Giant clams tell the story of past typhoons

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The waters surrounding Okinotori Island are home to a large number of Tridacna maxima, or giant clam. The isolated island is also located in a highly active typhoon region. Credit: Ministry of Land, Infrastructure, Transport and Tourism Kanto Regional Development Bureau

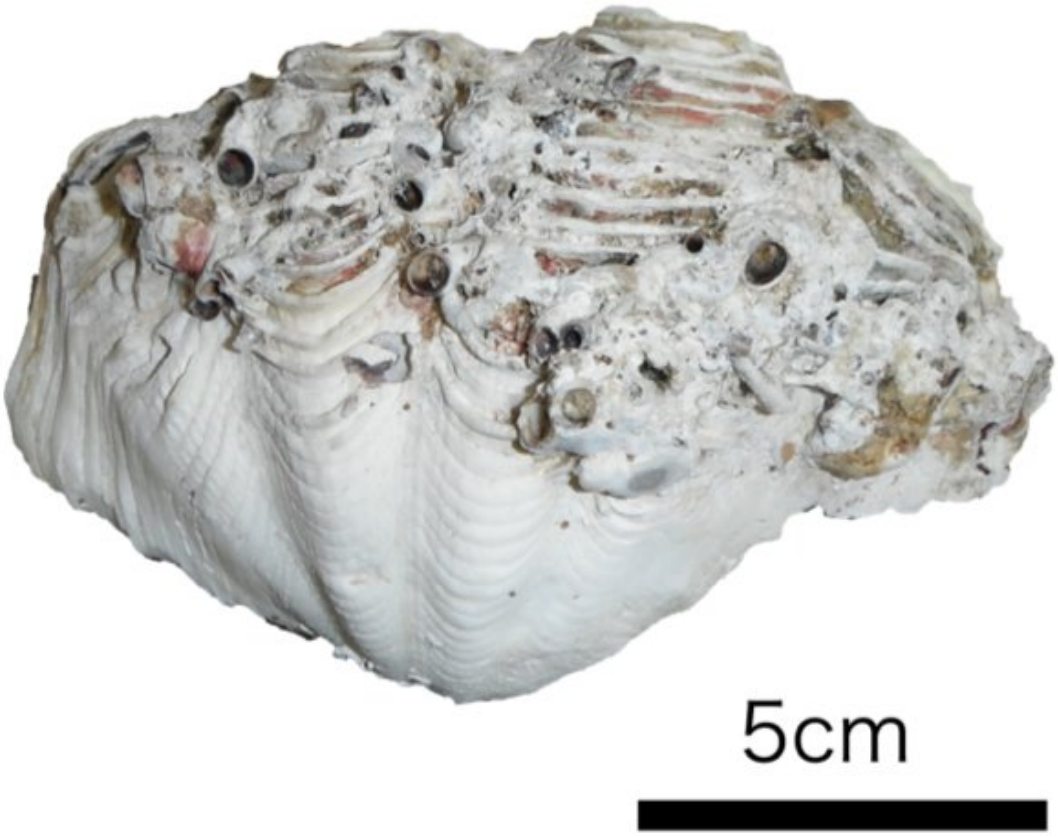
A team of researchers led by Tsuyoshi Watanabe of Hokkaido University has discovered that giant clams record short-term environmental changes, such as those caused by typhoons, in their shells. Analyzing the shell's microstructure and chemical composition could

reveal data about typhoons that occurred before written records were available.

Scientists are concerned that major tropical cyclones such as typhoons and hurricanes will increase with global warming. To better predict the frequency of these weather patterns, understanding typhoons in the past warmer periods of Earth's history is particularly important.

