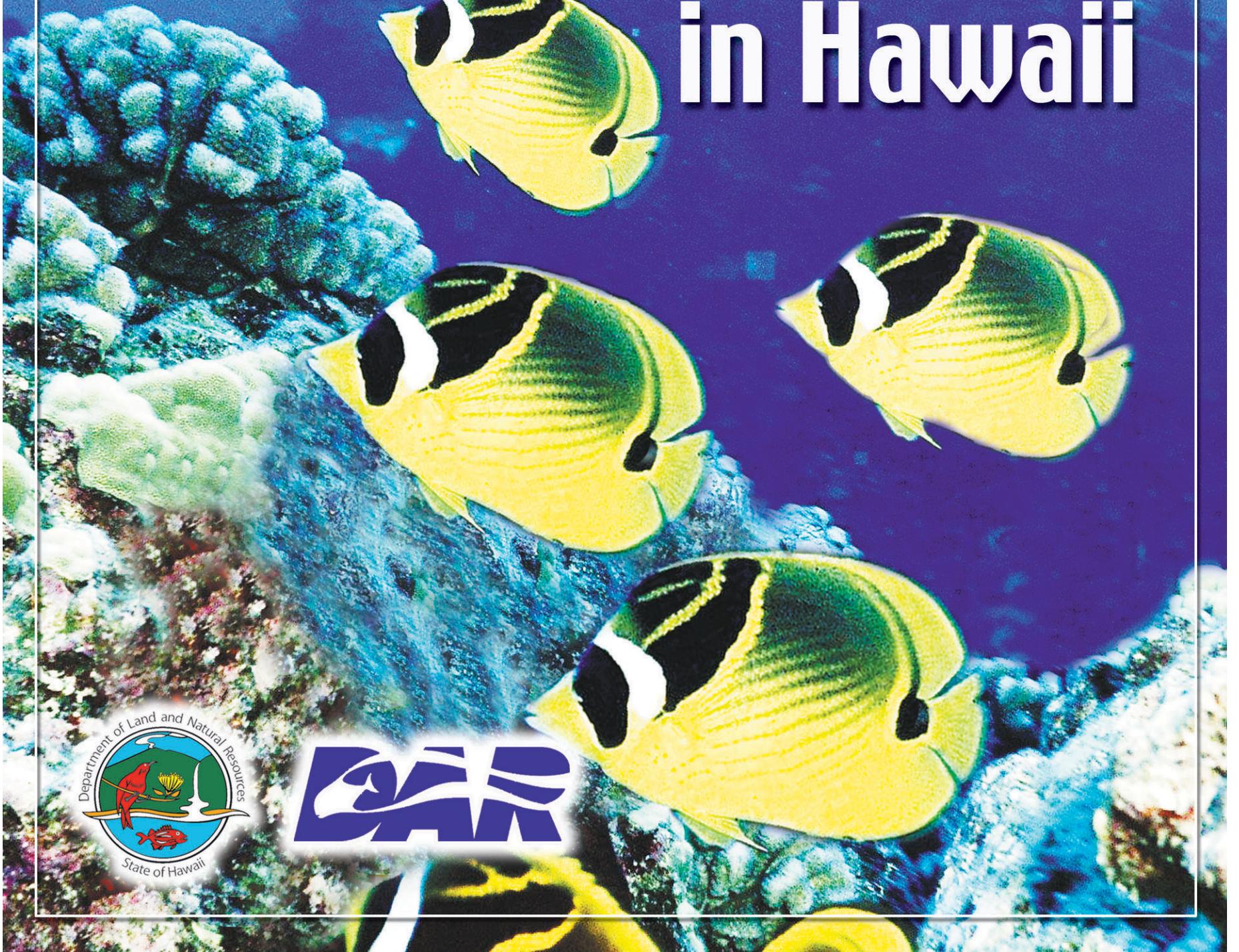
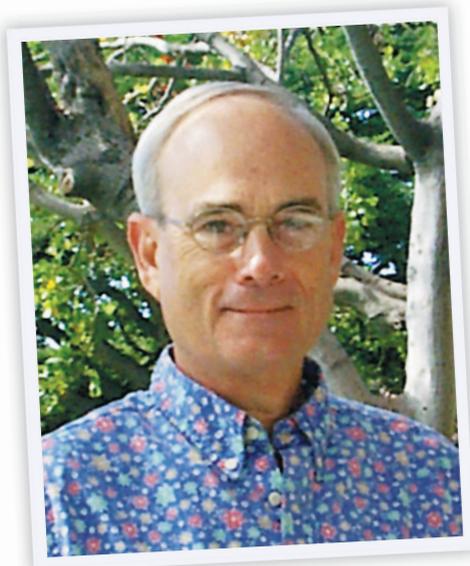


Marine Protected Areas in Hawaii





Aloha!

Thank you for taking the time to read through this publication, which tries to put into perspective the topic of Marine Protected Areas, or "MPAs."

DLNR's Division of Aquatic Resources' motto is "Fish for the Future." We ask that you keep this mission in mind as a personal goal when reading this. With your help, DLNR is looking for ways to ensure all of Hawai'i's people can continue to enjoy fishing, eating fish and seeing these beautiful elements of our ocean well into a bright future.

Although DLNR is the state agency tasked with protection and preservation of our natural and cultural resources, we recognize no one constituency, no one community, no one resource management entity has the sole responsibility for and jurisdiction over the resources. Each of us shares the responsibility for protection and preservation of our natural and cultural resources.

Please keep in mind the word "Ho'okuleana." It means "to take responsibility" - our individual and collective responsibility to:

- Participate - rather than ignore
- Prevent - rather than react
- Preserve - rather than degrade.

What each of us does every day affects Hawai'i's environment. So, it is important to recognize that we are all resource stewards. If we want Hawai'i's resources to remain healthy, we must each make it a personal commitment and goal to protect and care for them. We hope this will help connect our communities and constituencies with the resources that surround us.

Today, we are looking at the kinds of protection needed to assure we have fish for the future. MPAs are one tool that can help us do that. We hope you give careful consideration to this publication and the issues it raises and addresses. To find the right answers, DLNR needs your help.

We are suggesting that we create a structure, or "framework," to define and designate MPAs around the state. In doing so, we may end up renaming existing MPAs and putting them into different "categories." While this will not change the level of resource protection, it will group similar types of protection and permitted uses.

Please read this publication carefully. Ask questions, share this with others, and let us know what you think. We cannot do this alone, we need your help. This pamphlet explains how you can get involved and help us.

Sincerely,

Peter T. Young
Chairperson

contents

Historical and cultural context in Hawai'i	3
What is a Marine Protected Area?	4
What is an ecosystem?	5
What stresses Hawai'i's marine ecosystems?	6
How are Hawai'i's marine ecosystems doing?	7
Marine Protected Areas in the main Hawaiian Islands	8
What are some benefits of MPAs?	10
What are some drawbacks of MPAs?	12
What is the status of MPAs in other parts of the Pacific?	13
What is DLNR doing regarding MPAs?	14
Reviewing the status of Hawai'i's MPAs	15
What can you do?	16
Who to contact	16

DLNR's Division of Aquatic Resources: Our Role and Commitment

It is the role of DLNR's Division of Aquatic Resources to sustainably manage our unique aquatic resources and ecosystems for the benefit of Hawai'i's people, and as a legacy for fu-

ture generations. DLNR is committed to providing protection as necessary to conserve marine resources in the Hawaiian Islands, and ensure there will be "Fish for the Future."



