Researchers find reliable climate change data in nearby corals

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Staghorn coral (Acropora cervicornis). Credit: Wikipedia, CC BY 2.5

Tracking climate change through corals has historically meant studying coral in remote locations, away from civilization and the related environmental conditions that might affect the data. But research compiled by University of Guam faculty and published in the Journal of Coastal Research proves otherwise.

"We're not the first ones to find climate signals in coral in this region, but what we did was we found climate signal in a bizarre place," said Mark A. Lander, an assistant professor of meteorology at UOG's Water & Environmental Research Institute of the Western Pacific and co-author of the report.

The 2011 master's thesis of Tomoko Bell, a former UOG environmental studies student and lead author of the report, studied 50 years' worth of data from a P. lutea coral colony off of Gab Gab Beach in Apra Harbor—a shallow-water, near-shore, economically and recreationally active area. Bell's results in Apra Harbor showed the same long-term warming trend shown in other local and regional meteorological records.

"Apra Harbor has Navy ships, beaches, and people are snorkeling, but we got a climate signal, and it goes against the grain of what people think needs to be done to get climate data," Lander said. "Most scientists who set out to retrieve climate signals from coral try to find pristine, clean, undisturbed, deeper water locations."

The problem with using undisturbed locations are the logistical difficulties in drilling the coral and inaccessibility, which prevents researchers from closely monitoring environmental variables that might influence the chemical signal in the coral.

Bell's research consisted of drilling into the coral with a special tool and extracting samples from different periods of the coral's growth. She determined the strontium to calcium ratio of each sample, which shows an inverse correlation to the seawater temperature during the coral segment's formation. The accessibility of the site enabled her to also document environmental variables.

Lander then took the raw data and found that it followed the records found in the El Niño–Southern Oscillation (ENSO) and Pacific Decadal

Oscillation (PDO) indices, which track sea surface temperatures, over 50 years.

"This shows that reliable records of local climate are possible from disturbed places no one would have ever thought to look, and it means that great efforts need not be expended on the logistics of finding, traveling to, and maintaining instrumentation at a remote, pristine, undisturbed site," Lander said.

Having climate data locally allows scientists to establish a baseline for tracking climate change, he said, and to assess its impact in that location. Additionally, by using corals to determine the past climate of the ocean, scientists can make climate projections for the future.

"The results were unexpectedly interesting and are a novel contribution to this line of research," said John W. Jenson, director of WERI at the University and a co-author of the paper.

The data from a study of other corals in Apra Harbor and in Asan, however, did not yield the same results and still requires research as to why, Lander said.

After the discovery, Bell, Lander, Jenson and the other researchers—Richard H. Randall of UOG's WERI, Judson W. Partin of the Institute for Geophysics at the University of Texas, and Nancy G. Prouty of the U.S. Geological Survey's Pacific Coastal & Marine Science Center—merged the two studies into one 43-page article: "A 50-Year Sr/Ca Time Series from an Enclosed, Shallow-Water Guam Coral: In situ Monitoring and Extraction of a Temperature Trend, Annual Cycle, and ENSO and PDO Signals."

More information: Tomoko Bell et al. A 50-Year Sr/Ca Time Series from an Enclosed, Shallow-Water Guam Coral: In situ Monitoring and

Extraction of a Temperature Trend, Annual Cycle, and ENSO and PDO Signals, *Journal of Coastal Research* (2018). DOI: 10.2112/JCOASTRES-D-16-00099.1