

Council Chair
G. Riki Hokama

Vice-Chair
Danny A. Mateo

Council Members
Michelle Anderson
Gladys C. Baisa
Jo Anne Johnson
Bill Kauakea Medeiros
Michael J. Molina
Joseph Pontanilla
Michael P. Victorino



Director of Council Services
Ken Fukuoka

COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793
www.mauicounty.gov/council

March 3, 2008

Senate Committee on: Senate Ways & Means Committee
Attn: Chair Rosalyn Baker & Vice-Chair Shan Tsutsui
Testimony Supporting SB 3225: Relating to Fishing

February 25, 2008, 10:30 a.m.

Aloha Chair Baker, Vice-Chair Tsutsui, and Members of the Committee:

As the Maui County Council has not had opportunity to take a formal position on this measure, I am providing this testimony in my capacity as an individual member of the Maui County Council.

I strongly support Senate Bill 3225 (SB 3225).

There is a great need to impose restrictions on the gathering of ornamental fish in the waters of Hawaii. Others have submitted testimony supporting SB 3225, but may I respectfully add the following:

- An ongoing and growing problem in Hawaii has been “invasive algae” covering, and thereby destroying, our coral reefs. It is widely-known that herbivorous reef fish of Hawaii help to control algae growth by feeding on the algae. Therefore, if we do not impose restrictions on the gathering of our reef fish, there will be less fish to feed on the algae which is destroying our reef system.
- In “*Status and Trends of Maui’s Coral Reefs*” (see, attached pdf) by the Hawaii DAR and Hawaii Coral Reef Initiative Research Program, the growing problem of “invasive algae” was discussed. It states, in relevant part:

The Growing Problem of Invasive Algae. A significant and growing concern is the increasing overgrowth of reefs by invasive seaweeds, particularly *Acanthophora spicifera*, *Hypnea musciformis* and *Ulva spp.*. Shallow reefs in Kihei and Maalaea are now almost totally overgrown by those species and *A. spicifera* has become much more abundant in recent years at other locations including Honokowai/Kahekili and Papaula Point. Algal blooms are indicative of a loss of balance between factors which promote algal growth (e.g. nutrient availability) and those which control algal abundance (e.g. reef fish grazing). (emphasis added)

It further states:

Reefs with abundant herbivorous fishes, such as those in the Honolua and Molokini MLCs, have little or no invasive algae present, whereas reefs with depleted herbivore populations (e.g. Maalaea) are severely overgrown.

* * * *

In 1972, Ma'alaea coral reefs were described as being "striking in their diversity and in the presence of rare corals species." As late as 1993, estimated coral cover was 50-75% close to the site where cover is now 8%. Therefore, in just a few decades, the Ma'alaea reef has transformed from a healthy and diverse ecosystem into a badly degraded habitat overgrown by algae and with little surviving coral. (emphasis added)

- The economic impacts of unrestricted gathering of ornamental reef fish and the loss of our coral reefs are staggering. In "Assessments of Algae and Water Quality in the Coastal Waters at Kihei, Maui" (by University of Hawaii, Botany Department), it stated, in relevant part, that:
 - "Over 20,000 lbs of algae wash up on Kihei's beaches/week;"
 - "Economic study-algae in north Kihei cost the state more than \$20 million/yr;"
 - The "State spends greater than \$100,000/yr cleaning beaches;" and,
 - "Algae is growing extremely fast, with Hypnea able to double in size in two days. (These are among the highest growth rates ever recorded in any ecosystem on the planet);" and,
- In "Economic Valuation of the Coral Reefs of Hawaii," conducted by Cesar Environmental Economic Consulting (Grant No. NA 160A1449) (Date of Final Report: November 2002), it was determined that:

"Kihei's algae: Algae blooms have been a recurring problem on reef flats off the southern and western coasts of Maui for almost ten years. This has caused significant disturbance to the beach front, both in terms of its unattractive appearance and unpleasant odor. Potential contributing factors include wastewater discharge, leaching of injection wells, storm water and agricultural runoff, and golf course runoff. This leads to nutrient enrichment of the shallow reef area, which can cause phytoplankton blooms. These blooms limit the amount of sunlight reaching stony corals, thereby affecting their health. The major algal blooms occur in the North Kihei area, which has an algae cover of over 50 percent. Algae cover in South Kihei, which has not had such problems, was estimated at around 5 percent. The North Kihei algae problem is both a costly nuisance and a direct biological threat to local coral resources.

