EVALUATION OF CORAL MICRO-FRAGMENTATION AS A METHOD TO COVER ARTIFICIAL SUBSTRATES

by

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ABSTRACT

Coral reefs are vital ecosystems that are heavily degraded due to numerous anthropogenic stresses over the years. Although several intervention approaches have been applied to reverse this degradation trend, most methods do not use non-branching coral species due to their slow growth. Micro-fragmentation is a method that addresses this gap by planting multiple micro-fragments in an array, potentially covering large areas faster while using fewer resources. This study aimed to determine the feasibility of micro-fragmentation as a method for increasing coral cover, specifically by 1) evaluating how micro-fragments of three different hard coral genera representing three different growth forms increase coral cover over three artificial habitat designs located in Lian, Batangas and 2) comparing the cost-effectiveness of micro-fragmentation with coral gardening and larval enhancement in terms of cost, availability of propagules and fragments, and the ability to increase coral cover. Ceramic tiles containing nine micro-fragments each of *Acropora, Porites,* and *Merulina* were prepared and transplanted onto three artificial habitat designs (i.e., open-frame cubes, truncated pyramids, and jackstones) and monitored for growth and mortality over the course of five months. Cost-effectiveness simulations using a balance sheet model were also done to compare micro-fragmentation with coral gardening and larval enhancement as well as comparing the performance of the three coral genera used in this study for a given micro-fragmentation effort.

Results showed that, overall, *Acropora* both had the highest increase in coral cover and the highest rates of mortality. Significant differences in coral performance were also observed, including high *Acropora* mortality at the Cube AH and high dislodgement for all three coral genera at Talim Inner-Pyramid. Results of the simulation showed that larval enhancement was the most cost-effective, requiring the least number of coral colonies and having the potential to

be implemented on a larger scale, despite the high costs. In addition, the simulation showed that micro-fragmentation, in its current iteration, is not feasible for widespread use and requires more research to reduce coral fragment mortality and dislodgement, especially at the establishment stage. Although micro-fragmentation has the potential to be an alternative to existing coral intervention efforts as well as being an additional tool in an array of management strategies, the results emphasize the importance of carefully designing an intervention effort to the specific local environmental conditions.