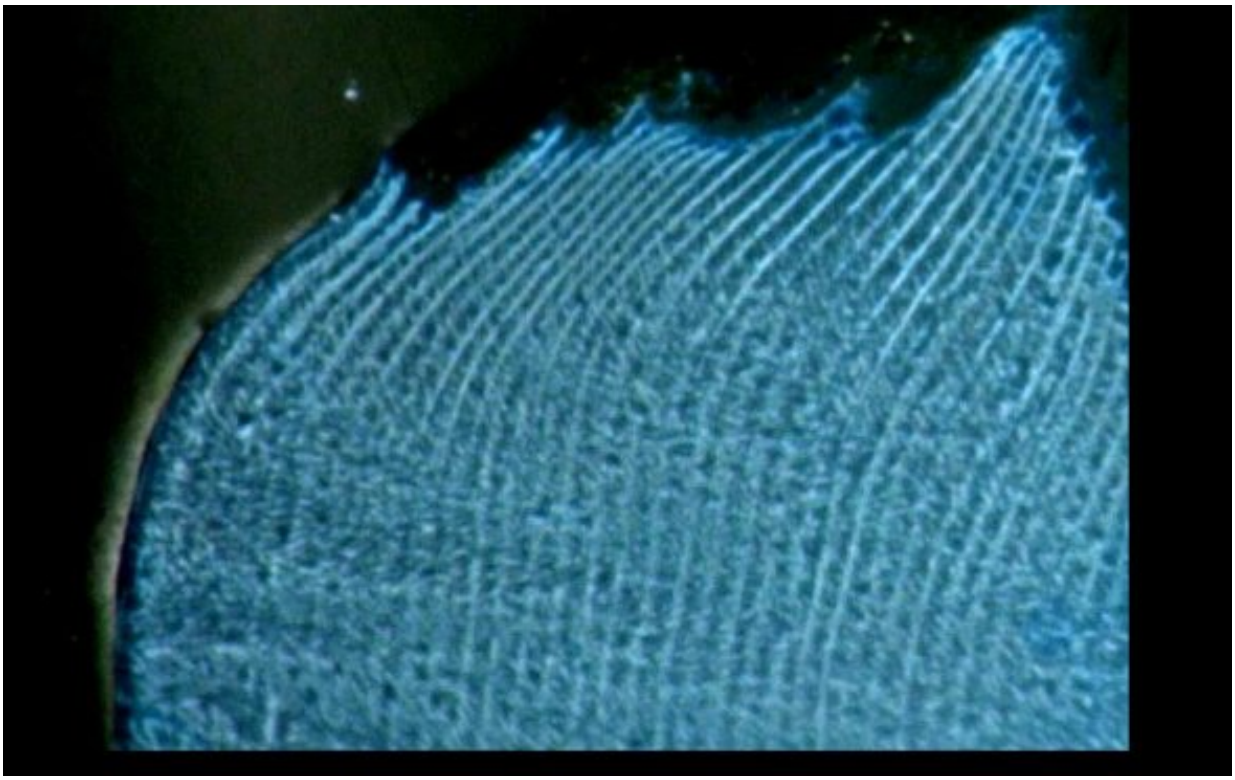
The giant clamTridacna maximaspecies was specifically chosen due to its fast and highly precise shell growth rate; daily growth increments in the shell can be seen, similar to tree rings, allowing researchers to accurately investigate the clam's paleoenvironment. Live specimens were sampled from the waters surrounding Okinotori Island, which lies in the middle of a common path taken by typhoons before making landfall in Japan and other parts of Asia. The team analyzed the shell growth increment of each year, measuring its thickness, stable isotope ratio, and the barium/calcium ratio. They then compared the data with the past environmental records such as typhoons and water temperatures.

With these methods, the team found the growth pattern and chemical compositions in the shells were altered by short-term environmental changes in the area. Cooler ocean temperatures and other environmental stresses brought on by typhoons disrupted shell growth and increased the barium/calcium ratio as well as the stable isotope ratio.



The whole Tridacna maxima valve. The shell was cut in two sections along the maximum growth axis. Credit: Komagoe T. et al., *Journal of Geophysical Research: Biogeosciences*

"Since microstructural and geochemical features are well preserved in giant clam fossils, it may now be possible to reconstruct the timing and occurrence of past typhoons to a level of accuracy that was previously impossible," says Tsuyoshi Watanabe of Hokkaido University.



Enlarged image of the shell edge showing a stripe pattern of growth increments. Geochemical analysis of increments reveals the clam's paleoenvironment. Credit: Komagoe T. et al., *Journal of Geophysical Research: Biogeosciences*

More information: Taro Komagoe et al. Geochemical and Microstructural Signals in Giant Clam Tridacna maxima Recorded Typhoon Events at Okinotori Island, Japan, *Journal of Geophysical Research: Biogeosciences* (2018). DOI: 10.1029/2017JG004082

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