THE SUPER SUCKER PROJECT

"An update on the battle against alien algae in Hawaii"

BY BRIAN HAUK

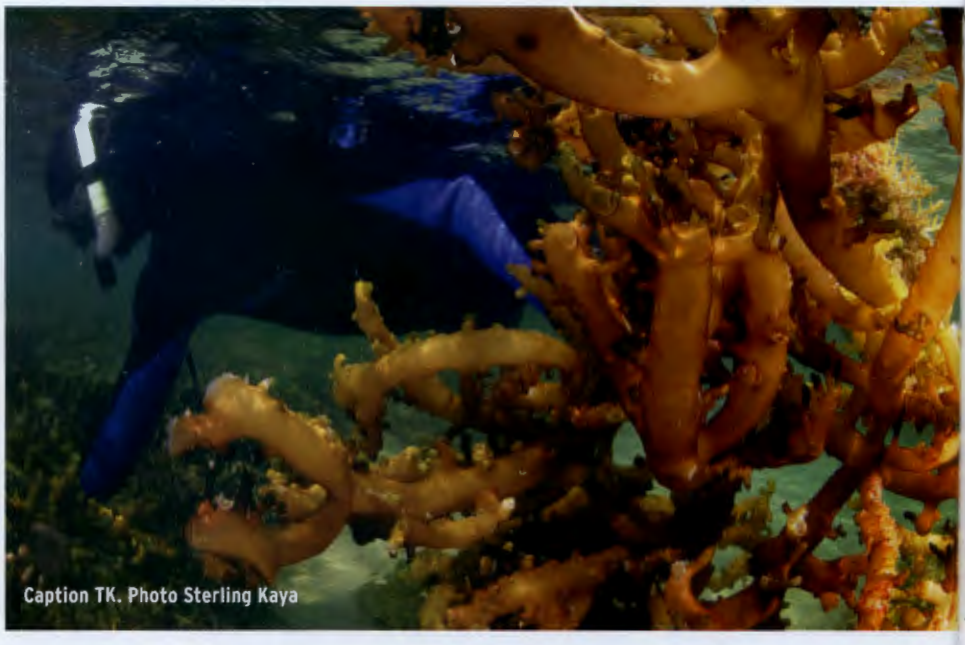
Brian Hauk. Photo Sterling Kaya

Alien algae harmful to reef ecosystems – how can fishermen help?

If you like to fish, snorkel or dive you might have noticed some changes to your favorite spots throughout the years.There are a variety of potential reasons for these habitat changes and/or decreases in fish. Land development, sedimentation, pollution, overharvesting and the escape of alien species are a few of the culprits. Traditional management systems, the use of Konohiki's, and the Kapu system began to fade in the 1800's. This type of resource management was a way of life and involved closed seasons, minimum sizes and other science based restrictions which maintained sustainable fisheries for generations. Western management techniques now model many of the traditional methods of the past and can hopefully help to preserve resources for future generations.

Hawai'i has served as a shipping stop-off point between the mainland U.S. and Asia for decades, where boats drop-off and pick-up supplies to be taken around the world. Unfortunately, with this influx of vessels also comes an invasion of unwanted visitors. While some invasive species were brought to Hawai'i inadvertently by ships, others were brought deliberately with the intention that they would be utilized as a valuable resource for the islands.

Gracilaria salicornia (Gorilla Ogo), Kappaphycus and Eucheuma spp. have now established themselves as the dominant alien limu species in Kaneohe Bay, Oahu. These species were introduced on the fringing reefs surrounding the Hawaii Institute of Marine Biology (HIMB) on Coconut Island in Kaneohe Bay as well as inshore areas of Waikiki. Researchers believed the algae would not have the capability to spread because they do not have the ability to travel over deep water, they do not have the capacity to re-establish holdfasts ("roots"), and the herbivore fish population within the bay would keep the biomass in check (Conklin & Smith, 2005). Well as usual, nature has found a way to get around its normal barriers. From its original introduction sites, Kappaphycus/Eucheuma spp. have spread through most of Kaneohe Bay and begun to establish low density populations further up the East side of Oahu towards Kaaawa and Punalu'u. Gracilaria salicornia can be found from Kahana Bay on the east side around the southern coast to Ewa on the West side



Caption TK. Photo Sterling Kaya

Effects on Ecosystem and Fishermen

Gracilaria salicornia and Kappaphycus/Eucheuma spp. are thick robust algae that are capable of causing detrimental effects on the ecosystem by outgrowing and outcompeting native limu and corals. Unfortunately these species were brought here without their natural predators. This gives alien algae an added advantage because our herbivore populations are reduced and not adapted to feed on these alien species. Kappaphycus & Eucheuma species are difficult to distinguish because they have a variety of morphologies based on where they grow. In some locations algae will form large tumbleweeds; in others it will create a matting effect across the substrate. However, all the alien algae species and morphologies have the same negative consequences on the reefs:

- They outgrow and smother corals eventually causing their death
- They outcompete the native limu
- They fill in cracks and crevices that fish and invertebrates use for shelter reducing habitat

The greater the amount of invasive algae, the less amount of coral and native limu, equals the fewer amounts of fish for our tables.

