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Experimental taphonomy and in-vitro mineralisation of coleoid cranial cartilage at semi-natural conditions.

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Squids are an evolutionary-biological success model since the Palaeozoic. The presence of cartilage enables them to a high-speed predatory lifestyle. Although coleoid and vertebrate cartilage are histological very similar, there is no need for *in vivo* mineralisation in squids. Contrary, its mineralisation in dead specimens under laboratory conditions was investigated several times, but until now taphonomic studies on coleoid cartilage are rare. We present an experimental setting in which we investigate the decay and possible mineralisation processes of coleoid cartilage under semi-natural conditions, using a substrate from the eastern Black Sea, which was collected during the Mare Nigrum Expedition 226. Elemental analysis of the sediment with X-ray fluorescence (XRF) revealed hints for palaeoenvironmental similarities to the deposits of the Late Triassic Polzberg *Konservat-Lagerstätte* near Lunz am See (Lower Austria, Northern Calcareous Alps), which provides deep insights to the morphology and ecology of the fossil belemnitid *Phragmoteuthis bisinuata*, including the preservation of soft tissues such as cranial cartilage. Mineralogical composition of the recent sediment was analysed by X-ray diffractometry (XRD) and clay mineral analysis. In a test series, full specimens of the coleoid *Loligo vulgaris* were buried in the sediment samples for two months. After exhumation of the “fossilised” squid, decay processes will be documented with a strong focus on cephalic cartilage. Possible mineralisation can be determined by the use of XRD and Fourier-Transformation-Infrared-Spectroscopy (FTIR). Stained histological thin sections of *Sepia officinalis* cranial cartilage before and after the experiment, as well as Magnetic Resonance Tomography (MRI) of two cephalopod specimens

(*Octopus vulgaris* and *Loligo vulgaris*) and the corresponding reconstructions constitute the dataset for cephalic cartilage morphology and its comparisons to the semi-fossilized cartilages. The fossilisation process will be tested under different environments, while changes in temperature, oxygen saturation and pH-values will be monitored. Associated morphological changes will be quantified with Micro-Computertomography (Micro-CT) and the methods above mentioned.

The obtained data on the decay and preservation in microenvironments of the coleoid carcasses and possible onset of cartilage mineralisation will increase the knowledge on the individual factors that are involved in the fossilisation processes, which lead to exceptional preservation in *Konservat-Lagerstätten*.