

A PRELIMINARY ASSESSMENT OF CORAL REEF DIVERSITY AND REEF DEVELOPMENT DURING THE LAST DEGLACIATION, OFFSHORE MOZAMBIQUE

James S. Klaus, Will Wright, and Gregor P. Eberli

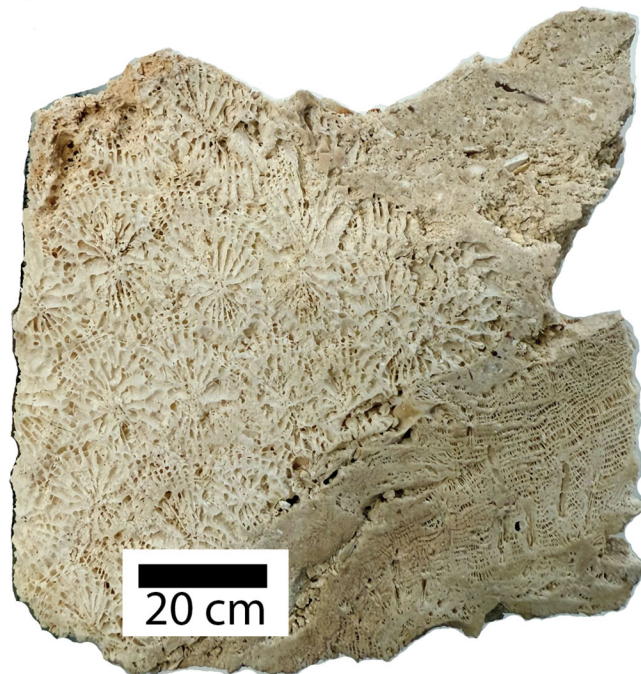
KEY POINTS

- The offshore Mozambique reef cores provide a unique opportunity to investigate the nature of reef development in association with sea level and environmental changes during the last deglaciation.
- A diverse coral fauna has been found throughout the 65 m of retrieved reefal core.
- 13 distinct morpho-taxonomic groups including 11 distinct genera have been identified so far.
- While tabular *Acropora* is the dominant taxa found in the core, vertical variations in coral composition reflect changes in sea level and environmental conditions throughout the period of reef development.

INTRODUCTION

Coral reef systems serve as important natural archives for tracking historical sea level shifts and environmental conditions. Because tropical coral reefs are highly responsive to changes in water chemistry and physical surroundings, they provide valuable insights into past climate and environmental variations. Shifts in factors like light availability and nutrient concentrations are often mirrored in the structure and composition of reef communities, as many reef-dwelling species are sensitive to even slight ecological disturbances.

The last deglaciation has proven to be particularly interesting regarding coral reef development in response to sea level and environmental change. Previous drilling projects have been conducted in Barbados (Fairbanks, 1989, Peltier and Fairbanks, 2006) around Tahiti (IODP expedition



*Figure 1. Sample of Mozambique lowstand reef core showing well preserved framework reef development with tabular *Acropora* and massive *Favia*.*

310; Camoin et al. 2007a, b, 2012) and off the Australian Great Barrier Reef (IODP Expedition 325; Webster et al. 2011, Yokoyama et al. 2011).

For example, the Tahiti sea-level record is based on the taxonomy and morphology of dominant and secondary coral colonies (branching, robust branching, massive, tabular, foliaceous and encrusting) and associated biota including coralline algae, gastropods, and foraminifera (Camoin et al. 2007). These authors use a robust branching *Acropora* and or *Pocillopora* assemblage associated with Mastophoroid coralline algae to constrain palaeowater depths to within 6m. Community transitions within a core may therefore represent reef response to changing palaeo-environmental conditions, but similar patterns may also be produced by ecological succession and vertical reef accretion, or lateral growth during sea level still stands. Homogeneous composition of framework facies within a given sequence may indicate the persistence of uniform environmental conditions, whereas repeated abrupt facies changes are interpreted to indicate lateral displacements of coral communities.

