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ABSTRACT BOOK

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Skeletal elements controlled soft-tissue preservation in echinoderms from the Early Ordovician Fezouata Biota

Farid SALEH¹, Bertrand LEFEBVRE², Christophe DUPICHAUD², Emmanuel MARTIN²,
Martina NOHEJLOVÁ³ & Léa SPACCESI²

¹ Institute of Earth Sciences (ISTE), University of Lausanne, Geopolis, 1015, Lausanne, Switzerland

² Univ Lyon, Univ Lyon 1, ENSL, CNRS, LGL-TPE, F-69622, Villeurbanne, France

³ Czech Geological Survey, Klárov 3, Praha 1, 118 21 Czech Republic

Exceptional fossils preserve non-biomineralized tissues in the geological record and provide crucial information on the evolution of life on Earth. Exceptionally preserved fossils are rarely discovered complete, challenging their morphological description and their palaeontological interpretation. Although decay experiments reconstructing degradation sequences in modern animals are necessary to better understand taphonomic processes involved in exceptional preservation, their applicability to some enigmatic and/or extinct fossil taxa is limited. Here, based on a representative sample of 423 specimens collected from a single stratigraphic level from the Early Ordovician Fezouata Biota, we reconstruct the degradation sequence of both skeletal remains and soft tissues of stylophorans, an extinct clade of echinoderms. The rare preservation of the water vascular system can be explained by the rapid post-mortem opening of cover plates resulting from the fast decay of associated muscles and the action of ligaments. In contrast, the proximal aulacophore and associated stylocone formed a particularly decay-resistant closed module, thus favouring the preferential preservation of included soft parts (foregut). The non-random location and frequency of pyritized intra-skeletal structures strongly suggest that skeletal elements dictated the preservation of underlying soft parts. As such, taphonomic investigations should not only focus on the environment surrounding a decaying animal, but also on the different micro-environments created within a particular carcass.