To Honorable
March 3, 2008
Page 3

Currently, the largest economic cost is the drop in occupancy rates, room rates and property values in North Kihei. According to our survey, these declines can be largely attributed to the algal blooms -43% as valuable as one bedroom units in the 'no-algae zone'. Occupancy rates and room rates were equally different between the two zones.

This case study estimated the net-benefits of solving the algal bloom problem in Kihei. **Not surprisingly, the annual benefits further decline from \$25 million to \$9 million if the coral reef gradually disappears and algae blooms continue occur. However, in a situation where nutrients are successfully reduced, the annual benefits will eventually increase by almost \$30 million.** The majority of this increase can be attributed to the growth in property values. It is not clear how the algae blooms can be eliminated. **However, the associated economic benefits of their elimination are such that major spending is justified."** (emphasis added)

- In January of 2008, numerous government agencies, nonprofit organizations and community groups collaborated to launch 2008 as the International Year of the Reef in Hawai'i. In doing this, Hawai'i joined the United States Coral Reef Task Force and various international organizations in designating 2008 as the *International Year of the Reef (IYOR)*.

For the foregoing reasons, and in this – the Year of the Reef - I strongly support SB 3225.

Sincerely,

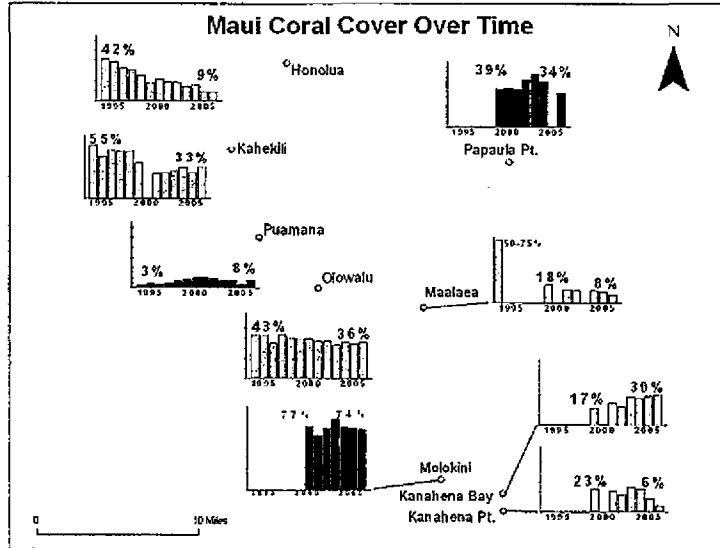
Michelle Anderson,
Council Member

In 1999, The Hawaii Division of Aquatic Resources (DAR) in partnership with the Coral Reef Assessment and Monitoring Program began annual surveys of coral condition at 9 reef areas in Maui County (see map 1). The 4 West Maui stations had been previously monitored by the Pacific Whale Foundation since 1994. Those long-term monitoring programs provide an opportunity to assess the status and trends of Maui's coral reefs over the last 7 to 13 years.

Coral Status and Trends:

- Coral cover in 2006 ranged from 74% at Molokini to <10% at 4 sites: Honolua (9%), Puamana (8%), Maalaea (8%), and Kanahena Pt (6%).
- Coral cover increased at only 1 reef (Kanahena Bay, 17% to 30%), remained stable (<5% change), at 3 reefs (Molokini, Papaula Point, and Puamana), and declined at 5 reefs, most dramatically at Honolua (42% to 9%) and at Kahekili (55% to 33%).
- Mean coral cover of the 9 reefs declined from 35% when sites were first surveyed (1994 for West Maui, 1999 elsewhere) to 27% in 2006. Thus, nearly 1/4 of all living coral was lost over that period.

