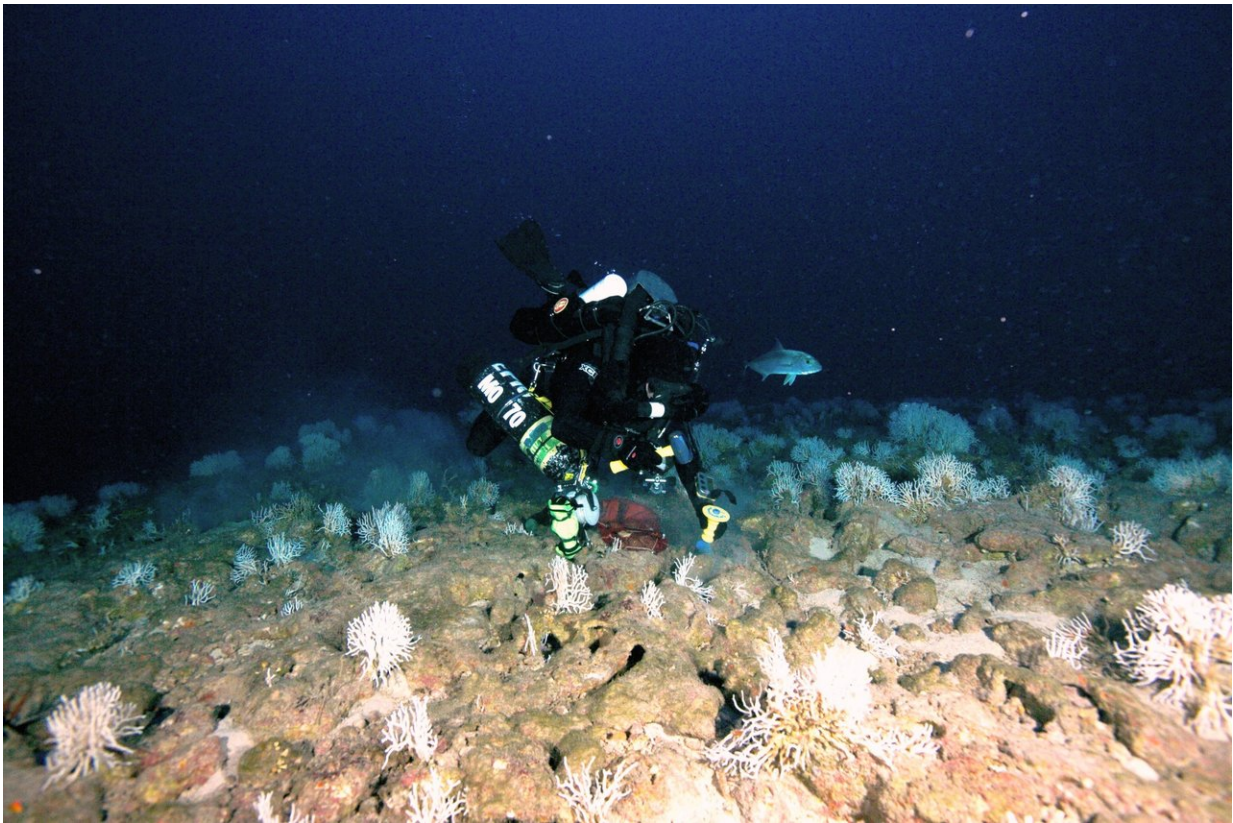


Did rapid sea-level rise drown fossil coral reefs around Hawaii?

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Technical rebreather SCUBA divers collecting the fossil coral material used in this study from the submerged terrace off of Kawaihae. Credit: Association for Marine Exploration.

Investigations to predict changes in sea levels and their impacts on

coastal systems are a step closer, as a result of international collaboration between the University of Sydney and researchers from Japan, Spain, and the United States.

Scientists globally are investigating just how quickly sea-level rise can occur as a result of global warming and ice sheets melting.

Recent findings suggest that episodes of very rapid sea-level rise of about 20m in less than 500 years occurred in the last deglaciation, caused by periods of catastrophic [ice-sheet](#) collapse as the Earth warmed after the last ice age about 20,000 years ago.

Lead author, PhD candidate at the University of Sydney, Kelsey Sanborn, has shown this sea-level rise event was associated with "drowning" or death of [coral reefs](#) in Hawaii.

The results are published today in leading geosciences journal *Quaternary Science Reviews*.

The paper provides new evidence of a meltwater pulse (referred to as meltwater pulse 1-A), based on analysis of fossil coral [reef](#) samples from off the coast of Kawaihae, on the northwest of the Big Island of Hawaii.

Co-author Associate Professor Jody Webster, from the Geocoastal Research Group at the University of Sydney's School of Geosciences, said although this pulse was greater than current modelling predictions of sea-level rise over the next few hundred years, it provides an example of the risks rapid environmental change poses to our marine ecosystems.

"If we saw a sea-level rise in the future of a similar rate as this past event, it would likely devastate coral reefs and coastal systems," Associate Professor Webster said.

The fossil corals used in this study were collected by a team of technical rebreather scuba divers who dove down to 150 m below present sea level to access the fossil reef. At this depth, more than 130m deeper than where you could dive along their living shallow counterparts today, the divers recovered targeted shallow reef species that were alive over 14,700 years ago.

Lead author Ms Sanborn said this coral reef had been growing for thousands of years, during the initially gradual sea-level rise as the ice sheets of the last ice age began to melt.

"During the meltwater pulse, sea level rose more rapidly than the reef could grow, preventing the photosynthetic algae living within the corals from receiving enough sunlight. This caused the previously thriving fringing reef system to drown, and left it to be overgrown by deep-water algae and other marine life," she said.

Although uncertainty remains regarding how quickly coastal areas could be inundated around the world, understanding how these events occurred in the past are key to understanding the risks we face in the future.

"The fact that this meltwater pulse was large enough to drown a large, active Hawaiian reef system implies that extreme climate change and associated sea-level rise occurred quite rapidly," Ms Sanborn said.

This event is believed to have been brought about by catastrophic melting of the Greenland, and potentially also Antarctic, ice sheets.

"This may help us better predict the extent of future sea-level rise based on how vulnerable the Antarctic ice sheet is to collapse and melting," Ms Sanborn said.

The research was a collaborative effort between the University of

Sydney, the University of Tokyo, the University of Florida, the University of Granada, the Monterey Bay Aquarium Research Institute, the University of Hawaii, and the Association for Marine Exploration.

Research details

As part of the research, Ms Sanborn examined the evidence for reef drowning by identifying the coral reef species which grow within a specific depth range, and dating them using radiocarbon dating.

Taking into account the sinking of the island due to its volcanism, the relative-sea level history of Kawaihae was reconstructed.

The findings suggest that this reef was rapidly drowned by the combined effects of sinking of the island and global sea-level rise.

This is supported by other studies from around the world showing a rapid [sea-level rise](#) around 14,700 years ago.

More information: Kelsey L. Sanborn et al, New evidence of Hawaiian coral reef drowning in response to meltwater pulse-1A, *Quaternary Science Reviews* (2017). [DOI: 10.1016/j.quascirev.2017.08.022](#)

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