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Historical and cultural context in Hawai'i

The ocean was part of what early Hawaiians called 'aina, or "that which nourishes." The ocean nourished their spirits and minds, as well as their physical bodies. Kanaloa, akua of the ocean, strengthened their spirits. Voyaging challenged their minds. And all manner of limu and fish, including shellfish, gave health and strength to their bodies.

Fishing was practiced from inner shoreline to deep blue sea, far from the sight of land. It was a necessary skill, practiced by men, women and children. Some were experts. Some took pleasure in it. Some did it for sport. All valued it.

To waste was an insult to akua, and was considered irresponsible. Care was taken to give thanks before and after taking. Sharing was a demonstration of civilized behavior. Hawaiians knew that the supply was limited, so they studied all aspects of the ocean and its inhabitants in order to better understand, and to malama (care for) it in a manner that was pono (in the necessary, correct and righteous way).

This understanding led them to cultivate and care for fishing areas (ko'a). Kupuna (elders) always cautioned the next generation not to take more than was needed, and to always leave something for others. Each community was responsible for caring for

and protecting their fisheries. It was understood that greediness and waste would eventually bring about misfortune.

The "kapu" provided a set of rules to regulate the behavior of people. These rules most often came about as a result of consultation between the people (hoa'aina) and their leaders (konohiki/ali'i). One strategy was to reserve certain species. Another provided for no fishing during certain times.

These kapu were exercised by the communities who had firsthand experience with the fishery in question. Many kapu coincided with spawning cycles. The system provided for rules that were sensitive to local and individual needs of various and diverse fisheries.

The construction and management of fishponds, along with preservation by drying or salting fish, enabled communities to have fish even during the times of no fishing, when fisheries were allowed to rest and rejuvenate.

When fisheries had been rested, the communities and their leaders would reopen

fishing to the local community. Kapu and good sense made the resources available to community members for their needs. Everyone in the community was responsible for abiding by these good practices.

Penalties were necessarily strict, as there were no food sources other than what was here in the islands. Inappropriate practices were evident to all. Censure from both leaders and the community was certain and, depending upon the nature of the violation, severe.

The needs of the community, as well as the health and well being of the fisheries, were essential to the necessary balance and conducive to pono behavior, which was everyone's goal.

It is the behavior of human beings which has the greatest impact on the existence of the rest of the creatures that share this world.

If we behave properly, often the "resource" (those other entities that give their lives so we can live) will take care of itself.



photo by TAI SING LOO, BISHOP MUSEUM



photo by ALONZO GARTLEY, BISHOP MUSEUM

Mauka – Makai: From the mountains to the sea

Mauka (toward the mountains) and makai (toward the ocean) are not just directional references; they embody our fundamental natural and cultural resources, land and ocean.

Hawaiians believe there is a balance between ocean and land. In traditional times, the ocean and its marine life were as well known as the life attributes of the upland areas.

This intimate relationship with nature resonates today in the modern principle of sustainability. We continue a strong interconnected, interrelated and interdependent relationship with our natural and cultural resources.

Some call it ecosystem-based stewardship. To Hawaiians, this was exemplified in the

ahupua'a, an ancient land division system divided into strips of land from the mountain to the sea, supporting self-sustained communities.

The legacy of the mountain-to-sea management system and ecosystem-focused sustainability continues today. Living on islands requires a balance between addressing human needs and protecting natural and cultural resources.

We must hold our islands in good stewardship for the generations to come.

Our natural and cultural resources are not simply historic sites, oceans, streams, mountains, trees, birds and fish. They are the foundation of our economy and the key to our quality of life.

Our natural and cultural resources define Hawai'i's "sense of place." They make and keep Hawai'i, Hawai'i.

What is a Marine Protected Area?

Marine Protected Area (MPA) is an “umbrella term” used globally by resource managers and scientists to describe portions of the marine environment set aside for the protection of the area and part or all of the resources within them. All over the world, natural areas are set aside with names like “park,” “protected area,” etc. MPAs include sites that vary in size, shape, objectives, types and levels of protection, but focus on conservation.

DLNR’s definition:

An MPA is any area of the marine environment established by law or regulation to protect or enhance part or all of the natural and cultural resources therein.

Are all MPAs “no-take”?

No. Most MPAs are multi-use, where the main goal is to

protect ecosystems. Limited take (removal of marine life) is allowed along with some other public use of marine resources.

MPAs are established for different reasons, which determine how restrictive they are. Some MPAs are established to protect an area in its natural, undisturbed state, minimizing human impacts as much as possible. These are the most restrictive, and their rules may need to prohibit access or removal of marine life. They are correctly referred to as “no-take” MPAs.

In Hawai‘i, “no-take” areas occupy less than one-third of one percent (0.3%) of coastal waters in the main Hawaiian Islands.

Are all marine areas that restrict public use designated as MPAs?

No. Not all marine areas that control or manage public use are MPAs. Some marine managed areas have special restrictions to meet goals other than conservation. These goals may include homeland

security, resolution of conflicts between fishing groups, provision for shipping lanes, etc.

The key word is protection. Because these areas are not set aside to protect resources, they are not Marine Protected Areas.

This publication focuses specifically on MPAs and the resources they protect.

Within the marine environment, different agencies and resource users have different goals and needs. Ecosystem protection (species and habitat) may not be the only concern in managing marine areas. There may be other goals, such as:

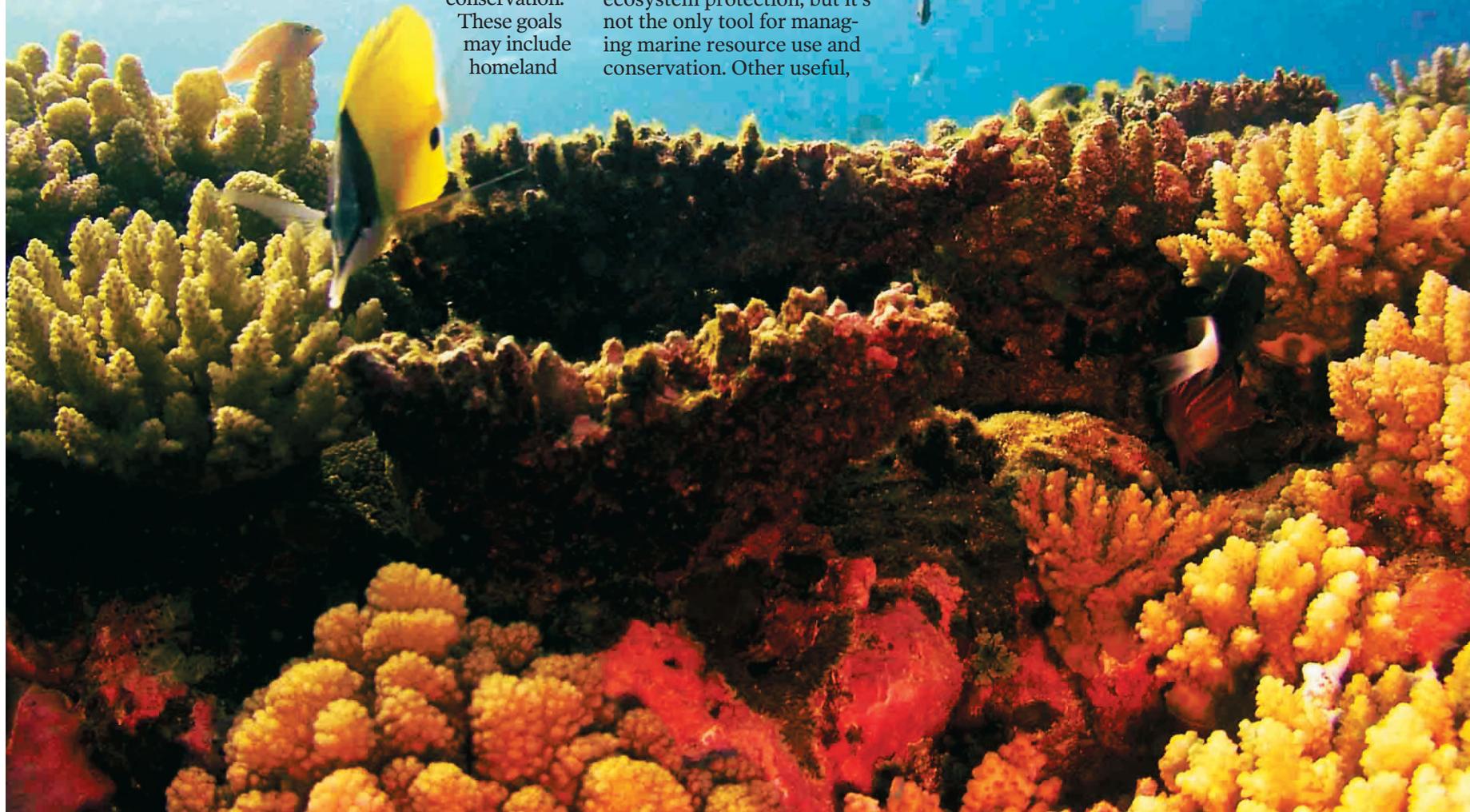
- Managing sustainable fisheries
- Providing sustainable and pleasant ocean recreation opportunities
- Ensuring safe and productive shipping;
- Optimizing and sustaining ocean industry.