Given the strong likelihood that several of the sites were already somewhat degraded when monitoring began, recent trends almost certainly underestimate declines over longer timeframes. For example, coral cover at the Maalaea site declined from 18% to 8% between 1999 and 2006, but a 1993 Fish & Wildlife Service study estimated coral cover there as being between 50% and 75%.



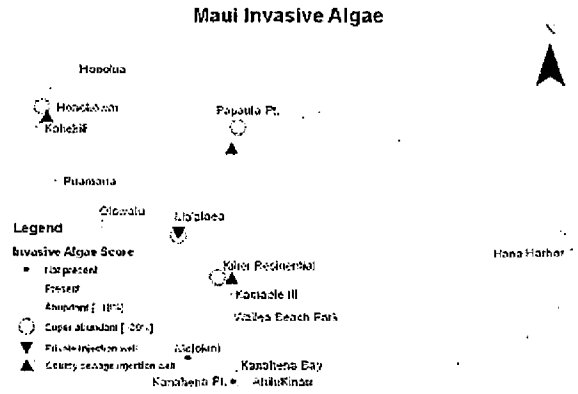
Trends in coral cover at 9 long-term monitoring stations. Red indicates >5% decline over monitoring period, green indicates >5% increase, black = no change (<5%)

The causes of coral reef decline around Maui are complex and vary among locations, but there are strong indications that human impacts have been very important. Notably, cover has declined at several West Maui sites: Honolua Bay, Kahekili, shallow reefs of Olowalu, and at Maalaea, where anthropogenic impacts from shoreline development and human use are likely greatest. Conversely, sites which have experienced increases or sustained high coral cover are remote or offshore (Kanahena Bay and Molokini). The one observed decline on a relatively remote reef (at Kanahena Point since 2004) was due to a local outbreak of the coral-eating crown-of-thorns starfish.

The Growing Problem of Invasive Algae

A significant and growing concern is the increasing overgrowth of reefs by invasive seaweeds, particularly *Acanthophora spicifera*, *Hypnea musciformis* and *Ulva* spp.. Shallow reefs in Kihei and Maalaea are now almost totally overgrown by those species and *A. spicifera* has become much more abundant in recent years at other locations including Honokowai/Kahekili and Papaula Point. Algal blooms are indicative of a loss of balance between factors which promote algal growth (e.g. nutrient availability) and those which control algal abundance (e.g. grazing). It is likely that both high nutrients & low grazing have been important

- Studies by researchers from University of Hawaii (UH, next page), together with the evident correspondence between reefs with severe algal blooms and coastal areas with high human population density (see →), strongly suggest that elevated nutrients from wastewater or fertilizers are fueling accelerated algal growth.
- Reefs with abundant herbivorous fishes, such as those in the Honolua and Molokini MLCDs, have little or no invasive algae present, whereas reefs with depleted herbivore populations (e.g. Maalaea) are severely overgrown by algae.



Distribution of invasive algae around Maui: 'present' means invasive species found only in low abundance & in limited habitats, 'abundant' indicates cover of 10-30% on extensive portions of reef, 'super-abundant' means >30% algal cover in multiple reef zones

Invasive algae are by no means the only problems affecting Maui's coral reefs. In fact the greatest decline in coral cover observed on any surveyed reef was at Honolua Bay, where invasive algae are scarce. It is, therefore, important not to discount other potential factors such as increased sedimentation, chemical run-off and other pollution. However, the causes and consequences of invasive algal blooms are relatively well understood and therefore worth considering in some detail.

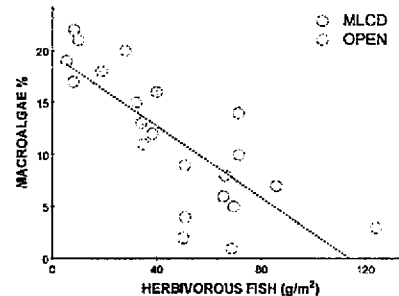
Sources and Consequences of Elevated Nutrients in Maui's Nearshore Waters

Recent research by UH scientists which has focused on shallow Kihei reefs which are currently overgrown by *Hypnea* and *Ulva*, strongly suggests that terrestrial, likely anthropogenic, nutrients are driving algal blooms there:

- Concentrations of nutrients (Nitrogen and Phosphorus) are highly elevated in nearshore areas where algal blooms are found.
- Stable isotope ratios ($\delta^{15}\text{N}$ ‰) in algal tissue are indicative of animal waste (presumably sewage) being their primary source.
- Growth rates of algae on shallow reefs are extraordinarily high (*Hypnea* is able to double its biomass in just 2 days). Such growth rates are so high that the estimated productivity of shallow Kihei reefs is among the highest ever recorded for any ecosystem on the planet.