The reef cores recently obtain from offshore Mozambique provide another unique opportunity to investigate the nature of reef development and faunal change in association with sea level and environmental fluctuations during the last deglaciation.

DATA SET AND METHODS

Preliminary analysis of core ES-103-BH collected from ~94 m water depth offshore Mozambique has provided a catalog of coral diversity throughout the 65 m long core. Visual inspection of the core material allowed for corals to be identified to broad taxonomic groups (typically genera) and assigned growth form characteristics (branching, tabular, massive, free-living). Future petrographic analysis will certainly help refine taxonomic identifications.

MAIN RESULTS

Reef Diversity

Preliminary assessments have identified 13 distinct morpho-taxonomic groups including 11 distinct genera. The genus *Acropora* was divided into tabular and branching growth forms. Similarly, the genus *Porites* was divided into massive and branching growth forms. This is clearly a minimum estimate of diversity given much of the coral material in the core is unidentifiable without petrographic thinsections due to bioerosion and encrustation. The cores were extracted in 1.5 m coring intervals, and when assessed by coring interval, diversity ranged from zero to seven taxa with an average of three taxa per 1.5 m coring interval. By far the dominant taxa identified in the core is the tabular growth form of the genus *Acropora*. Vertical changes in coral composition can be recognized and likely reflect changes in sea level and reef environmental conditions.

Modern day reefs from offshore Mozambique are extremely diverse. When assessed across all reef environments modern surveys have identified upwards of 40 distinct genera. These genera show distinct zonation patterns and reflect clear environmental preferences of the diverse taxa. While the documented diversity of the first Mozambique lowstand core has only captured roughly a

quarter of this diversity, it does provide important insight into the dominant reef building taxa present in the region during the last deglaciation and will provide a unique data set for comparison with other well documented lowstand reefs from Tahiti and the Great Barrier Reef.

REFERENCES

- Camoin, G.F., Iryu, Y. and McInroy, D. and the Expedition 310 scientists (2007a) Proc. IODP, 310. Integrated Ocean Drilling Program Management International, Inc., College Station, TX. doi:10.2204/iodp.proc.310.101.2007.
- Camoin, G.F., Iryu, Y., McInroy, D. and the Expedition 310 scientists (2007b) IODP Expedition 310 reconstructs sea-Level, climatic and environmental changes in the South Pacific during the Last Deglaciation. *Sci. Drill.*, 5, 4–12.
- Camoin, G.F., Seard, C., Deschamps, P., Webster, J.M., Abbey, E., Braga, J.C., Iryu, Y., Durand, N., Bard, E., Hamelin, B., Yokoyama, Y., Thomas, A.L., Henderson, G.M. and Dussouillez, P. (2012) Reef response to sea-level and environmental changes during the last deglaciation: Integrated Ocean Drilling Program Expedition 310, Tahiti Sea Level. *Geology*, 40, 643–646.
- Fairbanks, R.G. (1989) A 17,000-year glacio-eustatic sea level record: influence of glacial melting rates on the Younger Dryas event and deep-ocean circulation. *Nature*, 342, 637–642.
- Peltier, W.R. and Fairbanks, R.G. (2006) Global glacial ice volume and Last Glacial Maximum duration from an extended Barbados sea level record. *Quatern. Sci. Rev.*, 25, 3322–3337.
- Webster, J.M., Yokoyama, Y. and Cotterill, C. and Expedition 325 Scientists (2011) Proceedings of the Integrated Ocean Drilling Program Volume 325 Expedition Reports Great Barrier Reef Environmental Changes, Integrated Ocean Drilling Program Management International, Inc., for the Integrated Ocean Drilling Program.
- Yokoyama, Y., Webster, J.M., Cotterill, C., Braga, J.C., Jovane, L., Mills, H., Morgan, S., Suzuki, A. and Expedition 325 Scientists. (2011) IODP Expedition 325: Great Barrier Reefs reveals past sea-level, climate and environmental changes during the end of the last Ice age. *Sci. Drill.*, 12, 32–45.