crinoid assemblage at Kaugatuma is impressive. Ausich and his coauthors (2012, 2015) have identified eight different genera: *Calliocrinus*, *Desmidocrinus*, *Enallocrinus*, *Eucalyptocrinites*, *Methabocrinus*, *Protaxocrinus*, *Saaremaacrinus* and *Velocrinus*. Corals and stromatoporoids are common in the section. Sokolov (1952, 1955) and Klaamann (1962) have identified 11 species of the tabulate coral's genera *Aulopora*, *Favosites*, *Multisolenia*, *Paleofavosites*, *Subalveolites* and *Syringopora*. The record of rugose corals is incomplete and needs revision.

References

- Ausich, W. I., Wilson, M. A., Vinn, O., 2012. Crinoids from the Silurian of Western Estonia. *Acta Palaeontologica Polonica*, **57**(3), 613–631.
- Ausich, W. I., Wilson, M. A., Vinn, O., 2015. Wenlock and Prídoli (Silurian) crinoids from Saaremaa, western Estonia (Phylum Echinodermata). *Journal of Paleontology*, **89**(1), 72–81.
- Eichwald, E., 1854. Die Grauwackenschichten Von Liv- Und Estland. *Bulletin de la Société Imperiale des Naturalistes de Moscou*, **27**, 1–111.
- Einasto, R., 1990. Locality 7:3 Kaugatuma cliff. In: *Field meeting, Estonia 1990. An Excursion Guidebook* (Kaljo, D. & Nestor, H. eds). Institute of Geology, Estonian Academy of Sciences, Tallinn, 174–175.
- Klaamann, E. R., 1962. Upper Silurian Tabulata of Estonia. *ENSV TA Geoloogia Instituudi Uurimused*, **9**, 25–70. [in Russian]
- Leito, T., Märss, T., 2003. *Saaremaa pangad (Cliffs of Saaremaa Island)*. Tartu, Eesti Loodusfoto. [in Estonian]
- Männil, Reet, 1983. Upper Silurian Calymenidae (Trilobita) of the East Baltic. In: *Lower Paleozoic paleontology of Baltics and Podolia* (Klaamann, E. ed), Eesti NSV TA Geoloogia Instituut, Tallinn, p. 72–100. [in Russian]
- Pushkin, V. I., Nehkorosheva, L. V., Kopaeovich, G. V., Yaroshinskaya, A. M., 1990. *Prídolian Bryozoa of the USSR*. Nauka, Moscow. 1–125. [in Russian]
- Rosen, F., 1867. Ueber die Natur der Stromatoporen und über die Erhaltung der Hornfaser der Spongien im Fossilen Zustande. H. Laakmann, Dorpat, 1-98.
- Sokolov, B. S., 1952. Tabulaty Paleozoya Evropeiskij Chasti SSSR. Chast' III. Silur Pribaltiki (Favozitidy Venlokskogo i ludlovskogo Yarusov) [Tabulates of the Palaeozoic European part of the USSR. III. Silurian of the Baltic area (favositids from Wenlock and Ludlow)]. Trudy VNIGRI, **58**, 1–85. [in Russian]
- Sokolov, B. S., 1955. Tabulaty Paleozoya Evropeisko Chasti SSSR. Vvedenie. Obchchie Voprosy sistematiki i istorii razvitiya tabulyat (s karakteristikoj morfologicheskij blizkih grupp) [Tabulates of the Palaeozoic European part of the USSR. General questions of taxonomy and history of the development of tabulates (with characteristics of morphologically similar groups)]. Trudy VNIGRI, **85**, 1–328. [in Russian]
- Vinn, O., 2014. Stop B10: Kaugatuma & Lõo coastal outcrops. In *4th Annual Meeting of IGCP 591, Estonia, 10–19 June 2014. Abstracts and Field Guide* (Bauert, H., Hints, O., Meidla, T., Männik, P. Eds). University of Tartu, Tartu, 198–199.
- Vinn, O., Toom, U., 2015. The trace fossil *Zoophycos* from the Silurian of Estonia. *Estonian Journal of Earth Sciences*, **64**(4), 284–288.
- Vinn, O., Wilson, M. A., Isakar, M., Toom, U., 2024. Two high Value Geoheritage Sites on Sõrve Peninsula (Saaremaa Island, Estonia): A Window to the Unique Late Silurian Fauna. *Geoheritage*, **16**(2), 53-68.