The Role of Grazing Fishes in Controlling Invasive Algae

Clear evidence of the ability of grazing fishes (parrotfishes and surgeonfishes) to control the abundance of problem algae comes from the "Fish Habitat Utilization Study", a cooperative study by the National Oceanographic and Atmospheric Administration and Hawaii DAR. For that study, fish and habitat were surveyed in all of Hawaii's MLCDs plus comparable 'control' areas open to fishing. Among the findings were that, statewide, reefs with large stocks of herbivorous fishes tended to have much less macroalgae than reefs with low stocks of grazing fishes (see →). Supporting evidence for the capacity of grazing fishes to control the invasive seaweeds which are currently abundant on several Maui reefs comes from diet preference studies. Both *Acanthophora* and *Hypnea* are highly preferred foods for grazing fishes. In fact, *Acanthophora* has repeatedly been found to be among the most preferred foods for grazing fishes in studies both in Hawaii and elsewhere in the world. Therefore increases in stocks of grazing fishes would almost certainly lead to reductions in the spread and prevalence of invasive algae.



Relationship between biomass of grazing fish and macroalgal cover on 22 Hawaiian coral reefs. Red dots represents reefs closed to fishing (Marine Life Conservation Districts); green dots represent areas open to fishing

Case Study: Total System Collapse at Maalaea

The end result of reef degradation is evident at Maalaea Bay. In 1972, Maalaea coral reefs were described as being 'striking in their diversity and in the presence of rare corals species'. As late as 1993, estimated coral cover was 50-75% close to the site where cover is now 8%. Therefore, in just a few decades, the Maalaea reef has transformed from a healthy and diverse ecosystem into a badly degraded habitat overgrown by algae and with little surviving coral. One consequence of severe loss of living coral is that degrading reefs change from being actively-growing and structurally-complex habitats, into eroding and relatively flat areas which do not support abundant marine life. That process is well advanced at Maalaea, where fish stocks are now in very poor condition, being dominated by small wrasse, triggerfish and puffers. Given that the Maalaea reef is now a poor habitat for most grazing fishes, and that existing blooms of algae will continue to inhibit new coral growth, even in the best of circumstances (without water quality or fishing impacts), recovery of Maalaea would likely take many years.



Maalaea Reef. Dense growths of macroalgae dominates, remaining corals are in poor condition & reef physical structure is deteriorating as coral growth does not keep pace with the rate of erosion

Summary

It is very important to recognize that the kind of degradation which has occurred at Maalaea and elsewhere is not just a matter of loss of coral cover. Reductions in associated habitat quality and topographical complexity mean that once degradation is well established, affected reefs will have lower recreational and commercial value, and will support limited fish stocks, to the detriment of all resource users. The goal of those charged with the protection and restoration of Hawaii's natural resources must be to prevent such severe degradation from further affecting Maui's reefs. Given the trajectories of decline over the last 7-13 years, it is evident that substantial deterioration can occur rapidly. If steps are not taken to return conditions to those in which corals can thrive, it is nearly certain that additional reefs will reach the state of Maalaea. Recovery of herbivore stocks may be part of the solution at some locations, but without other steps to reduce land-based impacts there is unlikely to be substantial recovery across the island's reefs.

For more information, please contact:

Ivor Williams, Hawaii DAR & Hawaii Coral Reef Initiative Research Program at (808) 327 6226 or ivor@hawaii.edu
 Russell Sparks, Hawaii DAR, Maui Office at (808) 243 5294 or russell.sparks@hawaii.gov
 Celia Smith, UH Manoa, Dept of Botany at (808) 956 6947 or celia@hawaii.edu