Coral reef regeneration experiment with mineral accretion technology: a case study on Fregate Island, Seychelles

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Abstract

Coral reefs, including those in the Seychelles, have been damaged through overfishing, dredging, pollution but also by frequent coral bleaching events. The bleaching of 1998 resulted in 98% coral mortality within the granitic Seychelles islands. There are extensive coral restoration projects in the Seychelles, which have generally focussed in increasing coral recruitment on destroyed reefs through coral nurseries and coral fragment transplantation. However, there is limited literature evaluating the success of such projects, despite the fact that such evaluations would greatly help the development of best-practise guidelines. We report the preliminary results of a novel, large scale experimental restoration study, in which 800 storm-derived coral fragments (corals of opportunity) were transplanted onto eight artificial structures situated at depths between 5 and 7m. In this study, the first of its kind in the Western Indian Ocean, we compared the growth rates of coral fragments growing with or without mineral accretion technology (MAT). MAT involves the electrochemical deposition of calcium carbonate (CaCO3) by electrolysis on three dimensional iron structures to improve growth rates of transplanted coral fragments. Transplanted coral fragments were subject to either 10A 20V direct current (4 MAT treatment structures) or no current (4 control structures). First year results indicate absolute growth and settlement rates on MAT structures were higher than coral fragments in the control treatment. Survival rates on both MAT and control were 85-90%, with *Acropora spp* and *Pocillopora spp* performing particularly well on both structures but grow faster on MAT. Our results demonstrate that mineral accretion technology promotes faster growth of coral fragments. As MAT can be readily be scaled up to cover large areas, these results suggest that MAT can thereby reduce the need to harvest coral fragments from healthy colonies, and increase the speed at which new reef habitat can be established to support fish and arthropod species.

Keywords: coral, restoration, rehabilitation, ecosystem function, seychelles

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