



Rapid modification of intertidal substrates as a result of mangrove planting: a ‘natural’ experiment in tropical shoreline modification

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Mangroves are widely acknowledged to play an important role in the trapping and stabilisation of terrestrially-derived sediments and thus, in many localities, to act as important natural buffers to sediment and nutrient inputs that might otherwise affect adjacent coral reef and lagoon ecosystems. In a number of regions where terrestrial sediment run-off has been perceived as an environmental issue, or where poor management of vegetated intertidal environments has resulted in substrate destabilisation, the (re)planting of mangroves has been employed as a management strategy. How rapidly a mangrove is able to function as an effective sink for terrestrial sediment is, however, poorly understood, but is clearly important in the context of understanding the effectiveness of shoreline management strategies. One approach to this issue is to examine the sedimentology of the substrates on which mangroves have been (re)planted, since they provide a record of changes in intertidal sediment accumulation and thus a test of how effectively mangroves are retaining terrestrially-derived sediments.

The north-west coast of Rodrigues, in the SW Indian Ocean provides an excellent natural laboratory in which to examine the effectiveness of mangrove planting on intertidal substrates because mangroves (of the species *Rhizophora mucronata*) have been planted within a number of embayments along the north and north-west coastline. We have recently undertaken studies of intertidal sediments from three embayments with differing planting histories; Baie Diamant – planted in the period 1990 and then again in 1995 and 1996; Anse Pansia – planted during the period 1995-1997 and then again

in 2001; and Anse Goeland – planted in 2001. Mangroves have rapidly developed at Baie Diamant. Tree and sapling densities in the mangroves are up to $\sim 6/\text{m}^2$ and the mangroves show clear signs of seaward progradation and active juvenile establishment. Significant organic enrichment and modification of the intertidal sediments (to depths of 30-40cm) has occurred throughout much of the mangrove colonised area, reflecting a clear impact of planting on intertidal sedimentology. At Anse Pansia mangroves are also establishing well although tree densities are far lower (~ 1.5 trees or saplings/ m^2) reflecting the more recent planting history. A thin horizon (~ 10 cm) of organic enrichment is evident in the densest areas of the mangrove only and thus major modification of the substrates is not yet evident at this site. At Anse Goeland – essentially a control site - the mangroves are very patchy and stunted and there is no evidence of any influence on the intertidal substrates.

In these sites, which were previously devoid of mangroves (there is no historical or sedimentological evidence of mangrove occurrence around Rodrigues), mangrove planting, where colonisation has been successful and active juvenile recruitment is occurring, has clearly had a major effect on the intertidal substrate. The primary effects appear to be rapid organic enrichment of the substrate and increased accumulation of fine-grained substrates (presumably as a result of enhanced sediment trapping). This has occurred, at these sites, over a period of ~ 10 -15 years and appears to be linked to increases in the density of the mangroves as secondary phases of natural mangrove recruitment occur.