

REEF DEVELOPMENT DURING THE OLIGO-MIOCENE TRANSITION: A NEW RECORD FROM THE COCINETAS BASIN, COLOMBIA

James S. Klaus, Paula A. Zapata-Ramírez

PROJECT OBJECTIVES

- To investigate the changing nature of Oligocene and Miocene reef systems in the southern Caribbean.
- To assess the relative importance of oceanographic factors compared to sea level and tectonics in reef development and coral extinctions.
- Compare the new records from the Cocinetas Basin to a compiled database of Oligo-Miocene records from the Caribbean region.

PROJECT RATIONALE

The evolution of Cenozoic shallow marine carbonates has been linked to major perturbations in global climate and environmental conditions (Wilson, 2012). Cenozoic Caribbean reefs appear to be best developed during the Oligocene and Pleistocene, with the record of Cenozoic Caribbean reef diversity punctuated by two intervals of elevated extinction and faunal turnover; the Oligocene-Miocene and Pliocene-Pleistocene transitions. Although the Oligocene-Miocene faunal transition is broadly recognized, the exact timing and links to climatic and oceanographic changes has yet to be firmly established. The Oligocene has been generally perceived as a time of climate stability, despite Antarctic ice sheet and glacioeustatic sea-level oscillations of up to 50-65 m associated with glacial episodes Oi-2 (29.16 Ma), Oi-2a (27.91 Ma), and Oi-2b (26.76 Ma). Oxygen isotope trends suggest a Late Oligocene Warming Event (LOWE) between 26.5 and 24.0 Ma (Zachos et al., 2001) prior to cooling and the Mi-1 glaciation near the Oligocene/Miocene boundary (Mawbey and Lear, 2013). There is currently a lack of stratigraphic resolution in the record of shallow water reef development that inhibits establishing the link between reef collapse and the specific climate and oceanographic factors outlined above.



Figure 1. Fringing reefs from the Siamaná Formation located at the south flank of Arroyo Uitpa.

SCOPE OF WORK

The goal of this project is to document a new Aquitanian record of Caribbean reef development from the Siamana Formation of the Cocinetas Basin, outcropping within the Guajira Peninsula of Colombia. The Guajira Peninsula, northern Colombia (Fig. 1), provides an extensive and well-exposed Oligocene and Miocene sedimentary and paleontological record for the southern Caribbean. Extensive carbonate deposits within the peninsula offer an exceptional opportunity to study the depositional geometries and the distribution of carbonate facies, and to document the timing and nature of reef development in the Southern Caribbean. A high-resolution biostratigraphic framework of the visited outcrops has been recently conducted (Silva-Tamayo et al., 2017), providing calibrated stratigraphic ranges of the reefal units. Our main objectives are to (1) characterize the faunal composition and nature of reef development in the Cocinetas Basin during the early Miocene, (2) compare the Siamana reef system to other records from the Caribbean region, and (3) refine the temporal and biogeographic records of Caribbean reef coral development in the southern Caribbean to help constrain the response of tropical reef systems to environmental perturbations associated with the Oligocene – Miocene transition.

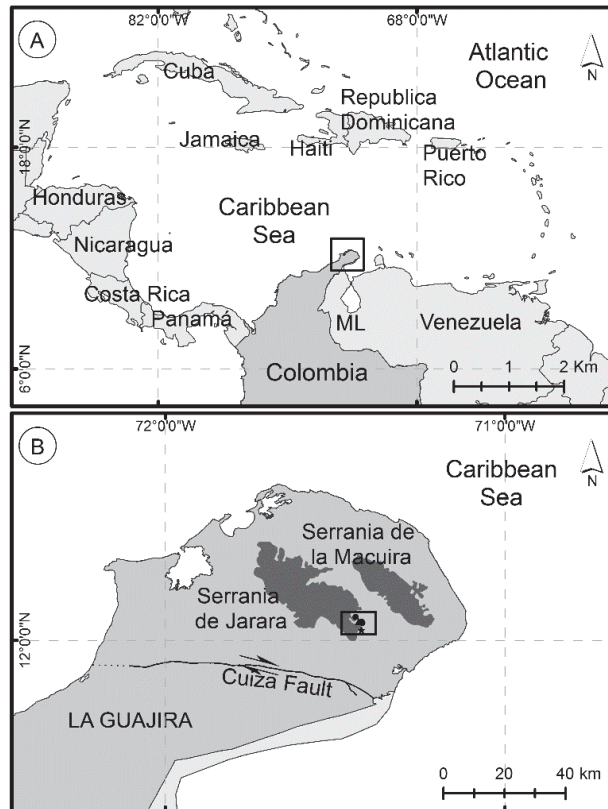


Figure 2. A) Regional Map showing the study area, the Guajira Peninsula of Northern Colombia. ML (Maracaibo Lake). B) Location map of reef sampling localities on the flanks and in the lowlands of Jarara Mountain.

SIGNIFICANCE

Oligo–Miocene platforms and ramps are recognized as good hydrocarbon reservoirs, including the approximately 300 m thick Oligo–Miocene carbonates of the Perla field, offshore Venezuela. These carbonates are predominantly composed of larger benthic Foraminifera and red algae with a minor contribution from shallow water carbonate components (green algae and corals). Comparisons between the Cocinetas and Perla carbonates should provide a broader characterization of facies variability within the carbonate factory of the Oligo–Miocene southern Caribbean.