MICROBIALITES WITHIN A LOWSTAND CORAL REEF, OFFSHORE MOZAMBIQUE

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OBJECTIVES

- To investigate the unique coral and microbial assemblages of a core section dated between 13400 to 13600 kyrs that formed in the last glacial period.
- Quantify the respective amounts of corals, microbialites and allochems in the reef framework.
- Reconstruct seawater chemistry and (anoxic or oxic?) conditions for microbial crust formation.
- Investigate the role of microbial binding in the early marine diagenesis and test the strength of these microbial bindings.

INTRODUCTION

The analysis of the slopes above the newly discovered giant gas fields offshore Mozambique (Fonnesu et al., 2020) revealed a long, approximately 40 m thick fringing reef that crested at -95 m water depth. A 2 m section of a core that was drilled through the reef displays a diverse coral community with several species from the genus *Montipora* and a few *Porites*, *Galaxea*, *Pocillopora*, and *Platygyra* but also thick crusts of greyish microbialites (Fig.1) and microbial pellets inside the coral frame (Fig. 2). Two samples collected for C-14 dating from this section yielded ages of 13400 and 13600 kyrs, documenting reef growth shortly after the Last Glacial Maximum during the deglaciation and the accelerated sea-level rise event called Meltwater Pulse 1A.

Similar microbialites in reefal environments have been documented in other Last Glacial Maximum and deglacial reefs in Tahiti, the Great Barrier Reef and the Maldives (Camoin et al., 2006; Heindel et al., 2012). In these publications, the microbialite has been interpreted to reflect the environmental change stemming from the deglaciation. In addition, the thickness of the crust has been attributed to the various amounts of fertilization from chemical weathering of volcanic rocks that stimulated primary productivity and microbialite formation. Based on lipid markers and chemical analysis Heindel et al. (2012) propose that sulfate

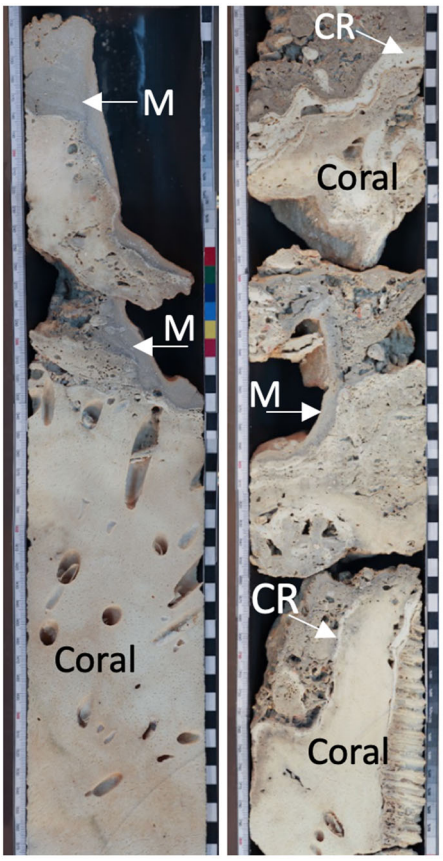

Figure 1: Core section lowstand reef with a diverse coral community and encrustations of microbialite (M) as well as calcareous red algae (CR).

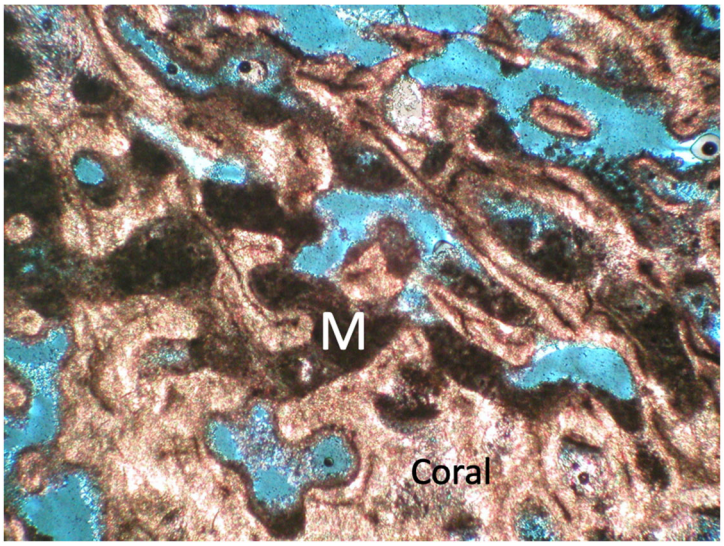

Figure 2: Thin section photomicrograph illustrating the occurrence of microbial micrite in the coral frame.

reducing bacteria play a crucial role in the precipitation of the microbial carbonate. The goal of this study is to test if similar mechanisms operated in the formation of the microbialites. In addition, we intend to estimate how much the microbialites contribute to the strength of the reef framework.

PROPOSED ANALYSIS

We will investigate the unique coral and microbial assemblages within a 2 m section using both visual inspection of the core, the thin section and SEM images. Color-coding of the various components and quantitative analysis using Image J will quantify the respective amounts of corals, microbialites and allochems. Chemical analysis will include XRD analysis of mineralogy, stable isotope analysis of the various components and rare earth elements (REE) for determining the oxidation stage during microbialite formation. C-14 ages will help to determine the age difference between corals and microbialite.

SIGNIFICANCE

Microbially encrusted coral reefs contain large intraframe porosity yet display an extraordinary strength, thus maintaining this porosity to large burial depth. If such microbialite/coral reefs form preferentially during deglacial periods, they could be identified as lowstand reefs on seismic data.

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