Area-based management, such as MPAs, is useful for ecosystem protection, but it’s not the only tool for managing marine resource use and conservation. Other useful,

often essential, tools include:

- For fisheries: seasonal restrictions, size limits, bag limits, limited entry
- For ocean recreation: vessel permitting limits, ticketed and/or gated entry systems, user education, lottery systems, boating rules
- For shipping: Rules of the road, shipping lanes, speed limits
- For ocean industry: limited access to marine mineral exploration and drilling sites, discharge regulations, permitting standards.

There are many other management tools, as well. DLNR and other agencies use a variety of approaches in managing our natural resources.



What is an ecosystem?

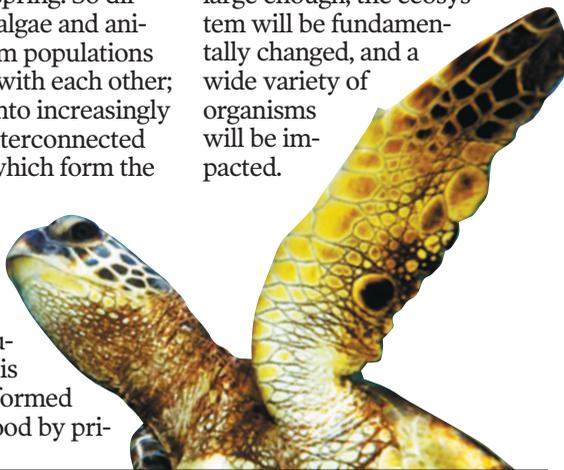
As mentioned earlier, MPAs are designed to protect marine resources at the ecosystem level, rather than by individual species or some other approach. An ecosystem is a level of organization that includes communities of living organisms and their physical environment. The physical environment includes water quality, climate, geology, and other non-living components.

There are different types of marine ecosystems, including coral reef, tidepool, open ocean, deep water, etc. Each type has its own characteristic communities, which are populations of different types of animals and algae (and sometimes plants) within a particular area. Populations are defined as all the members of a particular species within the area. A species is a group of organisms, genetically similar, which can interbreed to produce fertile offspring. So different types of algae and animal species form populations which interact with each other; they combine into increasingly complex and interconnected communities, which form the basis of marine ecosystems.

All ecosystems require a source of energy, which is usually the sun. This energy is transformed and stored as food by pri-

mary producers, such as phytoplankton and seaweeds. The food energy is then passed along to herbivores, animals which feed on primary producers. Herbivores are in turn preyed upon by carnivores, who are then eaten by higher level carnivores. The process continues up to the largest predators in the ecosystem, the top carnivores. So energy that entered the ecosystem as sunlight eventually makes its way up the food chain from primary producers to top carnivores, sustaining all living organisms in the process.

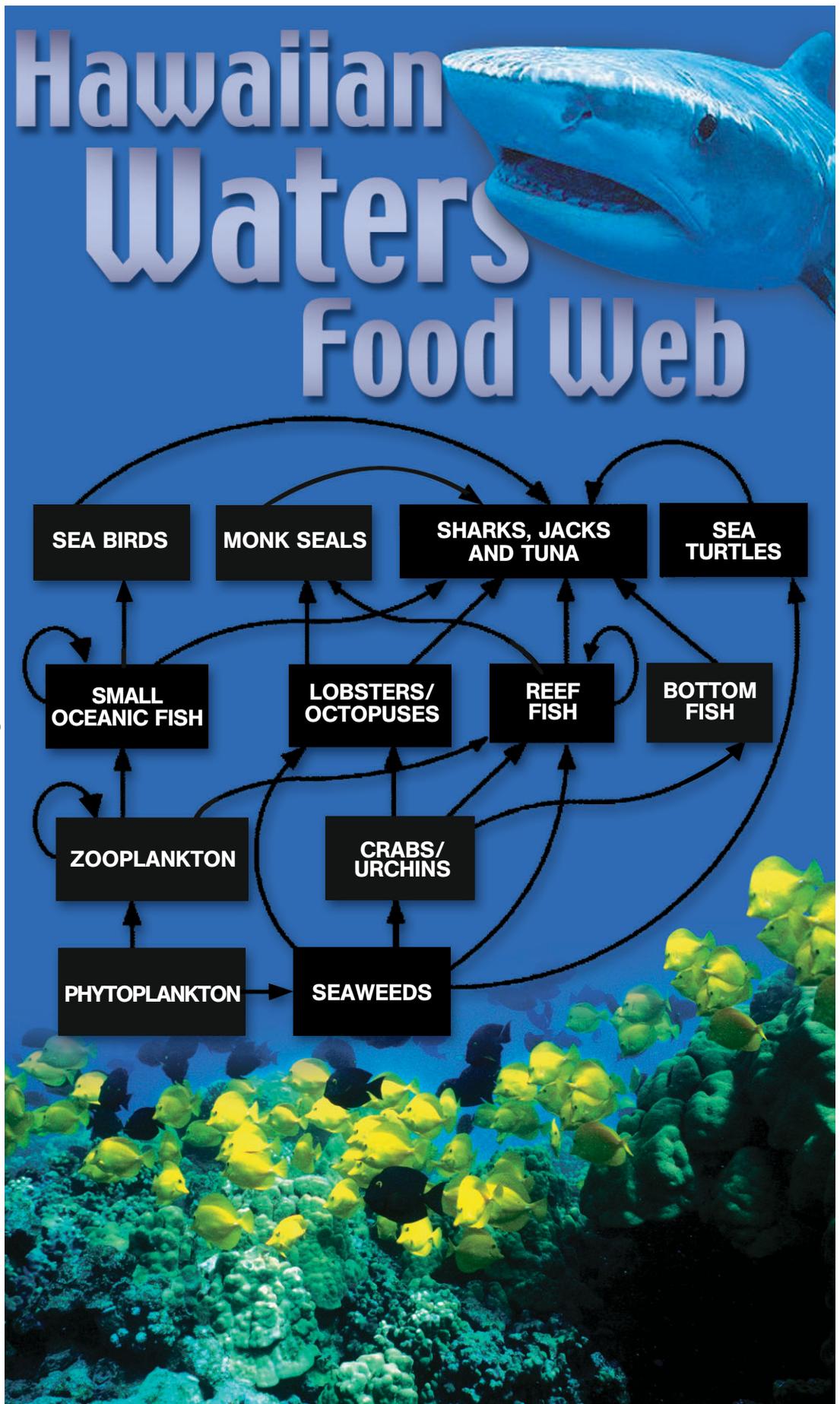
The feeding relationships that occur within ecosystems are extremely complex and dynamic. Together they form a food web; a greatly simplified version is shown here. When any component of this complex web is affected by outside forces, such as various human impacts, the effect cascades throughout the entire ecosystem. If the effect persists or is large enough, the ecosystem will be fundamentally changed, and a wide variety of organisms will be impacted.



