

Glacial-interglacial biotic changes on the Great Barrier Reef from onshore and offshore boreholes

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Understand how ecosystems respond to global environmental changes is important to predict their fate and decide on adequate measures of protection. The fossil record offers a unique opportunity to study the influence of natural perturbations on ecosystems. Here we examine the response of the Great Barrier Reef (GBR) coral communities to glacial-interglacial cycles based on a combination of offshore and onshore boreholes drilled by IODP Exp. 325 in 2010 and by the International Consortium for the GBR Drilling in 1995, respectively. Thirty four offshore boreholes were drilled during IODP Exp. 325 along four transects at three localities along the shelf edge of the GBR (Hydrographers Passage, Noggin Pass, and Ribbon Reef). These boreholes record the evolution of the GBR during glacial-deglacial conditions when the continental shelf was exposed and reef growth was restricted to the shelf edge. The onshore core material consists of two deep boreholes drilled in Ribbon Reef 5 (RR5) and Boulder Reef (BR) in the northern GBR. The RR5 and BR boreholes record a succession of highstand reef sequences formed during late deglacial-interglacial conditions when the shelf was submerged. These two data sets combined provide the first record of biotic changes in the GBR during a complete cycle of glacio-eustatic sea level change, from the glacial maximum to full interglacial conditions. Our statistical analysis reveals a marked difference in coral composition between glacial-early deglacial fringing reefs and late deglacial-interglacial barrier reefs, and enables us to clarify the relationships between reef architecture, shelf morphology and coral composition.

Keywords: Corals, Glacial-interglacial cycles, Great Barrier Reef, Quaternary, Boreholes