Major study reveals Great Barrier Reef’s 30,000-year fight for survival

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Research news

A landmark international study, recently published in Nature Geoscience, shows that the Great Barrier Reef has suffered 5 death events in the last 30,000 years. The groundbreaking study of the world’s largest reef system, involving the participation of Juan Carlos Braga Alarcón, a Full Professor at the UGR’s Department of Stratigraphy and Palaeontology, reveals that these events were driven mostly by variations in sea level and associated environmental changes.

The importance of the study cannot be overstated, as the project is the first of its kind to reconstruct the evolution of the reef over the last 30 millennia in response to large-scale, abrupt environmental changes. The research findings indicate that the reef adapted to these dramatic changes by migrating up and down the sea floor as the sea level rose and fell.

To obtain comprehensive geomorphic, sedimentological, biological and dating information, scientists deployed underwater sonar to map the seafloor and extracted fossil reef cores at 16 locations. Overall, the research demonstrates that the reef adapted to major environmental changes such as sea level and water temperature rise more effectively than previously thought. However, the study also sheds light on the reef’s high sensitivity to sediment input and poor water quality.

The findings illustrate the remarkable adaptation capacity of the reef, which on five occasions bounced back from death events and adapted to sudden environmental variations. Amongst other important events in the history of the reef, the study

covered the time period before the Last Glacial Maximum, which occurred around 20,000 years ago when the sea level was 118 metres below the current readings. During this period, approximately 30,000-22,000 years ago, the reef suffered two death events due to subaerial exposure — exposure of the reef to air caused by falling sea levels. In response, the reef migrated seaward to try to keep up with these significant drops in sea level.

Subsequently, around 17,000 to 13,000 years ago, after the Last Glacial Maximum, the reef suffered another two substantial death events, this time caused by rapid sea-level rise as the ice sheets melted. During this period, the reef started migrating landward; a strategy which would once again prove to be essential to its survival.

The final death event, which occurred approximately 10,000 years ago — before the emergence of the modern reef, was not clearly linked to any abrupt sea-level rise or post-glacial meltwater pulse. After analysing the core samples and data on sediment flux, the scientists concluded that rather than being directly connected with any rise in sea level, the event was related to a massive increase in sediment influx and poorer water quality.

The researchers suggest that while the reef has been able to turn the corner after all 5 death events, mainly due to its remarkable ability to move across the seafloor at a rate of between 0.2 and 1.5 metres a year, they are doubtful about its ability to survive the current trend of global reef decline. Major environmental changes, largely caused by harmful human activities since European settlement, are adding to the extent of coral bleaching, sea surface temperature rises, declines in coral coverage and water quality; all of which greatly affect the reef’s ability to adapt and survive.

Consequently, the scientists express grave concern for the future of the reef, pointing out that the its high sensitivity to sediment input should motivate further inquiry into how practices from primary industry influence sediment influx and water quality in the immediate proximity of the reef. In a similar vein, they warn that more attention should be paid to how rising sea-surface temperatures threaten the future of the reef; while previous studies confirm that sea-surface temperatures rose by only a couple of degrees over a timescale of 10,000 years, this pace has sped up drastically to 0.7 degrees per century.

The multinational study was conducted under the auspices of the International Ocean Discovery Program — a research collaboration that coordinates seagoing expeditions

to study the history of the Earth recorded in sediments and rocks beneath the ocean floor.

Read the full paper here:

Jody M. Webster, Juan Carlos Braga, Marc Humblet, Donald C. Potts, Yasufumi Iryu, Yusuke Yokoyama, Kazuhiko Fujita, Raphael Bourillot, Tezer M. Esat, Stewart Fallon, William G. Thompson, Alexander L. Thomas, Hironobu Kan, Helen V. McGregor, Gustavo Hinestrosa, Stephen P. Obrochta and Bryan C. Lougheed (2018). Response of the Great Barrier Reef to sea-level and environmental changes over the past 30,000 years. Nature Geoscience, 1. https://doi.org/10.1038/s41561-018-0127-3

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