

FY 2009 Aquatic Invasive Species Response Team (AIST): Highlights

- **Sea Urchin Biocontrol Used in Conjunction with Mechanical Removal Suction Devices (“Supersuckers”) in Kaneohe Bay**
- **Development of Sea Urchin Culture Ability at Anuenue Fisheries Research Center (AFRC) for Use as Biocontrol Agents**
- **Rapid Response to *Gracilaria salicornia* Report from Kona Resort on the Big Island**
- **Molokai Community-Based Invasive Species Control Project**
- **Molokai Upside-Down Jellyfish Removal Project at Kaunakakai Harbor.**
- **AIST Partnership with University of Hawaii (UH) Researchers, The Nature Conservancy (TNC) and Malama Maunalua; Working to Remove Invasive Mud Weed (*Avrainvillea amadelpha*) and Restore Seagrass Habitat in Maunalua Bay**
- **AIST Surveys and Distribution Maps for Alien Species**
- **Rapid Response to Grounded Vessel Carrying Documented New Species in Hawaii**
- **AIST Assistance to DAR Ballast Water and Hull Fouling Program; Acting to Help Prevent Movement of Potential AIS**

FY2009 HISC support to AIST funded a supervisor, eight technicians, two student hires and one AmeriCorps intern based on Oahu and the Big Island. In September 2009, the HISC approved \$240,000 to support the AIST’s work in FY10 compared to the \$411,400 in for FY09. The FY10 budget restrictions are going to trigger a reduction in work force and will the limit the AIST to core functions. HISC funds are being used for a wide variety of AIS projects that are outlined in the State of Hawaii Aquatic Invasive Species Management Plan.

Mechanical Removal via the “Supersucker” in Kaneohe Bay with Native Sea Urchin Biocontrol



The Supersucker barges are a fleet of mechanical tools used to assist in the control of alien invasive algae. They consist of a floating platform equipped with suction pumps and hoses which divers utilize to remove alien algae from the reef. With support from the Hawaii Invasive Species Council, AIST began overseeing operations of the Supersucker Project in 2009. Although AIST/DAR is overseeing operations, the project is still managed as a partnership with University of Hawaii and The Nature Conservancy (TNC).

In July 2008 a small patch reef, roughly 3000 m² in Kaneohe Bay, was cleared. Consequently, the algae re-grew to baseline levels in six months without any further intervention. In July 2009

re-clearing began on the reef using Supersucker Sr. along with help from its smaller version, Supersucker Jr. AIST is studying the combined effects of mechanical removal and increased native herbivory using the native collector urchin, *Tripneustes gratilla*, on the biomass re-growth of invasive algae. Experiments are being conducted to determine the urchins' effectiveness in grazing the alien algae and inhibiting its rapid re-growth after mechanical removal on a scale larger than previous studies. Urchins were collected from Z-slab artificial reefs along the West Coast of Oahu and then transported to the State of Hawaii's Anuenue Fisheries Research Center (AFRC) to be quarantined. Upon completion of quarantine, the animals were transported and carefully placed onto newly cleared sections of the reef. The urchins' progress and/or the possible re-growth of alien algae will be monitored to determine required stocking densities and the efficiency of using collector urchins as a native biocontrol agent.

The artificial Z-slab reefs will be monitored to measure any impacts from urchin removal as well as urchin population recruit and migration in the area.

Biocontrol Development and Sea Urchin Rearing



Further investigation is underway to determine long-term utility of native grazers, such as sea urchins, to assist in the control or elimination of invasive algae. The culture and outplanting of native sea urchins may allow managers to control the growth of invasive algae without endless mechanical removal. Previous research at the University of Hawaii has shown this method to be a highly effective tool on a small scale. Larger scale experiments would allow the tool be monitored and altered to test further success. In order to pursue larger scale experiments, a source of urchins must be developed. Collecting a large number of urchins from the reef may cause harm to the donor area. So, the solution is to raise urchins for the purpose of outplanting. Urchin rearing trials will take place at AFRC utilizing the infrastructure already in place. The rearing of large quantities of sea urchins will be implemented in conjunction with the Supersucker project in order to address invasive algae issues in a comprehensive approach. Once urchins are available in sufficient numbers, outplanting trials will begin to test for effective outplanting densities as well as strategies for density manipulation. All activities will be closely monitored for algal abundance, coral health, and reef improvement.

Rapid Response to *Gracilaria* sp. in Kona



In 2008, AIST was notified by a pond foreman at one of Kailua Kona’s resorts. The gentleman expressed concern about an algal species overtaking the substrate of one of the ponds at the resort, and inquired about removal techniques. AIST investigated the concern in August 2008. It was observed that a *Gracilaria sp.* population was restricted to a single man-made, lined, self-contained brackish water pond. In order to properly identify this *Gracilaria* species, preserved samples were sent to the University of Hawaii Botany department for genetic identification. The alga was positively identified as *Gracilaria salicornia*. The source was traced back to an aquaculture facility in Kona at the Natural Energy Laboratory of Hawaii Authority (NELHA). AIST/DAR worked with the resort to eradicate the population through a variety of techniques. The resort was able to lower the salinity in the pond by altering its well source and the population has subsequently been eliminated. AIST will continue communication to ensure the eradication remains successful from the area. This project was a positive example of government and private sector maintaining good communication and collaboration when dealing with the impacts of invasive species.

