



Late Holocene evolution of the Rodrigues carbonate platform: a carbonate system in the late stages of its geomorphic evolution

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Rodrigues Island in the SW Indian Ocean (lat. 19°43' S, long. 63°25' E) is a mid-oceanic volcanic (basaltic) pedestal with some 110 km² of emergent land area. The seaward flanks of the pedestal have been truncated to form a broad shelf that extends to a depth of 60 m, and covers an area of over ~500 km². A contemporary reef-lagoon system up to ~8 km wide, with a near continuous reef-rim encircles the Island. Apart from a deep water ~3 m coastal channel, much of the lagoon has been infilled to a water depth of <1 m (at spring low tide). Although depth to the underlying Pleistocene substrate is yet to be established, the presence of, outcropping Late Pleistocene carbonate eolianite deposits along the south and east coasts suggest active carbonate production and reef-lagoon development during previous sea-level highstands. Reef flat and sand aprons mark the seaward edge of the lagoon, while extensive areas of patch reef persist along the windward southern margins of the island, these become particularly dense in areas proximal to passes/channels within the reef crest. Extensive emergent erosional terraces truncate Late Pleistocene coastal carbonates at an elevation of ~0.5 m above present MSL and possibly correlate to a Mid-Holocene sea-level highstand.

Rodrigues Island has, at present, an apparently depauperate carbonate-producing fauna/flora with coral and crustose coralline algae comprising >80 % of the

constituent grains. This may be attributed to the general remoteness of the Island *Halimeda*, calcareous epiphytes and benthic foraminifera are, not major contributors. Despite this 8 sedimentary microfacies, based on textural, compositional and grain size characteristics are identified and can be generally correlated to principle geomorphic zones within the lagoon including: 1) reef flat, 2) sand apron, 3) outer lagoon 4) patch reefs, 5) sand banks, 6) inner lagoon, 7) coastal channel. However, across much of the inner and outer lagoon, surficial sediments only constitute a very thin 0-30 cm veneer over in situ coral-limestone pavement and coral rubble. It would appear that patch reef development was far more extensive within the central lagoon areas than the current extent of patch reefs would suggest. We propose three mechanisms which either independently or in combination resulted in demise of extensive areas of patch reef in the past, these include; 1) burial through lagoon infilling by carbonate detritus, 2) restriction of marine circulation through a mid- to late-Holocene sea level regression, and/or 3) the eventual establishment of a continuous reef crest and coralgal terrace, again restricting marine circulation. This leads to the conclusion that the long term ecological decline of many reef systems, including those observed on Rodrigues Island, may be in fact a consequence of reefs reaching a state of geomorphic maturity, restricting both reef development and carbonate sediment production.