Groundbreaking deepwater fossil study reveals reef's past and future

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(Phys.org) —Many people look back at their time on the Great Barrier Reef by viewing holiday snaps. Scientists have taken an even longer look back at the Great Barrier Reef via another image caught in time - deepwater fossils - which reveal the important role the deepwater reef plays in the health of the whole reef.

The research led by University of Sydney scientists Dr Liz Abbey and Dr Jody Webster, from the School of Geosciences in the Geocoastal Research Group, has recently been published in the journal *Palaeogeography, Palaeoclimatology, Palaeoecology*.

As the first comprehensive study of its kind on the deepwater fossil reef system in the Great Barrier Reef, the results are an analysis of the environments and timeframe the reefs developed in. These deepwater reefs are called mesophotic reefs and extend from 30 metres to 100 metres underwater.

The scientists collaborated with colleagues from the Australian Nuclear Science and Technology Organisation, Universidad de Granada, University of Oxford, University of Edinburgh, Aix-Marseille Université, Queen's University and the University of California.

The team are the first in the world to document and analyse the response of a mesophotic reef community to environmental disturbances over thousands of years, and to see how the reef responds to global sea-level rise and environmental changes.

"Nothing was previously known about the long-term record of mesophotic reefs on the Great Barrier Reef, and in fact, mesophotic reefs have been rarely, if ever, analysed using their fossil records, so this study is a real first," said Dr Webster.

"Significantly, our findings suggest that while these mesophotic reef systems have been an important part of the Great Barrier Reef's geologic past over the last 20000 years, they have actually been very sensitive to past environmental changes, such as sea level rises and increased sediment flux. This, of course, has relevance to how the modern Great Barrier Reef deepwater reef systems might behave in the future."

Dr Webster, together with his recently finished PhD student Liz Abbey looked at the mesophotic fossils. These are too deep to access via scuba-diving, so very little research has been carried out on this type of reef around the world, especially in comparison with their more accessible shallow water counterparts.

"Even in low light, the modern mesophotic reefs support corals, sponges and algae as the dominant structural components," said Dr Webster.

"We focussed on three fossil mesophotic reefs in the Great Barrier Reef and examined the timing of their development, analysed the species and uncovered the historical environmental settings for the reefs."

Using radiometric dating - carbon-14 and uranium-thorium dating - as well as analysing the sedimentary layers and paleoecology of the fossil reefs, the team discovered that the mesophotic reefs in the Great Barrier Reef had two specific periods of growth.

"We found that there were two distinct generations of fossil mesophotic coral community in the Great Barrier Reef - the first period was from 13000 until 10200 years ago, with a roughly two thousand year break,

then the second period from 7800 years ago until now," said Dr Webster.

"This period of over two thousand years when mesophotic coral growth was interrupted happened when there was a massive sediment flux, with sediment moving from the reef shelf to the basin. It appears that this huge movement of sediment happened as sea levels rose - flooding a huge area of the shelf during this time."

"It's very important to see how the mesophotic reef has responded to these challenges in the past, as we may be facing some of the same environmental changes in the near future, especially with global sea levels rising."

More information: www.sciencedirect.com/science/ … ii/S0031018213004458

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