

Title: Aquatic Invasive Species Mgmt and Control
Organization: Division of Aquatic Resources
Award: \$207,531



Introduction: The mission of the Hawaii Division of Aquatic Resources (DAR) is to manage, conserve and restore the state's unique aquatic resources and ecosystems for present and future generations. More specifically, the DAR Aquatic Invasive Species (AIS) program is focused on the management, control, and prevention of aquatic invaders throughout the Hawaiian Islands. The AIS team focused its efforts on the control of alien invasive algae in Kaneohe Bay, Oahu. Our total funding need for FY12 was \$711,214, of which HISC provided \$207,531, with NOAA and the U.S. Fish and Wildlife Service providing the remainder.

Achievements in FY12

1. Approximately 51,288 square meters (13 acres) across three patch reefs (Reefs 26, 27, 29) were proposed to be cleared of invasive algae (*Gracilaria*, *Kappaphycus*, *Eucheuma*) using the Super Sucker. Because baseline monitoring surveys were not yet completed, algal removal on Reef 26 did not begin until November, 2011. The reef was divided into plots to allow for systematic removal and efficient monitoring of quantity of algae removed. Removal time was further limited due to extreme low tides during day light hours. Algae removal on Reef 26 was completed the middle of March, 2012 with a total of 11,053 pounds of algae removed. Removal of invasive algae began on Reef 27 in late March and will be completed by the end of August, 2012 with a total of 10,745 pounds of algae removed so far. Once Reef 27 is complete, the Super Sucker barge will begin removal efforts on Reef 29, which is the largest of the three reefs at 30,000 m².

2. After clearing patch reefs, hatchery raised juvenile collector sea urchins (*Tripneustes gratilla*) were released onto each cleared reef to provide long-term low-maintenance biocontrol.

Modifications were made at the DAR sea urchin hatchery located at Anuenue Fisheries Research Center that increased larval survival and competency by an order of magnitude (from 1000's to 10,000's per tank. Twelve spawning events were conducted during this period with mixed results (see obstacles below).

New nursery systems were designed to decrease overcrowding, which included repairs to multiple 17' round tanks, an increase in the number of urchin settlement units, and development and implementation of the new urchin nursery down-weller systems used for grow out. Improvements were made to nursery systems that increased harvest procedures and efficiency. This reduced time out of the water and stress to juvenile urchins in transit from Sand Island to Kaneohe Bay.



Hatchery raised native collector urchin eating invasive seaweed in Kaneohe Bay, Oahu.

As a result of new hatchery procedures and new nursery systems, survival numbers have steadily increased. To date, 30,721 sea urchins have been released on Reefs 26 and 27 and these reefs will continue to be stocked until our goal of 2 urchins/m² is achieved. Once attained, algae/urchin coverage will be assessed to determine if additional urchins are necessary.

Obstacles or Delays:

Late autumn and winter spawns yielded sub-par results. Nutrition, egg quality and overall fecundity may be linked to seasonal environmental changes. Spawning and larval rearing activities continue to test if this is true. December spawns metamorphosed, but settlement numbers were considerably lower than the September and October spawns. January spawns showed similar results with a reduced number of settling urchins.

In addition, settlement rates of post-larval *T. gratilla* are highly variable. The reason for this variability is not yet known. Researchers have informally discussed a variety of causes including temperature, water quality and nutrition at various life stages. While the Anuenue team has been able to achieve production success, this post-settlement mortality still presents a significant bottleneck. Some attempts have been made at solving the challenges associated with this life phase.

Due to their small size at the time of outplanting, another challenge is to determine the amount of mortality that occurs in the field. They are very cryptic and can easily hide in small holes and crevices, therefore conducting thorough counts are a challenge. Furthermore, the patch reefs where urchins are transplanted are very large and it is not feasible to conduct an urchin count of the entire reef; survey methods to sub-sample the reef are being developed to get a better estimate of urchin density/mortality.

3. Baseline and quarterly monitoring will measure the success and sustainability of the project.

The field team assisted the Kaneohe Bay Monitoring Coordinator to research, test, evaluate, refine and implement new field survey methods for fish, benthos, echinoderms and rugosity. Each reef is stratified by habitat (reef crest, reef flat - consolidated, reef flat - mixed), randomly allocated using GIS and fixed transect were installed on 5 study patch reefs in Kaneohe Bay. The 5 reefs will be surveyed quarterly for fish, benthos and echinoderms on the fixed transects.

Other Activities in FY12

The AIS team partnered with the University of Hawaii Cooperative Fisheries Unit (Friedlander Lab) to conduct fish and benthic surveys on Lanai's east shore. The project objective was to assess marine resources for a community based conservation project, funded by the Hawaii Fish Trust and Conservation International. Surveys were conducted to characterize the fisheries, benthic, and algal communities around Maunalei-Lanai. This was a good opportunity for the AIS team to partner with other Hawai'i researchers and conduct a baseline assessment of aquatic invasive species threats on Lanai. Invasive algae coverage was very sparse with low levels of *Acanthophora specifera* and a few instances of *Hypnea cervicornis*. A full report is due out in October, 2012

The AIS Coordinator worked collaboratively with representatives from state and federal agencies and NGOs in order to provide review and comments for the new Department of Health rules as they relate to pesticides for invasive species control. Those rules are awaiting signature. Consulted with ISC leaders, USFWS, UH Law School, and invasive species managers to develop a list of policy recommendations that would increase Hawaii's effectiveness at preventing unwanted introductions.

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