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# Rocks and the Rise of Ordovician Life

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## MODELING THE PALEOECOLOGICAL TROPHIC NETWORK OF THE LOWER ORDOVICIAN FEZOUATA SHALE (MOROCCO) FOSSIL FAUNA

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The Fezouata Shale, a fossil Lagerstätte from the Lower Ordovician of Morocco, has a fauna composed of species typical of both the Cambrian Explosion and the Great Ordovician Biodiversification Event. This community is directly comparable to that of the Cambrian Chengjiang and Burgess Shales in that they were shallow, open water marine communities. Here, we reanalyzed species lists for the early Chengjiang fauna and later Burgess Shale assemblages. We then compiled a comprehensive species list for the Fezouata Shale and developed an empirical trophic network, including 15 of its comparable properties. These were compared to a modeling of the trophic structure of the three fossil faunas by the niche model, known for accurately representing modern trophic networks. An uncertainty analysis was also conducted to evaluate the presence of potential bias in the fossil data. The Fezouata trophic network was more speciose and larger (420 taxa and 18751 interactions; 178 trophic species and 4228 interactions) than that of Burgess (142 taxa and 771 interactions; 48 trophic species and 249 interactions) and Chengjiang Shales (85 taxa and 559 interactions; 33 trophic species and 99 interactions). The Fezouata network had a lower mean trophic level than that of Chengjiang, due to a higher proportion of basal species following the Ordovician Plankton Revolution. The Fezouata network was similar to the Burgess one as no property meaningfully differed between them. Thirteen properties of all three fossil networks showed little meaningful difference, but for a gradual increase or decrease from the oldest to youngest trophic networks. This is significant because it supports the hypothesis that there was a gradual slow-burn change in trophic complexity from the Cambrian Explosion through to the Late Ordovician, suggesting the Cambrian Explosion and the Great Ordovician Biodiversification Event were part of one same long-lasting diversification event.

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