

Optimizing Invertebrate Herbivore Restocking Strategies to Enhance Coral Recruitment

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The Florida Keys Reef Tract has experienced severe degradation in recent decades, leading to substantial declines in coral populations. A majority of reefs in the region are comprised of less than 5% live coral cover, leaving space for the proliferation of macroalgae. Beyond macroalgal competition, the accumulation of sediments has the potential to limit reef recovery via pathways such as reducing herbivory or reducing coral settlement and survival. Restoration efforts are pairing coral outplanting with invertebrate grazers, such as the Caribbean King Crab (*Maguimithrax spinosissimus*) and the long-spined sea urchin (*Diadema antillarum*), to promote substrate quality and boost coral recovery. The ability to produce large quantities of these grazing invertebrates through mariculture makes them prime candidates for large-scale reef restoration; however, there is limited information regarding the optimal stocking densities and grazer assemblages that will best facilitate coral success. Using aquaria-based experiments, we tested the ability of *M. spinosissimus* and *D. antillarum* to reduce macroalgal biomass. In addition, we tested whether different sediment loads (low, medium, and high) mediate herbivory. Treatments consisted of five different grazer assemblages plus control groups: (1) 1 *D. antillarum*, (2) 2 *D. antillarum*, (3) 1 *M. spinosissimus*, (4) 2 *M. spinosissimus*, or (5) 1 *D. antillarum* and 1 *M. spinosissimus*. We then used the tiles from two of the experimental runs for settlement assays with coral larvae from *Diploria labyrinthiformis* and *Acropora palmata* to determine their influence on settlement rates. We found that macroalgal removal varied by grazer assemblage and that sediments mediated herbivory particularly at higher levels. We also observed evidence that grazer assemblage and sediment load influenced the settlement rate of coral larvae, highlighting the potential for these two factors to shape the recovery of coral populations on Florida reefs.