What DAR and Partners are Doing

Many of you may have seen or heard about the "Super Sucker", a giant underwater vacuum that is used to mechanically remove the invasive algae. Since its de-

velopment in 2005, the Division of Aquatic Resources (DAR) has partnered with the University of Hawaii and The Nature Conservancy to use the Super Sucker to remove thousands of pounds of algae from various reefs in Kaneohe Bay. Previous removal efforts have determined that mechanical removal alone is not sufficient to prevent re-growth of Kappaphycus and Eucheuma spp., secondary bio-control efforts are necessary. DAR is now conducting experiments to grow and release the native collector urchin, Tripneustes gratilla, (hawae) to determine the efficacy of using the collector urchin as a means of its additional bio-control measure. Collector urchins are currently found within the bay, but their numbers are not at the levels necessary to keep the invasive algae under control. Research has begun, to determine whether increasing the urchin population will control the blankets of alien algae that are smothering our reefs and eliminating fish habitats.

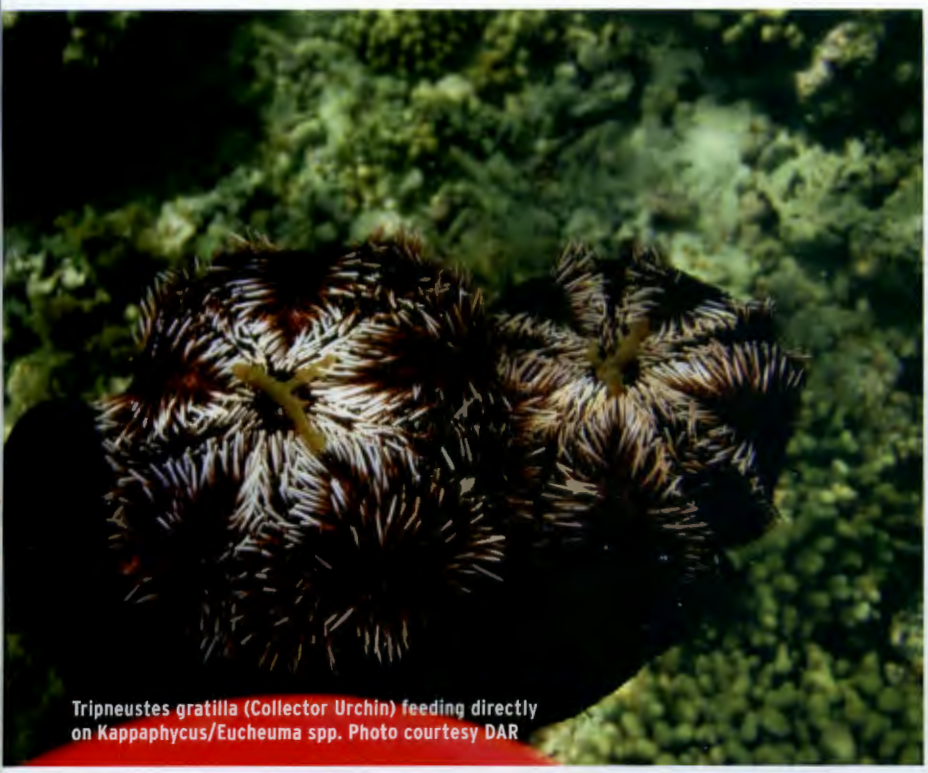
Caption TK. Photo Sterling Kaya

Utilizing Mechanical Removal in Conjunction with Native Sea Urchin Biocontrol

In July 2008 a small patch reef, roughly 3000 m2 in Kaneohe Bay, Oahu was cleared of alien algae using Supersucker Sr. along with help from its smaller version, Supersucker Jr. Consequently, the algae re-grew to baseline levels in six months without any further intervention. In July 2009, the reef was re-cleared. DAR 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.

