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Restorative Aquaculture: How Commercially Important Sea Urchins Can Aid in Coral Reef Recovery

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Abstract

Sea urchins are commercially important as their gonads, also known as roe or uni, are considered a delicacy in many countries. However, sea urchins also play an important ecological role as they are the main herbivores in marine habitats. Herbivores are essential on coral reefs as they control the abundance of benthic algae, which would otherwise outcompete corals and other benthic organisms for space. Currently, many Caribbean coral reefs lack herbivores and are dominated by macroalgae and a dangerous encrusting alga, Ramicrusta spp. The Institute for Socio-Ecological Research (ISER) has developed a novel approach in improving coral reefs by enhancing sea urchin populations in Puerto Rico through restorative aquaculture techniques. ISER is executing two different techniques to produce urchins for restoration purposes. Post larval settlers of the long spined sea urchin, Diadema antillarum, are collected from the field, brought back to the laboratory, and grown to a young adult size. Recently, we developed a small scale hatchery and have been closing the life cycle of the West Indian sea urchin, Tripneustes ventricosus, in the laboratory.

More than 5,500 lab-reared D. antillarum and more than 300 T. ventricosus, have been restocked to coral reefs all around Puerto Rico. Significant changes in the benthic structure were observed during the first week after the restocking. Significant reductions of fleshy macroalgae (Dictyota spp.) and thick turf algal/sediment mats (TAS), both unsuitable substrates (e.g., coral settlement), contributed to this change. Additionally, preliminary observations show that coral outplants have a higher chance of surviving when herbivores are present because they do not need to compete for space against cyanobacteria and macroalgae. Our work shows that producing sea urchins through aquaculture techniques provides direct ecological benefits to coral reefs and should be integrated in all coral restoration plans.

KEYWORDS: restorative aquaculture, sea urchins, coral reefs, restoration, Caribbean

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