Molokai Community-Based Invasive Species Control



The AIST initiated a Molokai community-based invasive species control project with funding from The National Fish and Wildlife Foundation and HISC. AIST will conduct a year-long project consisting of mechanical algae removal, community clean-up events, educational workshops, and outreach activities. *Gracilaria salicornia* is the primary species targeted for removal efforts. A bio-secure protocol for the processing and recycling of the alien algae is being developed; insuring that there will be no reintroductions and that algae biomass is utilized in a beneficial manner. Algae re-growth monitoring will measure the success of the algae removals. This project will serve as a model for community-based invasive species control across Hawaii and will take place at four locations: Kaunakakai Harbor, Keawanui Fishpond, Ualapue Fishpond & Kaloko eli Fishpond. This project has demonstrated a positive

collaboration between government and community groups and individuals in accomplishing invasive species control.

Molokai Upside Down Jellyfish (*Cassiopeia* sp.) Removal Project



In June 2009, AIST collaborated with the Molokai Invasive Species Committee (MoMISC) to remove approximately two hundred upside down jellyfish (*Cassiopeia* sp.) from Kaunakakai's recreational swimming area. Both organizations decided to remove the invasive jellies from the area due to the mild sting that these species cause when disturbed. The site will be monitored over the next year to determine removal success. Previous efforts in Hawaii have shown the manual removal of this species may be effective in its long-term control or eradication.

Maunalua Bay Alien Algae Removal and Seagrass Habitat Restoration



A study currently underway by AIST assisted by the University of Hawaii monitors the succession of native macroalgae/seagrass cover after the removal of *Avrainvillea amadelpha* in a plot site containing a mosaic of *A. amadelpha*, *Halophila hawaiiiana*, and other native and nonnative algal species. The restoration area is a 40-m diameter (1256 m²) circle plot located approximately 225 meters offshore Paiko Lagoon, Oahu. An estimated 235 human hours were required to remove an estimated 3000 kgs of *Avrainvillea amadelpha* from the plot. AIST has also assisted in community cleanup events organized by TNC & Malama Maunalua to scale up the alien algae removal effort in Maunalua Bay. These efforts and studies have help support TNC and Malama Maunalua's acquisition of economic stimulus funds from NOAA's Restoration Center.

AIS Surveys and Distribution Mapping for 5 Alien Algae Species



AIST has been conducting visual surveys for five major invasive marine macroalgae species (*Gracilaria salicornia*, *Kappaphycus/Euchuma* spp. complex, *Acanthophora spicifera*, *Avrainvillea amadelpha*, *Hypnea musciformis*) around the state since 2005. Since that time, over 40,000 data points have been collected from Oahu, Molokai, Hawaii, and Kahoolawe. Surveys typically extend from shore to the barrier reefs of potential habitats and are conducted on snorkel, making straight line swims from beach to reef. Portable global positioning system devices are used to record spatial data along with relative algal abundances. Data points are imported into ArcGIS software allowing the generation of accurate maps that project algal abundance and distribution. These maps are essential for determining further algal management strategies and are being used to develop and implement a comprehensive approach to remove and control the spread of non-native algae by utilizing mechanical removal, native grazers and the reintroduction of native species.

Rapid Response to Grounded Vessels



In June 2009 AIST responded to a sailing vessel which ran aground in shallow waters East of Kapapa Island in Kaneohe Bay, Oahu. The vessel had traveled from Washington State to Mexico, the Marquesas, and finally to Hawaii. AIST worked with experts to identify hull fouling organisms attached to the hull. Three different taxa of algae were collected from the bottom of the hull. It was determined that two out of the three were new alien species to Hawaii and represent a new introduction. Among a number of invertebrates collected that are currently established in Hawaii, two types of barnacles were also found to be alien species. The grounded vessel left two scars in the reef. The grounding and resulting scars represent a good example of a potential pathway for alien species' introduction to Hawaii. These scars and surrounding reefs will be further monitored in future months to determine if any of these alien species were able to

colonize the reef. If these introductions are detected in the environment, a rapid response eradication will be attempted.

AIST Assistance to Ballast Water and Hull Fouling Program



AIST continued to support DAR Ballast Water and Hull Fouling Program minimizing the introduction and spread of AIS into Hawaii from vessels. Ballast water is being managed by Hawaii's Administrative Rules, Chapter 13-76, relating to Non-Indigenous Aquatic Species. Rules have allowed the State to manage ballast water on a local level, by working with the shipping industry to limit the amount and reduce the risk of ballast water discharged in Hawaii's waters. Further verification is in the planning stages with the recently acquired sampling tools including a Ballast Water Assurance Meter which was recently approved by the US Coast Guard as the first tool to accurately check for ballast water exchange.

Hull Fouling, which is responsible for the majority of AIS introductions to Hawaii's waters, is being addressed as a high priority. DAR also continues to work with the Alien Aquatic Organism Task Force (AAOTF) to develop a comprehensive plan for preventing the introduction and dispersal of alien aquatic organisms found on the hulls of vessels. The AAOTF includes representatives from state and federal agencies, shipping industries, the scientific community and non-government organizations. DAR is currently reviewing how others are managing this vector as well as conducting studies, such as an assessment of recreational vessels in Hawaii, to get a better understanding of how to address hull-fouling issues.

The program is conducting AIS inspections using new technologies such as a remotely operated vehicle, a variety of pole cameras, and underwater drop cameras. Inspections are conducted on high-risk events such as unexpected arrivals, vessel groundings or vessels that may carry AIS. DAR is also assisting The Papahānaumokuākea Marine National Monument with inspections of vessels that enter one of the largest protected marine areas in the world. This program requires that 100% of the vessels (excluding US Coast Guard and Military vessels) entering into monument waters undergo a hull inspection and certification. The Monument has very few non-native species and rigorous inspection of vessel hulls, ballast water, ancillary and scientific gear is done to maintain the biosecurity of this potential World Heritage Site.