

## CLOSING A GAP – DISCOVERY OF A RARE ECHINOTHURIROID (ECHINODERMATA: ECHINOIDEA) IN THE MIOCENE OF STYRIA

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The echinothurioids or "leather sea urchins" are a group of echinoids characterised by their delicate skeleton with imbricate plates. Unlike most other echinoids, which have a relatively strong corona and are often preserved as fossils, the echinothurioids have an extremely poor fossil record. Apart from *Echinothuria floris* WOODWARD from the Santonian of England of which eight specimens are known (SMITH & WRIGHT, 1990) the present record is the only other fossil echinothurioid known from "complete" tests. Disarticulated material, mainly spines, have been reported from the Santonian of France ("*Phormosoma*" *homoei* LAMBERT, 1907), the Maastrichtian and Danian of Denmark ("*Araeosoma*" *mortenseni* RAVN, 1928, "*A.*" *brunnichi* RAVN, 1928 and "*Asthenosoma*" *striatissimum* RAVN, 1928) and the Netherlands (*Echinothuria* ? sp., JAGT, 2000; SMITH & JEFFERY, 2000), the Miocene of Sardinia ("*Phormosoma*" *lovisatoi* LAMBERT, 1907) and the Maltese Islands (KROH, unpublished data), and the Pliocene of New Zealand [*Araeosoma* aff. *thetidis* (CLARK), FELL, 1966; spine and test fragments].

The present specimens were recovered from the Lower Badenian (Langhian, Middle Miocene) marls overlying the coralline limestone of the Weissenegg Formation, outcropping in the quarries of the Lafarge cement company in Retznei, Styria. One of the two specimens is a nearly complete, albeit crushed corona, the other consists mainly of fragmented plates and spines. They belong to an echinothuriid with trigeminate ambulacra, crenulate, perforate primary tubercles, which are arranged in distinct adradial columns in the aboral interambulacra, membranous gap in aboral interambulacra and hollow, smooth primary spines. Unlike most extant echinothurioids which have spines terminating in a trumpet shaped hyaline hoof, the spines recovered terminate in a tapering, rounded tip.

Extant echinothurioids are almost exclusively confined to deep sea habitats, although some species of *Asthenosoma* (e.g. *A. varium* and *A. ijimai*, Red Sea and Indo-Pacific) are also found in shallow depth. The echinothuriids are epibenthic scavengers, which seem to ingest mainly macroplant debris (MORTENSEN, 1935), but may also feed on invertebrate prey. The spines and pedicellariae of some species contain strong toxins protecting the animals from predators.

Despite their poor fossil record the echinothurioids are a considerably old group. The earliest representatives known (*Pelanechinus*) come from Middle to Upper Jurassic sediments of England. In contrast to later members of this group they have a relatively strong skeleton and occur in shallow water environments. *Echinothuria* from the Late Cretaceous of England is the first and only well known fossil crown-group member of the echinothurioids.

A cladistic analysis was carried out to map the new taxon from the Middle Miocene of Austria on published trees for the echinothurioids (by SMITH & WRIGHT, 1990 and SMITH "The Echinoid Directory", 2003). The first runs with the original data matrices yielded no univocal results. A slightly extended set of characters, however, yielded a single most parsimonious tree that places the new taxon as sister-group to all living echinothuriinids and *Echinothuria* as sister-group of all living echinothuriinids plus the new taxon. This result is supported by the stratigraphic distribution of the taxa in question.

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