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Walter Gross 1903 - 1974

FIELD TRIP GUIDEBOOK

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Stop 16. Tori outcrop

Tori outcrop (called Tori Hell) is located on the left bank of the Pärnu River, approx. 20 km upstream of Pärnu in SW Estonia. Tori exposure is about 250 m long and 10 m high, being, thus the largest outcrop of the local unit, the Pärnu Regional Stage (RS) and also its stratotype.

The Pärnu RS is of the Middle Devonian, Eifelian age. It is the oldest Devonian unit in the Baltic area that crops out, whereas the underlying Lower Devonian strata belong to

subsurface units. The Pärnu RS overlies the Rezekne RS (Emsian) or unconformably the Silurian and even the Ordovician. It underlies the Narva RS. The Pärnu RS is largely a clastic unit. Its thickness varies from 15 to 47 m. The narrow outcrop area of the Pärnu RS is situated in the basins of the Pärnu River and its tributary, the Navesti River. The formation of the same name, the Pärnu Formation is subdivided into two members: the Tori and Tamme mbs.

The Tori Member consists of light grey or yellow fine to medium grained cross-bedded comparatively loose sandstone partly rich in mica; sandstone contains thin clay layers and pebbles. In the contact with the Silurian or Ordovician carbonate rocks sandstone of the Tori Mb is strongly cemented and includes pebbles of above rocks. The member is in SE Estonia up to 34 m thick.

The fossils characteristic of the Pärnu Fm come mostly from the Tori Mb. Of the exposures of the latter unit the Tori outcrop is the richest locality well known since the 19th century. It has yielded both animal and plant fossils.

Invertebrates are very rare. The old collections of the Tartu University Geological Museum contains a single lingulate brachiopod specimen from Tori. Fish remains are common, dark brown or black in colour and of rather poor preservation, i.e. mostly fragmental. They occur in the middle and lower part of the outcrop section. The fishes include: *Schizosteus heterolepis* (Preobr.) and *Psammolepis toriensis* (Mark-Kurik) (both common), *Tartuosteus* sp., *Actinolepis tuberculata* Ag., *Homostius* sp., *Byssacanthus dilatatus* (Eichw.) (common), *?Devononchus concinnus* Gross, *Porolepis* sp. (common), *Glyptolepis* sp., Osteolepididae, Dipnoi?. Plant remains are preserved as fragmental forking branches lacking fertile parts. They belong to the primitive plant *Hostinella* sp. (Pteridophyta or Progymnospermopsida). Phytollemma preparations have been made from these stems. Spores are also known from the Tori Mb, e.g. *Hymenozonotriletes parviconicus* Kedo.

The Tamme Member, consisting of grey, light green or pinkish fine-grained horizontally-laminated silty sandstone, and intercalating with siltstone and clay, forms the upper part of the Pärnu Fm. The sandstone may be comparatively loose or cemented with dolomite. Yellowish-grey sandy dolomite (0.5 -1 m thick) occurs at the top of the member. Thickness of the whole Tamme Member is 2 m or more.

Of fossils oogonia of charophyte algae are very frequent in the Tamme Mb. The name of the outcrop, the Tori Hell comes from the largest cave in the exposure. The roof of this cave has collapsed in the length more than 20 meters forming a gorge 5-8 m wide and 3.5-5.5 m deep. At the end of the gorge one can find a cave entrance, 4 m wide and 1.6 high. The cave is 8.5 m long and becomes gradually lower. The collapse of the cave has been gradual and was particularly rapid at the beginning of 20th century. The caves in the Tori and in several other Devonian outcrops in South Estonia are of suffosionic origin. Their development and also destruction is caused by numerous vertical crevasses in sandstone. Ground water, running in the crevasses has worn out a cave of complicated configuration.

Estonian folklore includes a number of stories concerning the Tori Hell (it has also been called Devils Hill). One of the versions tells that the cave was inhabited by devils mother using it as *sauna*. According to another story the cave was digged by dwarfs. Tori is known as a place where a large horse-breeding farm was founded long ago, in 1856. About 30 year later a Norfolk's trotter, the famous stallion "Hetman" was bought. Hetman had huge number of successors. In addition to it, several East-Friisian and Breton stallions were brought later to Tori for breeding the Tori horse based on local Estonian horses. The stallion Hetman has its monument in the park of the Tori Manor.

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