

Quarry-Based Mariculture of the Caribbean King Crab to Support Reef Restoration

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Scaling up herbivore populations is a critical component of Florida's coral reef restoration strategy. As part of the Mission: Iconic Reefs initiative, the Florida Keys National Marine Sanctuary plans to stock hundreds of thousands of grazers—primarily the long-spined sea urchin (*Diadema antillarum*) and the Caribbean King Crab (*Maguimithrax spinosissimus*)—to suppress macroalgal overgrowth and promote coral recovery. However, current production of these grazers relies heavily on resource-intensive land-based larviculture systems, which face bottlenecks in terms of cost, labor, space, and scalability.

This study explores quarry-based mariculture as a complementary grow-out strategy to support existing land-based hatchery operations. We tested the feasibility of using abandoned saltwater quarries in the Florida Keys to rear *M. spinosissimus* juveniles in semi-natural conditions. Across three experimental trials, we compared survival and growth between laboratory and quarry environments, evaluated performance across quarry sites and maternal clutches, and assessed the effects of stocking density. Environmental monitoring and algal community assessments were conducted to track seasonal variation in grow-out conditions.

While survival was low across all trials, early evidence suggests that quarry systems can support comparable juvenile growth and survival to traditional lab systems. Growth varied significantly by site and clutch, highlighting the importance of environmental conditions, while high stocking densities negatively impacted crab performance. Seasonal algal abundance and stable water conditions suggest quarries could provide a suitable, food-rich environment for cost-effective grow-out.

Quarry-based mariculture offers a scalable, distributed grow-out solution that can help relieve pressure on land-based systems. By bridging the gap between larval rearing and reef deployment, this approach enhances restoration capacity and supports broader ecological recovery goals for Florida's Coral Reef.