Hawai'i's unique marine ecosystems

It's estimated that about 25% of Hawai'i's coral reef species are endemic, found nowhere else on earth. Our sand and soft-bottom marine communities are similarly unique. This is due in large part to our geographic isolation. As a result, there is no

other source from which to replace our unique species, should their populations become endangered or extinct. Protection of key Hawaiian marine habitats and ecosystems is therefore an important priority, and Marine Protected Areas help serve that purpose.



What stresses Hawai'i's marine ecosystems?

In a word, the main source of stress on Hawai'i's marine ecosystems is people. Although there are natural causes of stress (e.g. hurricanes), by far the most important ones are a result of human activity. Hawai'i's human population has grown, increasing the effects of people on marine and coastal ecosystems.

In traditional times, the connection between ocean and marine life and upland areas was well understood, linked through mountains, streams, forests and groundwater. The effects of people are felt mauka to makai, from the mountains to the sea, and take many forms.

Overfishing

... is the practice of harvesting marine life faster than it can be replenished through natural growth and reproduction. More people fishing and the use of better gear, vessels and technologies adversely impacts fish populations.

Urbanization and coastal alteration

... reduces and degrades natural habitat. Inshore ecosystems are impacted by harbors, marinas, seawalls, channelization of streams, injection well seepage, and many other types of habitat alteration.

Recreational overuse

... damages habitat and interferes with spawning, feeding, and nursery areas. The impacts often occur as a result of overcrowded beaches, trampling on reefs, anchor damage, and recreational watercraft disturbances.

Alien species

... compete with native species. Various types of non-native fishes, invertebrates and algae have been introduced by people into Hawai'i's waters, often causing substantial ecological damage.

Sedimentation

... washes soil from upland areas into the ocean. Removal of vegetation makes the problem worse. Sediment smothers corals and other marine life, and often carries contaminants such as pesticides, petroleum residue, and other pollutants.

Pollution

... includes toxins and excess nutrients which flow into coastal waters and harm marine organisms in a number of ways. The effect of pollution is especially pronounced in bays and harbors, which have less natural "flushing" action from tides and currents.

All of these factors work together to stress Hawai'i's marine ecosystems. Within ecosystems, these impacts are interrelated, just like the food web. We know a little bit about each of these impacts, but we do not know the longterm effects resulting from their combination.

To better take care of our marine ecosystems we need to take less out (fish, habitat, etc.) and put less in (pollution, sediments). This is one area where everyone can do something to help. Each of us can make an effort to reduce our own impacts. This is the meaning of ho'okuleana: everyone doing his or her part to take responsibility.

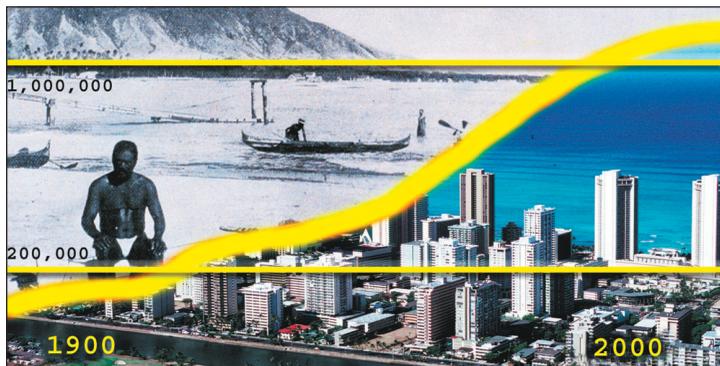


Taking responsibility for the marine environment might mean protecting some areas. Conserving resources and sharing them with future generations is part of our responsibility. Protecting resources today is much easier than trying to rebuild Hawai'i's unique ecosystems, which might be impossible.

We don't have all the answers, but most people agree that Hawai'i's marine resources are not what they used to be. Because we do not fully understand the consequences of stresses we create for marine ecosystems, we must use caution and minimize risks. MPAs are one tool we can use as insurance against uncertainty and to help conserve resources for the future.



A variety of factors stress Hawai'i's marine ecosystems, including (from top) urbanization, recreational overuse and competition from alien species.



A dramatic growth in the state's population (above) has added to stresses affecting by Hawai'i's marine ecosystems.

How are Hawai'i's marine ecosystems doing?

DLNLR/DAR uses data from commercial catch reports, underwater survey data, alien species surveys, and water quality sampling to evaluate the status of Hawai'i's marine ecosystems. Analyzing this information provides a glimpse into the condition of our marine ecosystems. Some of that information is summarized here.

Commercial catch reports

Commercial fishermen are required to file catch reports with DLNR, which are used to help gauge the status of the resource, and develop fishing and conservation policies. Catch rates are an indicator of overall resource abundance. When resources are plentiful, catch rates are high.

Based on trends in commercial catch rates across a spectrum of inshore species, there's been a significant decrease in abundance of inshore marine resources over the past three decades. Considering improvements in fishing gear, methods, and access to resources, these results suggest overfishing is stressing Hawai'i's marine ecosystems. But overfishing is just part of the picture, and declining habitat quality likely contributes to lower catch rates as well.

Underwater surveys

An important role of DLNR's aquatic biologists is to monitor the condition of marine resources, using scientific techniques to gather data and evaluate the need for management action. DLNR/DAR biologists and marine scientists from other agencies have been monitoring inshore reef fish populations more intensively in recent years.

This work has provided insights into the status of reef fish populations throughout the main Hawaiian Islands (MHI), especially as compared with the Northwestern Hawaiian Islands (NWHI). As might be expected, the surveys have

shown that where there are lots of people, marine resources are less abundant.

Alien species

Current estimates indicate there are now over 340 marine and brackish-water alien species in the Hawaiian Islands. In general, where urbanization and poor water quality prevail, the proportion of alien to native species is highest.

Of five alien seaweeds successfully established and dispersed around the Hawaiian Islands, all five have become ecologically dominant at some locations. Algae blooms pose a serious threat to inshore ecosystems. They also result in high cost to industries and recreation when beaches and other areas are overrun. Introduced marine algae, worms and other invasive species, found on the hulls of boats traveling across the world between harbors, are also among Hawai'i's concerns.