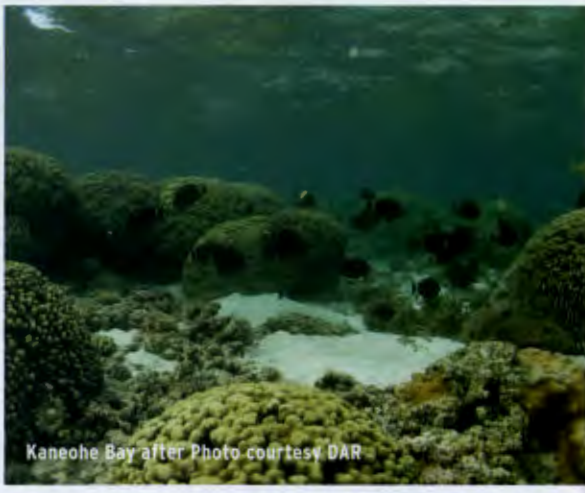
The artificial Z-slab reefs will be monitored to measure any impacts from urchin removal as well as urchin population recruit and migration in the area.

Brian Hauk. Photo Sterling Kaya



Tripneustes gratilla (Collector Urchin) feeding directly on Kappaphycus/Eucheuma spp. Photo courtesy DAR

Kaneohe Bay before Photo courtesy DAR



Kaneohe Bay after Photo courtesy DAR

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.

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Kaneohe Bay Border Control: A Transition from Alien to Native

In October, 2009 the AIS team began removing alien algae from a fringing reef in the northern section of Kaneohe Bay. This area marks the northern extent of dense Eucheuma denticulatum distribution. A 25 x 50 meter trial plot was cleared to determine removal rates and habitat types. We were unable to return to the area for two months due to equipment and weather complications. Upon our return, we found that the cleared area had been repopulated by a native species Turbinaria ornata. We are currently research the competitiveness of this and other native species with displacement experiments.

AIS Surveys and Distribution Mapping for 5 Alien Algae Species

DAR has been conducting visual surveys for five major invasive marine macroalgae species (Gracilaria salicornia, Kappaphycus/Eucheuma 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.

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.

What Fishermen Can Do To Help

Invasive algae can establish itself in new areas via sexual reproduction or through fragmentation. Therefore, every small piece of algae that makes its way to a different location has the potential to establish a new population on the reef. There are a number of measures that we can take to help prevent the spread of invasive algae:

What you can do while fishing

- Carefully inspect fishing lines, hooks, nets, traps and catch bags for small fragment of seaweed; remove and dispose of before leaving area
- Limit harvest of key herbivore species:
  - -Urchins such as hawae, wana, ina, and haukeuke ula ula
  - -Herbivorous fish such as uhu, enenue, kala, umaumalei, and manini

What you can do on your boat:

- Inspect anchor, mooring lines, propellers, bilge and trailers for small fragments of seaweed; remove and dispose of any seaweed before leaving area
- Keep your hull clean

What you can do while snorkeling or diving:

- Carefully inspect wetsuit (especially Velcro), footwear, gloves, BCD, fins and gear bag for small fragments of seaweed; remove and dispose of before leaving area
- Wash and dry tabis and other equipment between watersheds

Much like urchins, healthy herbivorous fish populations can also keep algae in check, but many of these species (such as parrotfish and surgeonfish) are overfished, so it is important to limit the harvest of these species. Remember to let the ocean be your ice box!!

Molokai Gorilla Ogo Removal Project

Funding Sources:
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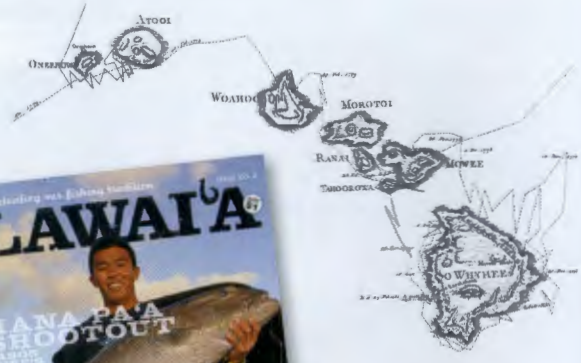

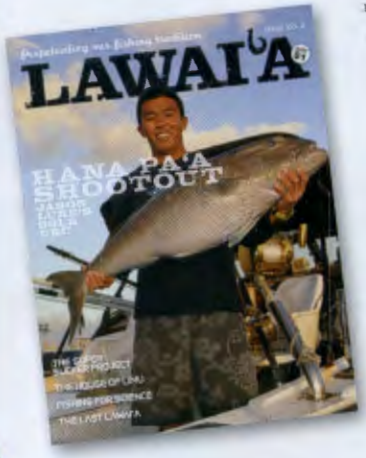

ON THE COVER:
Jason Luke's 33 lb Uku

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