INTRODUCTION TO THE MOZAMBIQUE CORAL REEF PROJECT

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KEY FINDINGS

- A 65 m core through the fringing lowstand reef offshore Mozambique had an excellent 86% recovery of highly diverse coral reef succession.
- Facies succession from fore reef slope to reef crest and back reef environment were retrieved but no siliciclastic layers.
- A variety of microbialites are an integral part of the reef edifice.
- The near complete record will be the foundation for investigating the pattern of global ice sheet dynamics and sea-level changes over the past 30,000 years

BACKGROUND

During the last glacial maximum (LGM) sea level was approximately 125 m lower than today. During this sea level lowstand coral reef systems established in the several ocean basins but drowned during the subsequent rapid sea level rise during the deglaciation. These submerged coral reef systems have been cored in several places around the world, including offshore the modern Barrier Reef and Tahiti (Camoin et al., 2006; Heindel et al., 2012, Vacchi et al., 2025, Webster et al., 2025). Core material from these reefs were used to reconstruct the pattern of global ice sheet dynamics and sea-level changes over the past 30,000 years (Camoin and Webster, 2015).

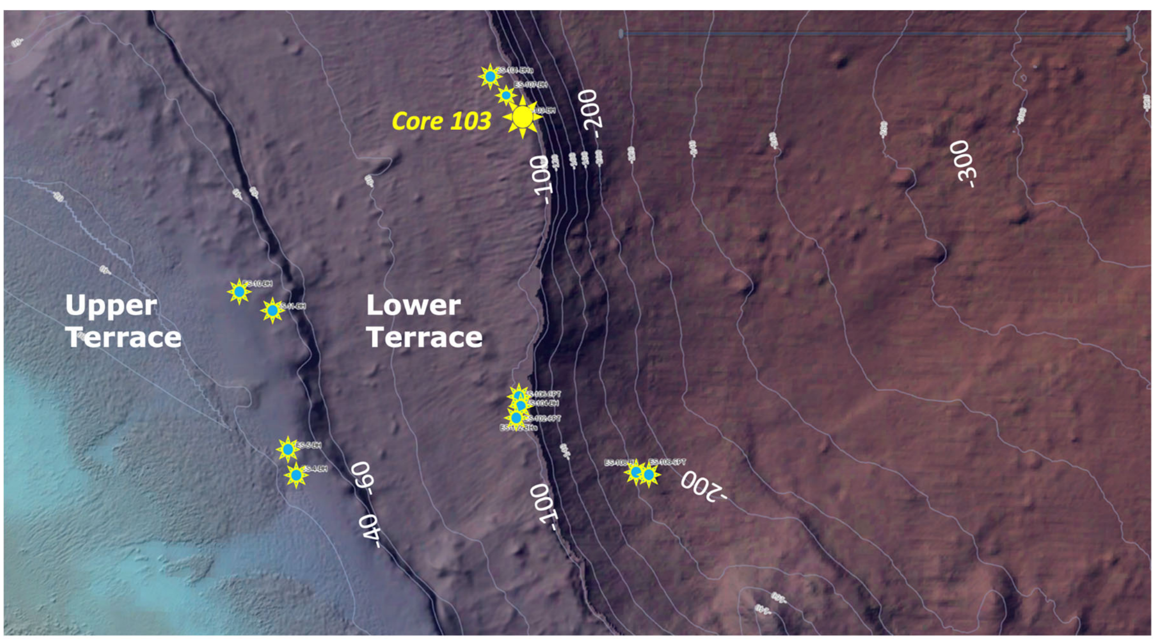

Figure 1: The data set of the Mozambique coral reef project consists of 10 cores from two terraces. Core 103 is situated on the lower terrace at – 94m near the edge of the fringing reef. It penetrated 67 m

THE UNIQUE DATA SET

What makes the cores from Mozambique unique is the number of long cores drilled into the LGM reef as well as the cores from the Upper Terrace that retrieved a younger backstepped reef (Fig. 1). Together these cores provide a unprecedent record of timing of LGM and the onset and rate of sea level rise during the deglaciation. This expansive core coverage is most valuable for several reasons. First, the six long cores through the fringing reef will provide the lateral variability of the LGM reef growth and microbial encrustation but more importantly will help to construct a robust time frame of the reef development during the LMG and the early deglaciation.

