The fight against invasive seaweed

By Jan TenBruggencate
Advertiser Science Writer

Biologists fighting aggressive alien seaweeds that destroy Hawaiian reefs are turning to sea urchins and fish that graze on the plants in hopes that their feeding will help control the invaders.

"If people can raise herbivore (plant-eating) stocks quite substantially, I believe it will have a big impact," said coral reef ecologist Ivor Williams, of the Hawai'i Coral Reef Initiative and the state Division of Aquatic Resources.

Researchers put collector urchins on weed-infested reefs in cages in Kane'ohe Bay, and found that they quickly ate away much of the alien limu inside their cages.

"We have not had enough urchins to test them out on a whole reef, but in every experiment on a smaller scale, we saw that urchins stop infestations of alien algae to begin with, or prevent the regrowth of existing alien algae," said Eric Conklin, who conducted some of the urchin-algae experiments and is now marine science adviser to The Nature Conservancy's Hawai'i Marine Program.

Researchers have reason to believe the restoration of herbivore populations will work, based on observation and experiments, but there are tricky issues.

For instance, some herbivores prefer one seaweed over another. Grazing fishes such as manini seem to be quite fond of the acanthophora seaweed that's a big problem on West Maui. But the fish don't much care for the kappaphycus weeds in Kane'ohe Bay. However, collector urchins love them.

The effort to repopulate urchins and fish stocks comes as researchers have found that manual and mechanical removal of dense seaweed patches are merely a short-term measure, Conklin said.

Technologies such as an underwater vacuum called the Super Sucker and its recently unveiled offspring, Super Sucker Junior, aid in the process, but the limu still grows back. One proposed technique is to use the suckers to reduce the volume of alien weed, and then set the urchins and fishes on what's left.

"Using the urchins (and herbivorous fish) in conjunction with the Super Sucker, that carries us through the next few years," Conklin said.

One problem that still has to be overcome is that people eat collector urchins, and their populations have been overharvested to the point where they can't keep up with the seaweed.

Scientists in Cindy Hunter's University of Hawai'i laboratory are learning to produce collector urchins in large numbers in aquariums so they can be released onto the reefs to restore overfished urchin populations.

Hunter's program has thousands of larval collector urchins swimming in a big aquarium at Coconut Island, but has not yet figured out what to feed them to prompt them to change to their next growth stage. Two of her associates will fly to Okinawa.

University of Hawai'i and Bishop Museum invasive algae Web site:
www.hawaii.edu/reefalgae

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to study techniques used by captive urchin production facilities there.

The worst aggressive limu problems in the state are on Maui and O'ahu. Marine scientists note that the seaweed infestations seem to be worse in areas that are overfished and areas with high nutrient loads from sewage and agricultural runoff. Areas not overfished and without significant nutrient problems seem to do better.

"We don't have an invasive algae problem (in Kona) because we have very healthy fish stocks," said Williams, of the Hawai'i Coral Reef Initiative and the state Division of Aquatic Resources.

And then there's Hanauma Bay, a marine preserve for four decades. Throughout the reef flats around southern O'ahu, alien seaweeds like gracilaria and acanthophora abound. But in Hanauma Bay, where grazing species are healthy, there is no problem with invasive seaweeds.

West and Central Maui reefs have become notorious for the aggressive algae blooms.

"We're just identifying very disturbing trends in coral health on our reefs," said Russell Sparks, an education specialist with the state Division of Aquatic Resources on Maui.

He said many South Maui reefs are losing coral fast, and some may be beyond help, like areas near Ma'alaea where algae has filled cracks and holes in the reef, and there are no hiding places left for fish. The state is proposing an aggressive program to protect herbivores on one West Maui reef that is under siege but is not yet lost.

"At Kahekili Beach — it's also called Old Airport Beach or North Ka'anapali Beach — coral cover has dropped from 55 percent in 1994 to 33 percent in 2006. There are big blooms every summer of the alien algae acanthophora," Sparks said. "We propose to establish a marine managed area to protect surgeonfish, parrotfish and rudderfish, as well as urchins, along about 1.5 miles of coast."

The work on finding natural controls for alien algae is a collaboration of the state Department of Land and Natural Resources Division of Aquatic Resources, University of Hawai'i natural sciences, The Nature Conservancy of Hawai'i, the Hawai'i Coral Reef Initiative, the Hawai'i Invasive Species Initiative and others.

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SPREAD OF INVASIVE ALGAE AROUND MAIN HAWAIIAN ISLANDS

The three species of non-native limu listed below are among 19 alien marine algae introduced to the islands since 1950. Of those, 10 have become well established. In doing so, they are displacing native marine organisms and smothering coral reefs.

Acanthophora spicifera  
Hypnea musciformis  
Gracilaria salicornia

KAUA'I  
O'AHU  
MOLOKA'I  
LĀNA'I  
MAUI  
KAHO'OLAWE

Scientists hope that they can control alien seaweeds by increasing the number of limu-eating collector sea urchins, or hāwae. They're trying to raise them in aquariums for release into the wild. A kelii, shown here, 42 days after fertilization, is about 1/16th of an inch wide from the ends of its tube feet.  

Cindy Harsa / Lab photo

HERBIVORES THAT FEED ON ALGAE

Mānai (surgeonfish)  
Pilakalua (parrotfish)  
Mālikole (surgeonfish)  
Uhu (parrotfish)  
Hāwae Māoli (collector urchin)

Source: DLNR, UH, The Nature Conservancy  
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Back

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