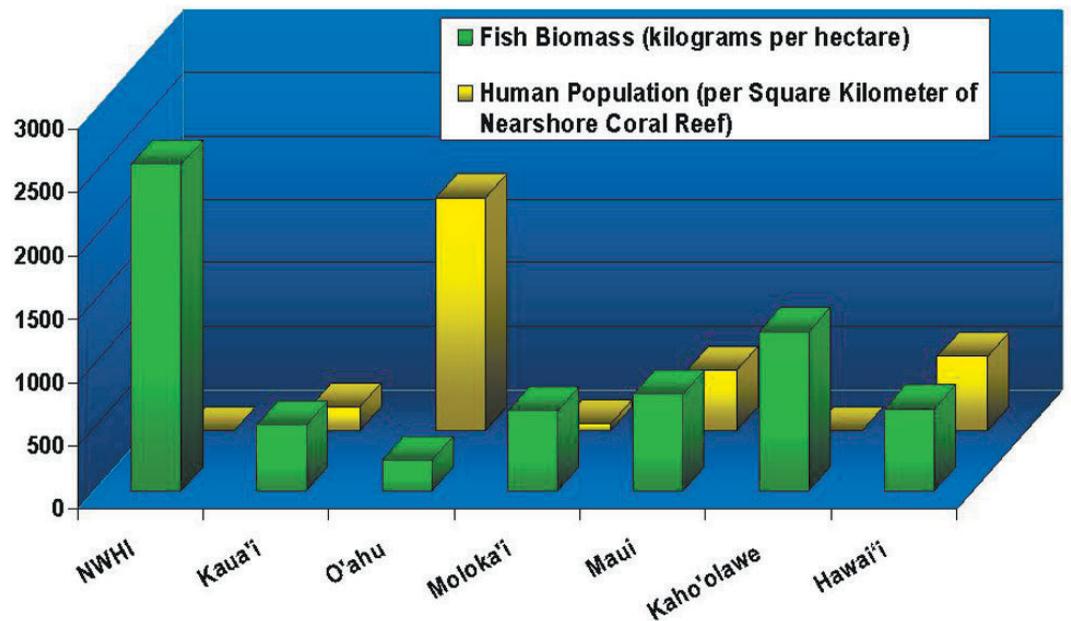
Once established, it is practically impossible to eliminate alien species, many of which can out-compete native species for food and habitat.

Water quality sampling

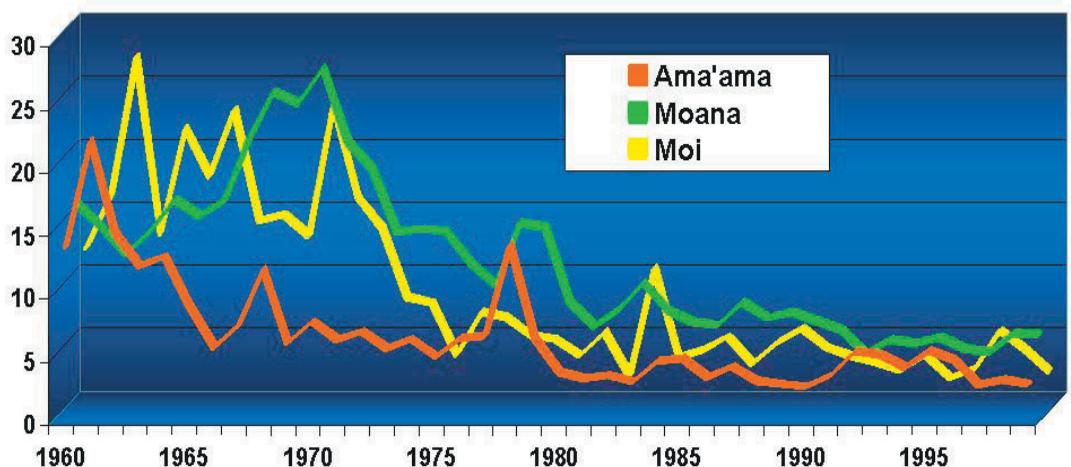
DLNR reviews data from the Environmental Protection Agency (EPA) for information about coastal water quality and "watershed impairment." The EPA monitors water quality throughout watersheds, from streams to coastal waters, measuring pollutants, nutrient levels, sediments, and other factors. If the water quality of streams within a watershed is sufficiently reduced, the watershed's ability to carry out its natural function is also reduced and it is said to be impaired. Alterations such as dams, wells, and stream diversions contribute to watershed impairment as well.

With the exception of Ni'i'hau and Kaho'olawe, all of the main Hawaiian Islands show declines in coastal water quality, especially on O'ahu and Moloka'i. Watershed impairment is most pronounced on O'ahu and Kaua'i.

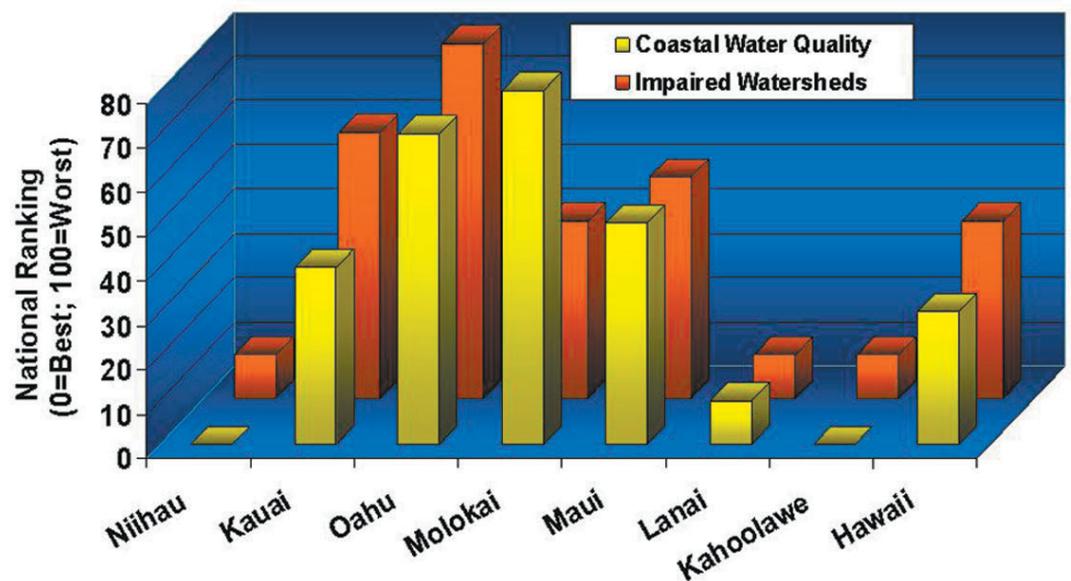
People versus fish populations



Commercial Catch Rate



Watershed & Coastal Water Quality



What are some benefits of MPAs?

Insurance for the future

Studies of MPAs in Hawaii and around the world have shown large increases in biomass (total weight of marine life), density (number of organisms in an area), size and diversity (variety of organisms). MPAs protect healthy diverse ecosystems. Healthy ecosystems are more likely to survive disturbances, including those we can't control like weather or climate-related changes. In this way MPA's provide insurance for the future.

