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Session: Interventions and restoration->What methods and techniques can upscale coral reef restoration?

Content English

Title: Improving the performance of nursery-reared corals: implications for restoration

Abstract: Operating & maintaining a large-scale coral nursery can be expensive. Moreover, coral reef restoration efforts using nursery-reared corals are hindered by poor outplant survival. New techniques are needed to reduce costs while increasing outplant success. The most widely employed approach to reef restoration involves transferring and outplanting individual nursery-reared coral colonies directly to the benthic substrate using nails, cable ties & epoxy. Long-term survival of outplanted colonies is low & factors affecting survivorship are, at present, not well understood. Preliminary work with nursery-reared corals in Little Cayman Island (BWI) led to an observation that corals fixed to elevated substrates tended to fare better than those attached directly to the bottom. To further explore this, we compared growth & survivorship of *Acropora cervicornis* suspended in the water column to colonies attached to dome structures & to those outplanted directly to the bottom. At three sites (5m, 15m, 18m depths), corals were suspended in the water column on replicate PVC frames or attached to replicate domes. At two sites (3m & 16m), individual colonies were outplanted using a nail, cable tie & epoxy. After 5 months, colonies on frames & domes exhibited 100% survival; that of colonies directly outplanted was 37% at 16m & 41% at 3m. After 14 months, colonies on frames & domes showed a survival of 91% & 80%, respectively. Survival of directly outplanted corals after 14 months is pending. Mean monthly growth in total linear extension (TLE) over 14 months was 19.25cm/month on the frames & 8.2 cm/month on the domes. Differences in TLE between suspended corals & those attached to domes likely reflect a trade-off in which attached corals reapportion metabolic resources to increase skeletal density as an adjustment to an altered physical environment. These findings, in combination, lead us to hypothesize that corals fixed to a substrate are more robust than those suspended in the water column & that survivorship of outplanted corals might be facilitated by adhesion to elevated dome structures. In fact, fixing corals to modular domes in a nursery habitat could obviate the need for a two-step restoration process where corals grow suspended in the water column, then are transported & outplanted. Corals reared on domes could be transferred to restoration areas without handling individual colonies, resulting in a more cost-efficient process with a better long-term outcome.

Keywords: Restoration, artificial structures, innovative techniques, coral nursery,