Second, the four cores through the younger reef on the Upper Terrace (Fig. 1) offer the opportunity to examine the changes in reef composition during the Holocene sea-level rise and also help to assess if the amount of microbial coating that is so prevalent in the LMG reefs is decreasing with rising sea level (Camoin et al., 2006; Heindel et al., 2012). Furthermore, the six-fold coverage of the LGM reef allows to address many questions in a very comprehensive way, such as the evolution of the reefal community and the changes of the reef-building community towards the drowning, as well as the onset of microbial coating that is typical for LMG reefs.

CORE ES-103 – AGE SPAN

After viewing and sorting the core material we decided to first work on core ES 103-BH, which is located on the edge of the LGM fringing reef and has a total core depth of 65 m. Initial dating of the core yielded an age from 27,190 yrs at 59m to 10,580yrs at 5.75.m core depth. With these ages, rocks in Core 103 will cover the LGM (29 – 19kA), the Meltwater pulses (MWP) 1A and 1B, as well as the Younger Dryas. The onset and duration of the LGM is still a matter

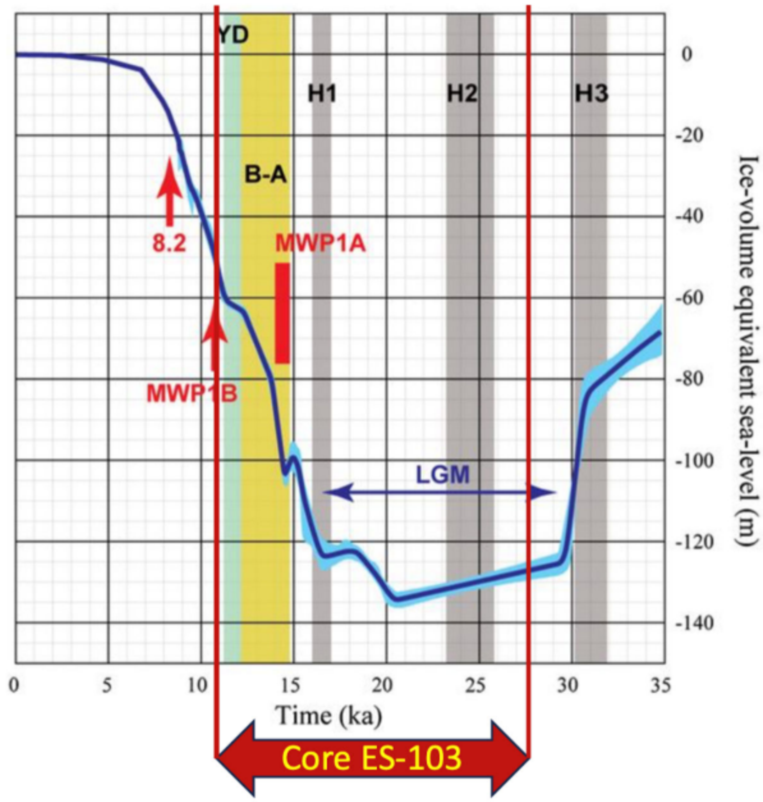

Figure 2: Sea level curve through the last glacial maximum (LGM). Core ES 103 records the LGM and the early Holocene sea level rise. Also shown are Heinrich events H1 to H3, the Bølling-Allerød warm period (B-A), and the Younger Dryas cold period (Y-D)] as well as the timing of MWP-1A, 1B, and the 8.2 ka BP cooling event (from Lambeck et al., 2014).

of debate. According to Clark et al. (2009), growth of the ice sheets to their maximum positions occurred between 33.0 and 26.5 ka and stayed at their LGM positions from 26.5 – 19 and 20 ka. Within the cold period with maximum ice sheets Heinrich events were times of ice sheet instability in the northern hemisphere.