More, bigger, different marine life

Recently, 60 sites in the main Hawaiian Islands were studied to determine what effect complexity of habitat, and protection from fishing, have on fish communities. No-take MPAs had over twice the biomass, higher diversity and larger fish than partially protected and open access sites. (Friedlander et al, 2003)

More eggs, more fish

Big fish are very important for reproduction. A 26-inch 'omilu (bluefin trevally) is twice as long as a 13-inch 'omilu, but it produces 86 times as many eggs. In marine fish about one in 250,000 eggs reaches adulthood (on average), so fish need a lot of eggs to maintain populations. MPAs protect big fish. Big fish produce more eggs. More eggs means more fish.

Benefits outside the MPA boundaries

Benefits from protecting marine life in certain areas can also extend beyond the MPA boundaries. Ocean currents carry eggs and larvae of marine life. Fish and invertebrate larvae can be carried 600 miles or more from their origin, and even seaweeds can disperse several miles (PISCO, 2000). The flow of marine life out of reserves is called spillover. Spillover will vary

The shifting baseline

Fishermen and Scientists have seen living resources in the Main Hawaiian Islands decrease over the past century (Shomura, 1987). When more than 90 kupuna were interviewed statewide, nearly all commented that abundance of fish had declined in almost all fisheries, from near-shore to deep sea. (Maly and Maly, 2003).

Our kids today consider these degraded reef ecosystems as normal, unaware of what they used to look like. This shift in perception of a "natural" state from generation to generation is referred to as a shifting baseline. Without a reference as to how resources might look in a more pristine state, it's hard to make management decisions that will maintain or restore resources to that condition. In other words, if you don't know what you've lost, you'll never know what needs to be done to get it back. MPAs can provide this natural reference to scientists, managers, and the public when making important decisions for the future.

for each species and location. Fishers often recognize when spillover occurs, and they "fish the line" because fishing is better close to the MPA boundaries.

Research in Florida showed that before 1985 record-size fish were caught around the state, but since 1985 nearly all record-size fish have come from within 60 miles of an MPA at Cape Canaveral. These fish have been allowed to reproduce over long periods to the benefit of resources and re-



The value of Hanauma Bay's fishery might be about \$2,500 per year if it were open to fishing, but the recreational value is estimated at \$35 million per year.

source users inside and outside the reserve boundary (PISCO, 2000). At Sumilon Island in the Philippines, a well-studied no-take MPA encompassing 25% of the coastline resulted in fish catches doubling for the local community (Russ and Acala, 2003). Another Philippine island with a small MPA, Apo Island, also proved to increase

catches with only 10% of the reefs protected (ibid).

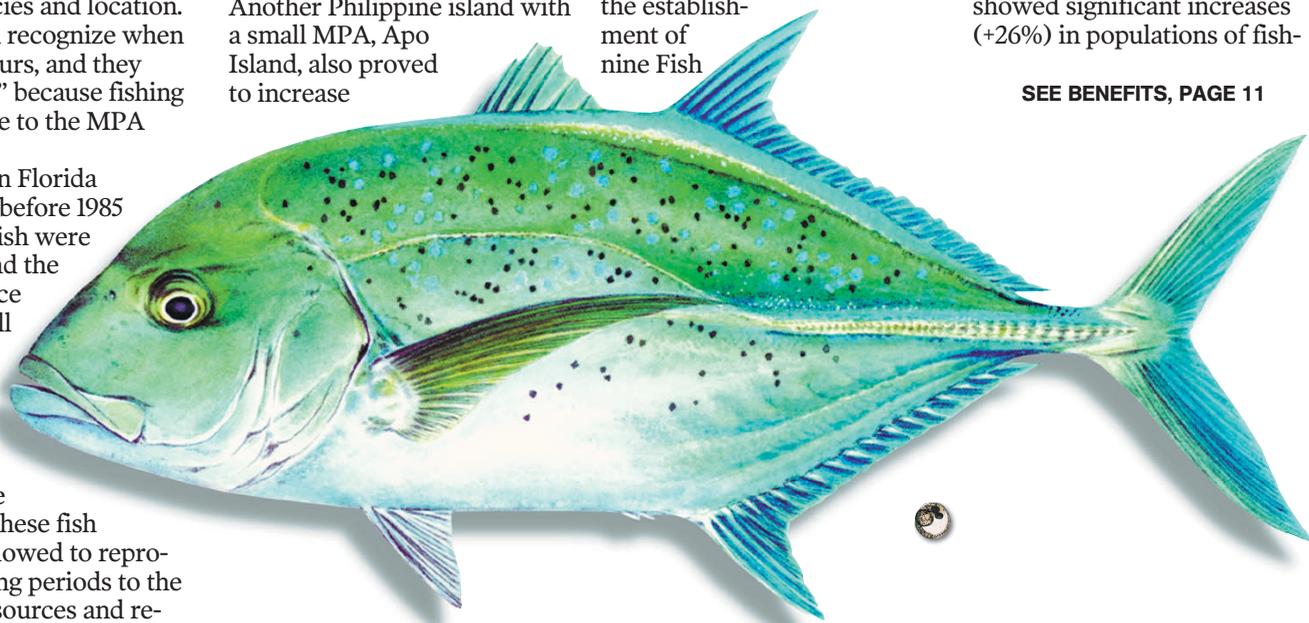
Sustainable fisheries

More than 30% of West Hawaii's coastline was closed to aquarium fishing through the establishment of nine Fish

Replenishment Areas (FRAs). An ongoing study was designed to see if these FRAs improve fish stocks. The study compares fish populations in closed and open areas, both before and after the new rules were implemented.

Results after four years showed significant increases (+26%) in populations of fish-

SEE BENEFITS, PAGE 11



Benefits: MPAs preserve the future

CONTINUED FROM PAGE 10

es which are targeted by collectors in all areas. Yellow tangs, the most frequently collected species, increased by 49% inside the FRAs. In open areas outside the FRAs there has been no significant decrease in the number of aquarium fish, even with presumed increased collecting pressure. These results demonstrate that area-based management can effectively help improve fish stocks in Hawai'i (Tissot et al, 2004).

Education and recreation

MPAs provide teachers, students, visitors and locals with places to gain first-hand experience of natural marine ecosystems. Some MPAs provide additional education. For example, the Hanauma Bay Education Center teaches all visitors about coral reef ecosystems and their protection. These people are more likely to adopt reef-friendly practices not only at Hanauma Bay, but also at other reef areas they may visit. Non-consumptive activities like snorkeling, diving, and underwater photography are enhanced in protected areas.

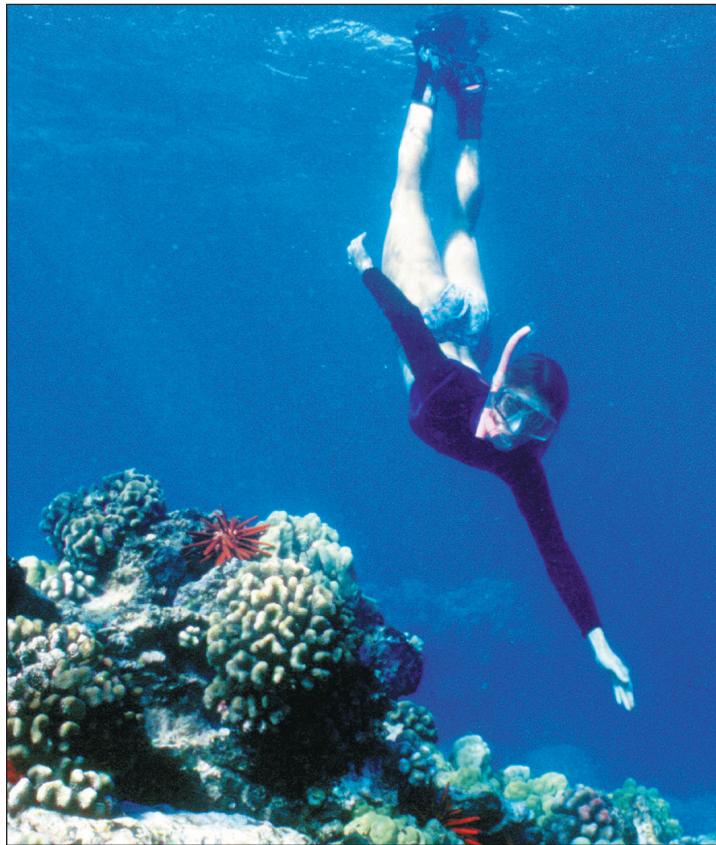
Assist enforcement

Conservation officers find it is easier to keep

watch on a defined area with specific regulations, such as an MPA, than to try and be in all places at all times enforcing a broad range of regulations.

