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Response of reef-building corals to post-glacial sea level rise: IODP Expedition 325

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Major objectives of the Integrated Ocean Drilling Program (IODP) Expedition 325 (GBREC: Great Barrier Reef Environmental Changes) include reconstructing histories of sea-level change, sea surface temperature variation and reef growth since the Last Glacial Maximum (LGM), and analyzing the responses of reef-building corals to post-glacial sea level rise. Submerged reef structures were drilled along four transects in three localities (Hydrographers Passage, Noggin Pass, and Ribbon Reefs) on the shelf edge seaward of the modern Great Barrier Reef. A total of 34 boreholes were cored at 17 sites ranging in depth from 42 to 167 meters below present sea level.

Seven coral assemblages are identified based on coral taxonomy and morphologies. Their paleoenvironments are inferred by comparison with modern coral communities of the Great Barrier Reef and range from shallow wave-exposed to deep low-energy reef habitats. The initial post-glacial coral assemblage is dominated by shallow-water massive-submassive-branching Isopora associated with branching Acropora and Seriatopora. The deeper assemblages consist mainly of encrusting to submassive Montipora and encrusting Agariciidae. Horizontal changes in coral assemblages along transects, from proximal to distal cores, probably reflect the changing reef geomorphology and hydrodynamic regime during sea level rise. Vertical changes within a core reflect an increase in water depth followed by a drowning of the coral community and the formation of the submerged reef tops. As sea level rose, shallow reef assemblages re-established further upslope and accumulated several meters of reef structure before drowning in turn.

Keywords: IODP Expedition 325 GBREC, Great Barrier Reef, corals, last deglaciation, sea level rise, paleoenvironmental changes