'Mysterious' ancient creature was definitely an animal, research confirms

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A Dickinsonia fossil was first described in 1947. Credit: Alex Liu

It lived well over 550 million years ago, is known only through fossils and has variously been described as looking a bit like a jellyfish, a worm, a fungus and lichen. But was the 'mysterious' Dickinsonia an animal, or was it something else?

A new study by researchers at the universities of Oxford, Cambridge, Bristol, and the British Geological Survey provides strong proof that Dickinsonia was an animal, confirming recent findings suggesting that

animals evolved millions of years before the so-called Cambrian Explosion of animal life.

The study is published in the journal *Proceedings of the Royal Society B*.

Lead author on the paper is Dr Renee Hoekzema, a PhD candidate in Oxford University's Mathematical Institute who carried out this research while completing a previous PhD in Oxford's Department of Earth Sciences. She said: "Dickinsonia belongs to the Ediacaran biota - a collection of mostly soft-bodied organisms that lived in the global oceans between roughly 580 and 540 million years ago. They are mysterious because despite there being around 200 different species, very few of them resemble any living or extinct organism, and therefore what they were, and how they relate to modern organisms, has been a long-standing palaeontological mystery."

In 1947, Dickinsonia became one of the first described Ediacaran fossils and was initially thought to be an organism similar to a jellyfish. Since then, its strange body plan has been compared to that of a worm, a placozoan, a bilaterian and several non-animals including fungi, lichens and even entirely extinct groups.

Co-author Dr Alex Liu, from the Department of Earth Sciences at the University of Cambridge, said: "Discriminating between these different hypotheses has been difficult, as there are so few morphological features in Dickinsonia to compare to modern organisms. In this study we took the approach of looking at populations of this organism, including assumed juvenile and adult individuals, to assess how it grew and to try to work out how to classify it from a developmental perspective."

The research was carried out on the basis of a widely held assumption that growth and development are 'conserved' within lineages - in other words, the way a group of organisms grows today would not have

changed significantly from the way its ancestors grew millions of years ago.

Dickinsonia is composed of multiple 'units' that run down the length of its body. The researchers counted the number of these units in multiple specimens, measured their lengths and plotted these against the relative 'age' of the unit, assuming growth from a particular end of the organism. This data produced a plot with a series of curves, each of which tracked how the organism changed in the size and number of units with age, enabling the researchers to produce a computer model to replicate growth in the organism and test previous hypotheses about where and how growth occurred.

Dr Hoekzema said: "We were able to confirm that Dickinsonia grows by both adding and inflating discrete units to its body along its central axis. But we also recognised that there is a switch in the rate of unit addition versus inflation at a certain point in its life cycle. All previous studies have assumed that it grew from the end where each "unit" is smallest, and was therefore considered to be youngest. We tested this assumption and interpreted our data with growth assumed from both ends, eventually coming to the conclusion that people have been interpreting Dickinsonia as having grown at the wrong end for the past 70 years.

"When we combined this growth data with previously obtained information on how Dickinsonia moved, as well as some of its morphological features, we were able to reject all non-animal possibilities for its original biological affinity and show that it was an early animal, belonging to either the Placozoa or the Eumetazoa.

"This is one of the first times that a member of the Ediacaran biota has been identified as an animal on the basis of positive evidence."

Dr Liu added: "This finding demonstrates that animals were present

among the Ediacaran biota and importantly confirms a number of recent findings that suggest animals had evolved several million years before the "Cambrian Explosion" that has been the focus of attention for studies into animal evolution for so long.

"It also allows Dickinsonia to be considered in debates surrounding the evolution and development of key animal traits such as bilateral symmetry, segmentation and the development of body axes, which will ultimately improve our knowledge of how the earliest animals made the transition from simple forms to the diverse range of body plans we see today."

More information: Renee S. Hoekzema et al, Quantitative study of developmental biology confirms Dickinsonia as a metazoan, *Proceedings of the Royal Society B: Biological Sciences* (2017). DOI: 10.1098/rspb.2017.1348

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