Ancient, bottom-dwelling critter proves: Newer isn't always better

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This is a *Rhabdopleura compacta* zooid. A new study identifies rhabdopleurids as an ancestor of more elaborate species that have since died off. Credit: Dr. Atsuko Sato, University of Oxford

Tiny sea creatures called rhabdopleurids reside on the ocean floor, building homes of collagen on the shells of dead clams. Rhabdopleurid colonies are small, and the critters are by no means the dominant animals

in their ecosystem.

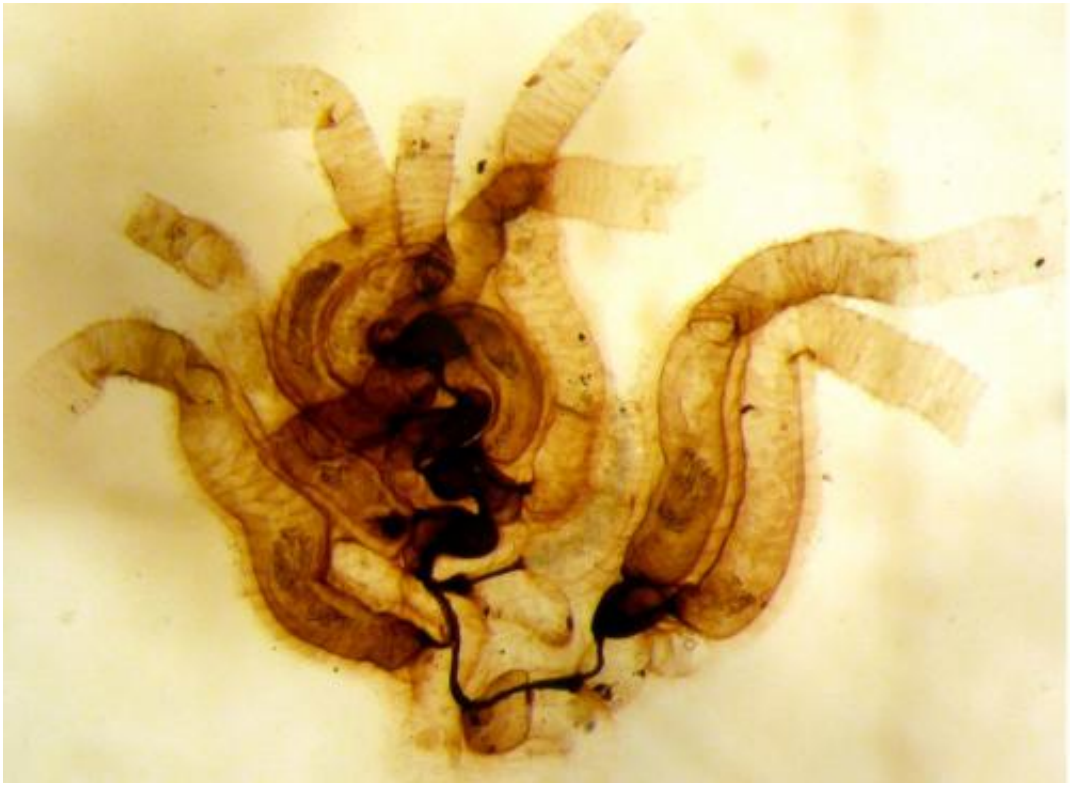
But they have lived this way—and survived—for more than 500 million years. And in doing so, they have outlasted more elaborate species that also descended from a common ancestor, according to a new study in the journal *Lethaia*.

Though rhabdopleurids' age and modern existence are well-documented, the paper breaks new ground by identifying them as a predecessor to ancient zooplankton—known as pelagic graptolites—that went extinct about 350 million years ago.

The lesson, according to lead author Charles Mitchell: Newer isn't always better.

"We think that change is always going to lead us to a better place, that evolution is always going to lead to something better," said Mitchell, a University at Buffalo geology professor. "But all this progress in making all these wonderful pelagic graptolites didn't lead them to take over the world. They didn't survive, but these simple dudes, these bottom-dwelling creatures, did."

Mitchell's partners on the research included Michael J. Melchin from St. Francis Xavier University in Nova Scotia, Canada; Chris B. Cameron of the Université de Montréal; and Jörg Maletz from the Frei Universität Berlin.



This is a colony of A *Rhabdopleura compacta*. Rhabdopleurids, which have lived at the ocean bottom for some 500 million years, build such colonies from collagen they secrete. Credit: University of Edinburgh

The paper, which appeared online on Aug. 2, used rhabdopleurids' structure and form to determine that they were some of the most primitive graptolites that ever existed.

While their zooplankton relatives evolved rapidly, splitting into many new species and evolving many new traits, rhabdopleurids pretty much stayed the same over the course of history.

As the zooplankton developed ways to live closer to the ocean's surface, the rhabdopleurids continued dwelling on the ocean floor. The zooplankton became important players in their new ecosystems. The

rhabdopleurids remained inconspicuous.

Ultimately, the conservative approach won out: The rhabdopleurids survived and are still around today, living in areas from Bermuda to the Bering Sea. The zooplankton graptolites went extinct.

"High speciation rates generally go hand in hand with high extinction rates, and likewise low with low," Mitchell said. "Conservative lineages may weather the storms of climate change and other events, but do not become big parts of the ecosystem, whereas the major players are impressive but often brought low by mass extinction and other 'slings and arrows of outrageous fortune.'"

The idea that conservative approaches can bear rewards over time is one that holds true not only in biology, but in other fields of study as well, Mitchell said. He pointed to financial markets as one example.

"You can pick 'safe' investments like bonds and blue chip stocks, and so expose your money to low risk of decline in values, but the yield is low, as well: Values do not grow much," Mitchell said. "On the other hand one can pick high-yield tech stocks like Facebook and Apple, but the risk of declines in value, especially in bad economic times, is also high."

Though humble, rhabdopleurids and the colonies they build are beautiful to behold under a microscope.

The creatures themselves are about a millimeter long and Y-shaped, with a pair of tentacled arms extending from a narrow body to filter food from the water. The colonies they fashion are whimsical-looking structures, consisting of a network of copper-colored tubes that resemble tiny elephant trunks, each one bearing numerous ridges.

The knowledge that rhabdopleurids are ancient graptolites will enable

researchers to gain insight into poorly understood aspects of graptolite biology. Studying rhabdopleurids could reveal new clues about how early graptolites looked and reproduced, and even what they ate.

More information: The paper is titled "Phylogenetic analysis reveals that Rhabdopleura is an extant graptolite."

Provided by University at Buffalo