

NOAA Coral Reef Conservation Program Project Final Report

A. Award Number: NA11NOS4820006

B. Amount of Award: \$64,208

C. Recipient: UH, Pacific Cooperative Studies Unit, Dr. David Duffy

D. Award Title: Development of a Biocontrol Option for Alien Algae Control

E. Award Period: November 1, 2012-December 31, 2013.

F. Period Covered by this Report: April 1, 2013 – September 30, 2013

G. Summary of Progress and Expenditures to Date: *When describing the progress of projects, please evaluate projects against the scope of work described in the final application submitted to NOAA CRCP*

Projects:

- **Project Title:** Invasive Algae Control through Native Grazer Replenishment
- **Project Status** (please x): No activities to date _____ Planning _____
In progress _____ Completed X _____
- **Summary of Project Accomplishments (by each objective):**

Urchin Hatchery

April: A spawn was conducted on April 1st. Eggs appeared to be of good quality, but spawns were small. Three larval rearing tanks were stocked. Larvae performed well. Competent animals were moved into three settlement tanks on April 25th and 26th. Good settlement was observed in all tanks within two weeks.

May: A spawn was conducted on May 7th. An attempt was made to spawn hatchery raised urchins. Several males spawned, but only two females. One tank was stocked with the product of this spawn. This population dwindled and then crashed completely on Day 7. Other animals were collected on snorkel in the shallows off of Sand Island Park. Eggs quality was good, but very few animals spawned. Two tanks were stocked. One population crashed over Days 5 & 6. One tank performed well and was moved into a settlement tank on May 28th at Day 21. Good settlement was observed within 2 days.

The April spawns appear have experienced a mortality event approximately two to three weeks post settlement. Remaining animals are strong, but it is estimated that population were diminished by 30%. These are qualitative observations as there is no way to quantify animals of this size.

June: A spawn was conducted on June 10th with animals collected off of Sand Island Park. Four tanks were stocked. Populations in all tanks crashed within four days.

A spawn was conducted on June 17th with animals collected off of Sand Island Park. Four tanks were stocked at approximately 800,000 larvae per tank. All tanks experienced a dramatic population crash between days 4 through 7. One tank crashed completely. Of the remaining three, two fared well and large numbers of larvae were brought to competency and subsequently moved to settlement tanks on July 8th and 11th. The other population experienced a second population crash over Days 12 & 13 and never quite recovered. On Day 7 of this larval run it was determined that the UV filter was not operating properly. The unit was replaced immediately. The larvae stabilized the next day.

Urchin Outplanting

April: 12,050 urchins were released in Kaneohe Bay. 200 urchins were donated to UHM Prof. Celia Smith and the Waikiki Aquarium for release as part a Mauka to Makai Day event.

May: 2550 urchins were released into Kaneohe Bay. 12 urchins were donated to the Waikiki Aquarium for their exhibits.

June: 15 urchins were donated to the Waikiki Aquarium for their exhibits.

Macroalgae & Phytoplankton

Cultures in the new phytoplankton room are performing well. Recent improvements have resulted in an increase in both culture density and overall volume, effectively doubling capacity. New lighting and improved climate control have resulted in a one third increase in phytoplankton culture density. New tanks have increased volume by 80%.

There appears to be an increase in protozoan activity in the cultures as well. It is not clear if this due to increased contamination or the change in growing conditions. It appears to have little or no impact on larval culture at this point. Larvae and phytoplankton are monitored daily and adjustments to technique will be made as needed. New moisture traps have been added to the air delivery system.

Gracilaria parvispora production increases as day length increases. Overall culture health is improving as well. The program continues to donate *G. parvispora* to the Hale Kula school urchin project every other week. They will be wrapping up their project next month.

Monitoring

Monitoring Surveys Completed:

Accomplishments:

- Fixed Permanent Sites (fish, benthic, echinoderm):
 - Reef 16: June, 2013
 - Reef 26: May, 2013
 - Reef 27: May, 2013
 - Reef 28: June, 2013
 - Reef 29: April, 2013

Outreach

April 4: AIS team participated in Ben Parker Elementary School's Science Night. The booth had an interactive invasive algae display and urchins for the visitors to see and touch. The focus was on invasive algae and the impacts on the coral reefs in Kaneohe Bay. Also, there were brochures on reef health, invasive algae, and fishing regulations for the parents to take with.

April 13: The AIS team participated at the Ocean Expo. This public event targeted ocean and fishing enthusiasts. The booth had an information display, invasive algae samples, juvenile urchins, a Super Sucker video, brochures, and an interactive activity for kids.

April 13: The Urchin Hatchery Manager brought hatchery urchins to the Waikiki Aquarium's Ocean's Day. This family-friendly event had hands on educational displays and showcased more than 20 city, state, and federal agencies that are aimed to preserving and protecting Hawaii's environment. There was an emphasis on the Island's unique water resources from mauka to makai.

April 20: The AIS team participated in a family friendly Earth Day event at the Windward Mall coordinated by The Nature Conservancy. The booth had an information display, invasive algae samples, juvenile urchins, a Super Sucker video, brochures, and an interactive activity for kids. AIS intern also participated in an Earth Day event held on Pearl Harbor Naval Base. The event was open to the public. An informational display was brought to showcase the Super Sucker project and invasive algae impacts in Kaneohe Bay.

- **Management Outcomes** (*How did this project address critical management needs?*)

This project addressed critical management needs through continued research and improvement of methods to raise native sea urchins to be used as a bio-control tool in the fight against alien invasive algae. Data collected through this project will help DAR managers in their goal of reef restoration to conserve healthy coral that is threatened by alien invasive algae throughout the State. The reduction of invasive algae will open more space for new coral recruits, native algae, and a more suitable habitat for reef fish species. Data collected will be used to determine the optimal stocking density of urchins based on the algal species type, habitat characteristics, and resources available

- **Obstacles or Delays:**

The Field and Monitoring teams were terminated from early May through the middle of July due to funding issues, so no removal or monitoring took place at that time. The layoff of the Field Team also had significant detrimental effects on the hatchery. The hatchery staff had to limit broodstock collection to inshore areas where broodstock appear to be of lower quality.

The mid-cycle crash that occurred in the hatchery may have been due to several factors. Renovations in the algae room may have caused changes in the quality of the phytoplankton. Those changes may cause rapid tank fouling or the introduction harmful microorganisms. Broodstock quality may have affected larval performance. Lack of filter maintenance seems a likely culprit. All of these factors, and their causes, have since been remedied or addressed for the time being.

- **Analysis**

Due to the monitoring team being terminated and new staff hired after July, analysis of results could not be completed in time for this final project report.

- **Future needs:**

While leaps and bounds have been accomplished with this project, there are still many unknown questions that need to be answered. The hatchery was able to outplant over 60,000 urchins during the 2012 calendar year; however, this was only enough urchins to barely stock two reefs in Kaneohe Bay. With many more reefs affected by invasive algae, it is imperative this project be continued in order to increase efficiency and allow for more urchins to be outplanted. All accomplishments listed above were possible due to the help from multiple funding sources. The continued success of this project and the long-term health of the reefs will require an increase in staff resources and a long-term steady funding source.

Furthermore, the data collected in the field has started to be analyzed. This data will help us to understand how a certain density of urchins, all varying in size, can affect different habitats and different algal species. Not all reefs in Kaneohe Bay have the same habitats and reef/algal compositions. Therefore, it is crucial that effort be continued in order to determine an effective management plan that can be used across the entire Bay, so our limited resources and urchins are used efficiently.

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