

ABSTRACT

Echinoderm Lagerstätten from high-latitude Gondwana – filling the gap in the Ordovician diversification of the phylum

Martina Nohejlová^{a*}, Christophe Dupichaud^b, Bertrand Lefebvre^b, Elise Nardin^c and Farid Saleh^d

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

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

^c UMR 5563 Géosciences Environnement Toulouse, Observatoire Midi-Pyrénées, CNRS, Toulouse, France

^d Institute of Earth Sciences (ISTE), University of Lausanne, Lausanne, Switzerland

* Corresponding author, martina.nohejlova@geology.cz

Received 31 March 2023, accepted ..., available online ...

The phylum Echinodermata is a major component of marine ecosystems since the first appearance of echinoderms in the Cambrian. Like other metazoan phyla, echinoderms underwent two major evolutionary pulses in early Palaeozoic times: the Cambrian Explosion and the Ordovician Radiation. In the Ordovician, the exploitation of new ecological niches triggered an exponential diversification of the phylum, leading to its highest morphological disparity and class-level diversity (about 18 classes compared to only the five extant classes) of the whole Phanerozoic. However, the precise spatio-temporal patterns of the Ordovician Radiation of echinoderms remain poorly known, owing to geographical and taphonomic biases. Over two centuries, the sampling effort was mostly focused on faunas from Europe and North America, providing a wealth of information on crinoid-and/or blastozoan ('cystoid')-dominated low-latitude assemblages from Avalonia, Baltica and Laurentia. Moreover, echinoderm Lagerstätten, bearing fully articulated skeletal elements, provide valuable snapshots of past communities but are rare in the rock record because echinoderm endoskeletons disarticulate into many calcite plates shortly after death. Recent discoveries of several new Ordovician Lagerstätten from high-latitude Gondwana, i.e., the Czech Republic (Barrandian area), France (Armorican Massif, Montagne Noire) and Morocco (Anti-Atlas, Meseta), provide a unique opportunity to fill the existing knowledge gap regarding the Ordovician diversification of the phylum. Echinoderm assemblages from high-latitude areas are dominated by asterozoans, blastozoans and stylophorans, with very few crinoids, unlike those from low-latitude regions. By comparing and combining these two sets of information, it is possible to coherently frame the early diversification of echinoderms in space and time.

Keywords: Echinodermata, Ordovician, diversification, Lagerstätten