

First animals developed complex ecosystems before the Cambrian explosion

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A group of Ediacaran specimens of Fractofusus and Plumeropriscum from the “E” surface, Mistaken Point Ecological Reserve, Newfoundland, Canada. Credit: Charlotte G. Kenchington (CC BY 4.0, creativecommons.org/licenses/by/4.0/)

Early animals formed complex ecological communities more than 550

million years ago, setting the evolutionary stage for the Cambrian explosion, according to a study by Rebecca Eden, Emily Mitchell, and colleagues at the University of Cambridge, UK, publishing May 17th in the open-access journal *PLOS Biology*.

The [first animals](#) evolved towards the end of the Ediacaran period, around 580 million years ago. However, the [fossil record](#) shows that after an initial boom, diversity declined in the run-up to the dramatic burgeoning of biodiversity in the so-called "Cambrian explosion" nearly 40 million years later. Scientists have suggested this drop in diversity is evidence of a mass extinction event roughly 550 million years ago—possibly caused by an environmental catastrophe—but previous research has not investigated the structure of these ancient ecological communities.

To evaluate the evidence for an Ediacaran mass extinction, researchers analyzed the metacommunity structure of three fossil assemblages that span the last 32 million years of this geological period (between 575 to 543 million years ago). They used published paleoenvironmental data, such as ocean depth and rock characteristics, to look for metacommunity structure indicative of environmental specialization and interactions between species. The analysis revealed increasingly complex community structure in the later fossil assemblages, suggesting that species were becoming more specialized and engaging in more inter-species interactions towards the end of the Ediacaran era, a trend often seen during ecological succession.



Dr Mitchell laser-scanning the E surface, Mistaken Point. In the foreground Ediacaran organisms such as *Fractofusus* are visible. Due to the subtle features of the fossils, they are only clearly visible for a particular angle of sunlight, as shown here. Credit: Charlotte G. Kenchington (CC BY 4.0, creativecommons.org/licenses/by/4.0/)

The results point to competitive exclusion, rather than [mass extinction](#), as the cause of the [diversity](#) drop in the late Ediacaran period, the authors say. The analysis indicates that the features of ecological and evolutionary dynamics commonly associated with the Cambrian explosion—such as specialization and niche contraction—were established by the first animal communities in the late Ediacaran.

Mitchell adds, "We found that the factors behind that explosion, namely

community complexity and niche adaptation, actually started during the Ediacaran, much earlier than previously thought. The Ediacaran was the fuse that lit the Cambrian explosion."

More information: "Metacommunity analyses show an increase in ecological specialisation throughout the Ediacaran period" *PLoS Biology* (2022). [DOI: 10.1371/journal.pbio.3001289](https://doi.org/10.1371/journal.pbio.3001289)

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