Support our economy

MPAs cost money to create and enforce, but they also generate income and benefits, particularly from activities like ecotourism and education. In an economic study of six Hawaiian MPAs, all six showed that income and other benefits exceed costs by a considerable margin. A fish on the reef can be worth many times more than one in the hand. The value of Hanauma Bay's fishery might be about \$2,500 per year if it were open to fishing, but the recreational value is estimated at \$35 million per year (Van Buerking & Cesar, 2004). For many people, access to quality ocean environments is a prime motivator for visiting Hawai'i. A 2001 survey indicated over 50% of visitors from the US mainland and 17% from Japan said they participated in snorkeling or diving (DBEDT, 2001).



MPAs cost money to create and enforce, but they also generate income and benefits, particularly from activities like ecotourism and education.

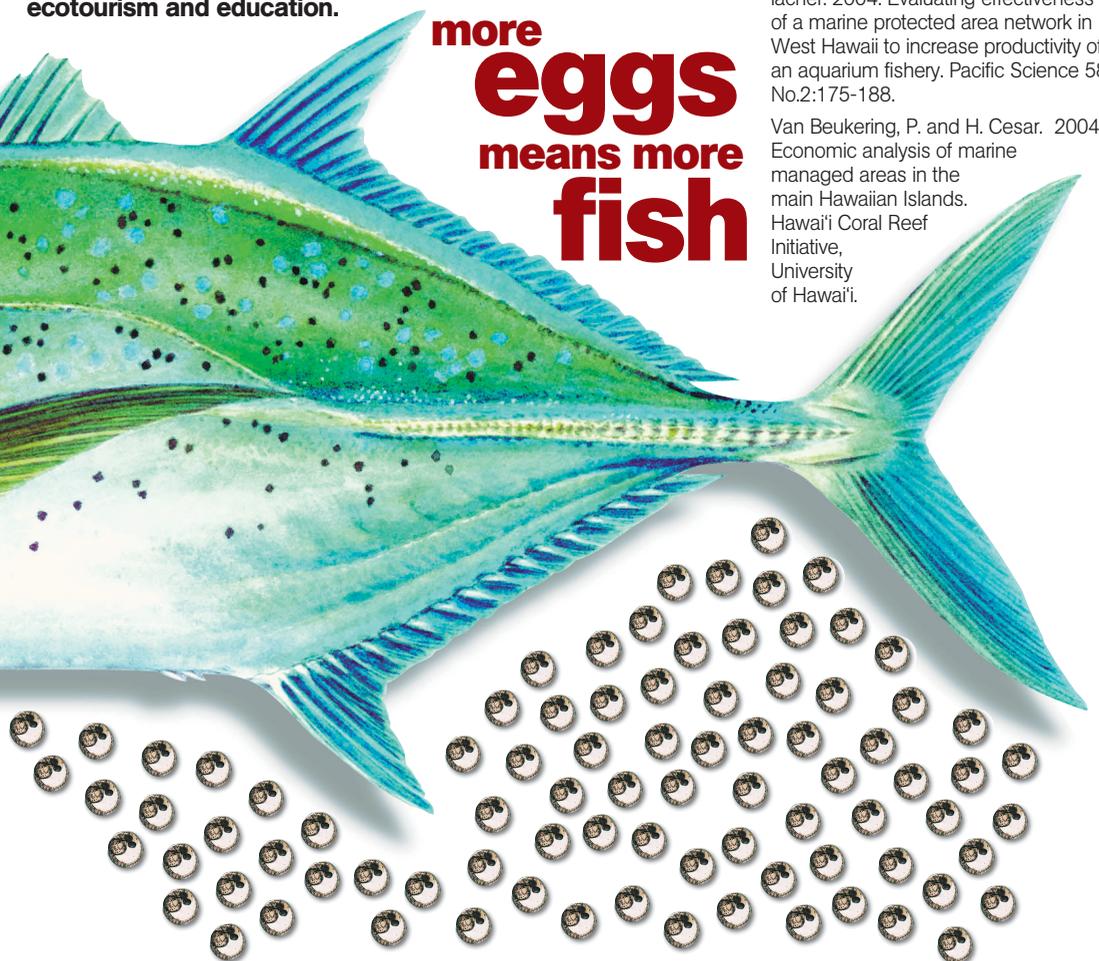
more
eggs
means more
fish

MPAs protect big fish:

A 26" Omilu produces 86 times more eggs than a 13" Omilu

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What are some drawbacks of MPAs?

MPAs limit use

The main drawback of MPAs is that they limit people's use of marine areas. MPA restrictions may curtail fishing opportunities for recreational and subsistence fishers, cause loss of income for businesses (such as commercial fishers or tour operators), and impact other resource users by limiting their activity. As a result, MPAs may cause these activities to become more concentrated in other areas.

MPAs may need to be in place a long time to achieve goals

Increases in fish abundance take some time to be realized once an area is closed to fishing. As an example, marine surveys in the Waikiki Diamond Head Shoreline Fisheries Management Area showed two-year open/closed management cycles (1978-1989) achieved higher gains in fish biomass than the current 1-year open/closed cycles (since 1989).

MPAs attract visitors, which can cause overcrowding

Since it became an MLCD in 1967, Hanauma Bay has received up to 3.7 million visitors annually, making it one of the most heavily visited MPAs in the world for its size. Studies show that overcrowding in shallow areas damages reefs, creates pollution and can upset ecosystems. While management improvements have helped reduce the number of visitors to Hanauma Bay since 1990, more studies are needed to help understand how damage from recreational overuse can be prevented in MPAs. With this information we can keep them from being "loved to death."

MPAs can't protect species that move outside their boundaries

Once a fish moves outside the protection of an MPA, it's



The Kealakekua Bay Marine Life Conservation District on the Big Island was established in 1969 and boasts an exceptional diversity of coral and fish, many of which are quite tame. As an added benefit, dolphins are commonly seen inside the bay.

