Herbivore Enhancement Area to strengthen reef

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At a FIN (Fish Identification Network) event at Kakekili Beach (Airport Beach) in Ka‘anapali in October, “finnies” learned that what they were seeing in their fish counts was evidence of how fish diversity suffers when invasive algal species take the place of endemic species in a coral reef. I was among the fish counters and was disturbed to hear a confirmation of what I had long been noticing with my own eyes.

“The alien algae problem can be a symptom and a cause of reef degradation,” explains Darla White, a marine biologist who works with community groups to develop volunteer monitoring protocols derived from Department of Aquatic Resources (DAR) data sets.

“An Herbivore Enhancement Area (HEA) is not going to work for every reef,” she explains. The health of the reef differs from site to site for different reasons.” However, in some areas, enhancing the herbivore population can curtail the growth of invasive algal and restore the health of the reef, she said.

Since local fishermen have been experiencing a decline in their favorite species of fish, they are welcoming this new concept in fish/reef management and support the designation of the targeted area (which will begin at Keka‘a fronting the Sheraton Hotel and extend around Honokowai Point to the southern edge of Honokowai Beach Park) as an Herbivore Enhancement Area.

Surfing for articles on coral reefs to see how Maui’s reefs compare to others worldwide, I noticed that the crisis of our reefs is a global problem. On the list of human and natural impacts to reefs: high nutrient agricultural runoff, sedimentation, pollution from pesticides/herbicides and other chemical wastes, sewage, disease, over-harvesting of herbivorous fish, global climate change is the most recent addition. While often storms cause damage to the reef (which act as a barrier to the land), coral has a natural resilience to surge and storms. Unfortunately, the problem runs deeper than that.

Coral Grief

Algal blooms that smother living coral, and stress to the plant within the coral polyp (also known as bleaching) are noticeable forms of degradation in shallow reefs. A diseased reef is then prone to predators such as crown of thorns starfish andnematode worms which voraciously consume coral polyps when unchecked by natural balances.

Reefs are a nursery for abundant marine fauna in their larval stages of development. In fact, reefs are a nursery for 25 percent of all known marine species. Thus, here in Hawai‘i, the primary cause for alarm is not the disgruntled tourists who complain of fewer fish to ogle while snorkeling, but instead the local population dependent on the protein rich food sources that should be abundant in the ocean.

Ma‘alaea Bay is a case in point. In 1972, Ma‘alaea coral reefs were described as being “striking in their diversity.” As late as 1993, estimated coral cover (meaning the area covering the bottom) was 50-75 percent near the site where cover is now eight percent. In just a few decades, the Ma‘alaea reef has transformed from a healthy and diverse ecosystem habitat into a badly degraded habitat overgrown by algae with little surviving coral.

This once structurally complex, actively growing reef was once a habitat for diverse fish. Now it is hospitable to only a few dominant fish: small wrasses, puffers, and triggerfish. Neither other fishes and turtles, nor the coral polyps and larva that would be recruited to a healthy reef, are now able to survive in the degraded area.

Although Australian fishery management on the Great Barrier Reef has had significant short-term success with no take areas (NTAs), in Hawai‘i the approach best suited to our Kanaka Maoli subsistence fishers and local fishermen is an Integrated Coastal Zone Management (ICZM) program,as it approximates the ancient ahu pua‘a system of management. Fishermen are still able to fish certain species while observing kapu (restrictions) for some fish during vulnerable spawning seasons; for other fish a kapu on sizeor age of take; and still others-a complete no take until the species and the coral have recovered.

Recent scientific research has condemned the earlier practice of simply monitoring for diversity and abundance of fish species. Instead, the new management concentrates on the function of three herbivores with herbivorous fish being the dominant group. These fish are plant grazers that keep the algal blooms in check, and eat invasive macro-algae species that would otherwise smother the reef. Furthermore, herbivorous fish such as surgeonfish (kala), parrotfish (uhu) and chub (nenue), as well as the large urchins are the potentially abundant shallow and mid-depth herbivores which feed on benthic (bottom dwelling) algae.

The slippery slope to slime

The easiest way to understand what is happening here in the MHI (main Hawaiian Islands) is to visualize a causal chain.

Reefs in an already poor condition are certainly much more vulnerable to overgrowth by invasive algae – if habitat quality is poor and grazing fish stocks are depleted, and particularly if nutrients are also elevated, there is little to prevent invasive algae from choking the reef. It is also the case that once invasive algae become established on a marginal quality reef, the overgrowth of corals and the infilling of holes and cracks in the reef structure by algal mats will further reduce the reef’s ability to support the fish stocks which could provide some check to the spread of the overgrowing invasive algae.

Thus, once alien algae become well-established on a reef, the condition can worsen exponentially. Therefore, blooms of invasive algae on Hawaiian reefs are likely both a symptom and a cause of degradation in
affected locations.

The good news

A DLNR/DAR study entitled “Fish Habitat Utilization Study” (FHUS) that conducted surveys of fish and habitat at all Hawaii’s Marine Life Conservation Districts (MLCD) and comparable ‘control areas’ (nearby reefs which are open to fishing) presents an interesting correlation between the biomass of herbivorous fishes and the amount of macro-alga (fleshy, large alga).

The conclusion is simple to grasp: (1) “reefs with large stocks of herbivorous fishes had very little, if any, macro-algae, whereas the reefs with few grazing fish had lots of macro-algae; and (2) reef areas closed to fishing tended to have much larger stocks of grazing fishes than fished areas.”

The proposed Herbivore Enhancement Area in West Maui, not yet operational, will be an experiment in joint stewardship of the reef: local fishermen, UH Researchers, DAR technicians, and possibly members of FIN (Fish Identification Network) will participate in this resource management strategy.

Indeed, looking to long term recovery, reef management needs to be more inclusive of Kanaka Maoli input and to support ownership and empowerment of users as stewards of reef resilience. The government should provide incentives for herbivore protection before – not after – fish stocks collapse, and implement flexible restrictions.

Kahea (outcry) is the word that best describes the concern expressed in public hearings regarding recent and pending development near coastal waters. The Wailea/Makena area and Honolua and Kapalua Bays, are some of the most vulnerable.

Mitigating the impacts of treated sewage and herbicide runoff from golf courses should be the focus of debate and subsequent legislation.

To date, the technology of injection wells has not solved the problem of nutrient-rich discharge into coastal waters and the algal bloom it feeds. Let us hope that we can learn from these lessons of reef degradation and prevent further crisis in Hawaiian reefs.