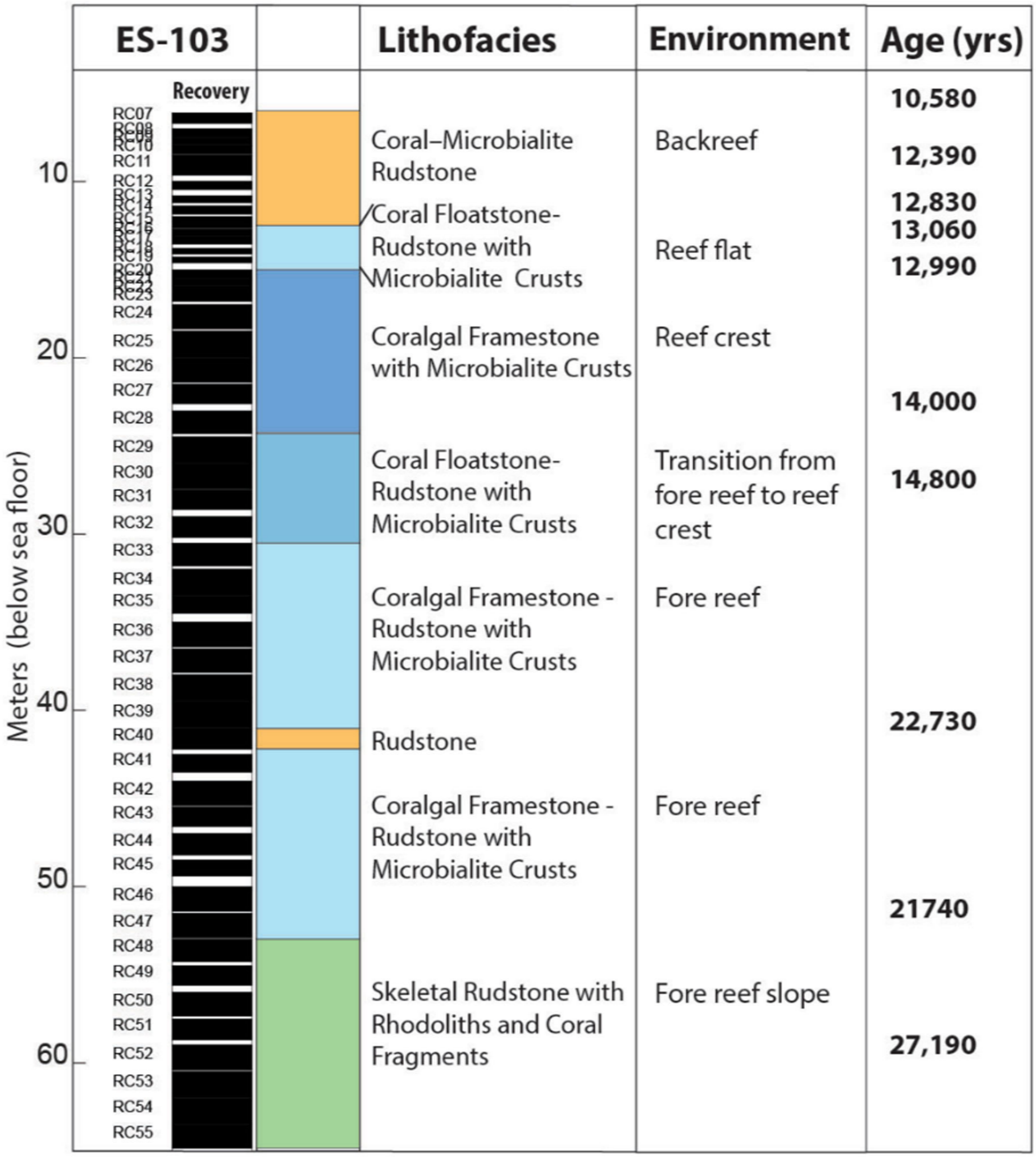

Figure 3: Summary diagram of Core ES-103. Recovery was 86%. Facies document the retrieval of facies from the fore reef slope to fore reef, a shallowing into the reef crest that is topped by a reef flat and finally the back reef area. This reef complex developed from the last glacial maximum into the meltwater pluses 1A and 1B.

INITIAL RESULTS

- The excellent recovery in core ES-103 allows for a detailed documentation of the reef system regarding lithology, coral community evolution and diagenesis. The core retrieved the facies from a fore reef slope environment into a thick (>20m) of fore reef facies with a highly diverse reef community of platy and finger corals before transition into a reef crest with head corals. This reef crest is overlain by a rubble of the reef flat environment. The top of the core has corals with muddy sediment indicating a back reef environment before the reef system drowned (Fig. 2).
- 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.
- The core offshore Mozambique has - like all cored LGM reef system – a high amount of microbialite. This was first documented by Tomchovska (2022) in a 2 m core section (RC25) from the reef crest. Microbialites are present throughout the cemented portions of the core and occur in all variations from crusts to pore filing microbialites (see Wright et al., this volume).
- The fringing reef is situated on a siliciclastic margin that experiences strong currents. Yet no clastic material is visible in the cores. The fine fraction of the unconsolidated sediment also yielded only traces of mica and silt.

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