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# Giant Fungus Fed on Aquatic Microbes, Not Plants, Research Shows

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DURHAM, N.H. -- In a paper published this week in the *Proceedings of the Royal Society B: Biological Sciences*, University of New Hampshire research associate professor Erik Hobbie and co-author C. Kevin Boyce of the University of Chicago provide evidence that a fossilized, 20-foot-tall fungus that towered over Earth's landscape 400 million years ago likely thrived not by feeding on plants – as modern fungi largely do – but, rather, relied on carbon-rich microbial mats in floodplain environments.

The research outlined in the paper, entitled "Carbon sources for the Paleozoic giant fungus *Prototaxites* inferred from modern analogues," helps solve the long-running mystery about how the fungus could have grown so big in an environment largely devoid of host plants upon which to feed.

A rendering of Prototaxites as it may have looked during the early Devonian Period, approximately 400 million years ago. Credit: Painting by Mary Parrish, National Museum of Natural History.

The fungus, which when first described in 1859 was classified as a conifer because of its size, has long been a geologic curiosity. When it lived – during Earth's early Devonian period – the vascular plants common today and upon which fungi feed were just beginning to populate the landscape. The vascular plants, which were dwarfed by *Prototaxites*, were just simple stems with no roots or leaves – hardly a sufficient food source to grow the giant fungus.

Chemical and anatomical analysis by, among others, co-author Boyce, had shown that *Prototaxites* was indeed a fungus rather than a plant but until now the fungus was thought to have fed on land-based plants and microbes rather than on organic matter derived from aquatic photosynthesis by algae and bacteria.

Hobbie, of the Complex Systems Research Center at UNH's Institute for the Study of Earth, Oceans, and Space, specializes in analyzing the "light" and "heavy" forms of carbon (isotopes) in fungi. He discovered that the isotopic patterns Boyce had found in his Devonian-period samples of *Prototaxites* closely matched samples he had recovered from a recently deglaciated environment in Washington State's Cascade Mountains. Many of the

mushrooms from this barren environment were collected around the site's numerous shallow meltwater pools, an environment similar in some ways to the barren river valleys where plant life first evolved on land.

"I had collected mushrooms from that system and some of the isotopic patterns of the mushrooms didn't fit with any of the known carbon sources," explains Hobbie. As a result, he never published his findings, but when he saw Boyce's results he began to think the odd isotopic pattern he had found might reflect an aquatic origin for the source of carbon.

The *Proceedings of the Royal Society B: Biological Sciences* paper is the result of the two researchers combining their respective work – Boyce's *Prototaxites* analysis from the Devonian period and Hobbie's modern-era data. The National Science Foundation's Division of Integrative Organismal Systems funded the work.

Says Hobbie, "Fungi nowadays are primarily saprotrophic – getting food from dead organic matter – and they feed mostly on vascular plants. We know that plant life on land started in shallow river valleys because they were still very tied to water and high water availability and didn't have the biological characteristics needed to deal with arid conditions."

And we now know that the world's most humongous fungus grew on an alien Earth landscape around pools of carbon-rich water surrounded by stumpy proto-trees and bushes, millipedes, wingless insects, and worms.



-30-

**Image available to download:**
http://unh.edu/news/cj_nr/2010/mar/prototaxites_01.jpg
Caption: A rendering of *Prototaxites* as it may have looked during the early Devonian Period, approximately 400 million years ago.
Credit: Painting by Mary Parrish, National Museum of Natural History.