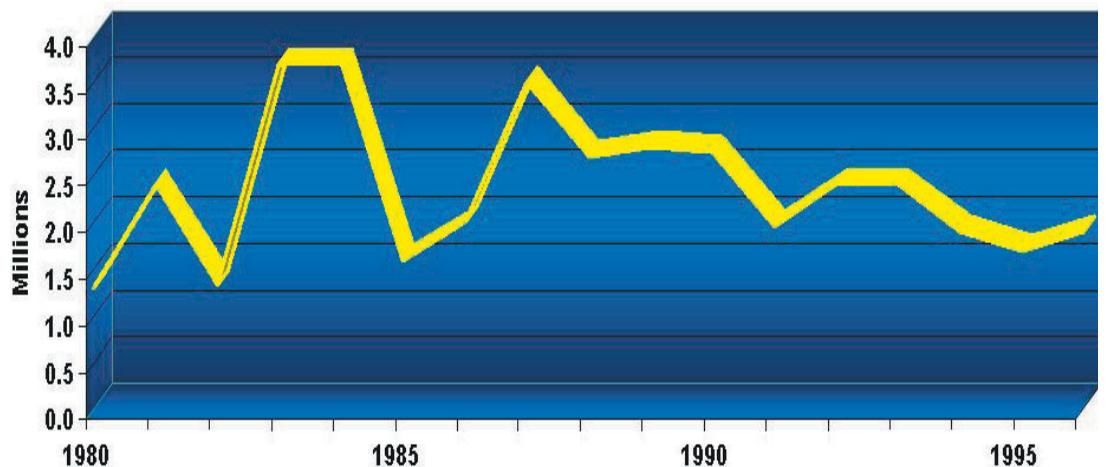
at the mercy of fishers. Many of Hawaii's reef fishes have been shown to travel remarkably long distances. An example of a wide ranging species is the kaku (barracuda). Once thought not to travel far from its home area, a barracuda tagged in the Ala Wai Canal (O'ahu) in 2003 was caught a few weeks later at Kalaupapa (Moloka'i), over 60 miles away. Examples of other potentially wide ranging species are shown in the table.

MPAs cost money to manage properly

MPAs focus public attention and increase resource abundance. As a result, they also raise both expectations of enforcement and risks of poaching. Studies have noted that a lack of adequate enforcement is a major problem for MPAs worldwide.

All forms of management cost money. If an MPA is to be successful, it's important to allocate adequate funding for important management needs, such as enforcement, research, monitoring, visitor education, restrooms and other facilities.

Annual Visitor Count at Hanauma Bay



SPECIES	Documented Movement in Hawaiian Waters	
	Distance	Observations/Comments
BARRACUDA	60 miles	Ala Wai (O'ahu) to Kalaupapa (Moloka'i)
'OMILU	59 miles	Kewalo Basin to Waimea (O'ahu)
HE'E (TAKO)	5-8 miles	In and out of Kane'ohe Bay (O'ahu)
WHITE PAPIO	52 miles	Ke'ehi Lagoon to Haleiwa (O'ahu)
STRIPED MULLET	72 miles	Hilo to Kealakekua (Hawaii)
WHITE WEKE	64 miles	Kane'ohe Bay to Waianae (O'ahu)

MPAs in Other Parts of the Pacific

It's estimated there are over 1,300 MPAs around the world, and efforts continue to create a global network of protected areas. Here is a look at some of the sites and efforts both nationally and internationally in the Pacific region.

Guam

Guam initiated a network of marine preserves after 15 years of fisheries data showed a 70% decrease in catch per unit effort values (a standard measure of fishing success). Nearshore fisheries were depleted, and the Guam Division of Aquatic and Wildlife Resources believed it was due to overfishing and poor land use practices. They investigated potential sites for marine preserves to protect habitat and improve fisheries, especially for important food fishes. During initial public hearings, most parties rejected the idea of marine preserves, especially the fishing community. In response, additional meetings took place to explain declining fishery data and included revisions to the original proposal based on public concerns. Finally, there was buy-in from almost all concerned parties. In 1997, five preserves were established covering approximately 11.5% of the coastline. Fishing is either prohibited or limited to certain cultural use practices that do not threaten restoration goals. Today, the public has noticed more and bigger fish within the preserves. Fishermen have noted improved fishing just outside MPA boundaries and "fish the line." New regulations are being worked on to regulate users other than fisherman and ensure their impacts are minimized in the preserve areas.

Lessons for Hawai'i

MPA establishment can be a long process, especially when initiated by government agencies. However, with collaborative effort by the public and government, MPAs can

reflect local needs in addition to protecting resources.

Japan

The sea and seafood have always played very important roles in Japanese society, just as in Hawai'i. This has influenced the development of Japan's MPA system, which began in 1970. Today there are 58 small marine parks that function primarily for education and tourism. They are not effective for ecosystem protection due to their size. Fishermen get income from shops and boat tours, which replaces income lost from fishing. Fishermen cooperative associations control Japan's coastal resources. By contrast, Hawai'i's ocean resources are public resources and more challenging to manage.

Lessons for Hawai'i

Alternate activities can replace or exceed any income lost when fishing is restricted. MPAs can create jobs.

Fiji

The Fiji Locally Managed Marine Area (LMMA) Network supports traditional communities who have observed declines in marine resources and want to take action. Local partners plan and implement actions to conserve local resources. Alifereti Tawake, a local Fijian, helped initiate a project in Verata, which depends on clams for its survival. By the mid-1990s, both clam sizes and clam populations were dwindling fast. Alifereti explained, "My grandfather told me that in the old days, he would prepare dinner by setting a pot of water to boil, going down to the sea, catching his fish, and coming back to cook it before the water boils. Now it can take villagers a whole day to get enough food for dinner, and many would rather just buy tinned food than spend hours trying to fish for themselves. The important thing is to set up no-take areas systematically, and train local people to monitor the effectiveness of the scheme, and to track



Australia's Great Barrier Reef is the largest MPA in the world, with an area of 134,000 square miles.

changes." In the seven years since Alifereti began his work in Verata, clam populations have increased 24-fold. There are now more than 60 LM-MAs in Fiji, covering about 15% of the coastline.

Lessons for Hawai'i

Local involvement in identifying problems, protecting and monitoring resources is important for any MPA to succeed. Communities can also learn from one another how to organize active groups to manage resources.

California

In 2002, California designated 12 MPAs in the Channel Islands. This brought the state's total number of MPAs to 62. The designation was marred by the total collapse of the public input process and resulting court actions.

Lessons for Hawai'i

Consensus between different user groups may be impossible to achieve and undermine the process. Substantial agreements may be lost if consensus is the only measure of success.

Australia

The Great Barrier Reef Marine Park is the largest MPA in the world, with an area of 134,000 square miles. It supports a tourism industry worth \$1 billion annually, along with a \$250 million



The role of the sea and seafood in Japanese society influenced the development of Japan's MPA system, which began in 1970.

commercial fishery. A very large recreational boating and fishing sector has 55,000 registered boats. In July 2004, the Australian government increased the level of protection within the park. The Minister for Environment and Heritage stated, "Coral Reefs around the world are under rapidly increasing pressure from various aspects of population growth, and our Great Barrier Reef is no exception. The best scientific advice is that the most effective way to ensure reefs are healthy enough to cope

with these sorts of pressures is to protect at least one fifth of all bioregions in no-take zones, and that is exactly what we have done. The Great Barrier Reef is not only a treasure for Australia but for the world."

Lessons for Hawai'i

Our coastal waters need to support multiple uses such as fishing, recreation, and tourism. A zoned, area-based management approach may accommodate all users while maintaining concern and care for the environment.

What is DLNR doing regarding MPAs?

Scientific studies...

...DLNR continues to look for answers to many questions about MPAs. The effort involves collaborative MPA research in Hawai'i, using both state and federal (National Oceanic and Atmospheric Administration) funding. Current studies include:

- Annual underwater surveys to monitor marine populations and habitats
- Tagging and tracking fish movements into and out of MPAs
- Documenting the presence of rare and alien species
- Looking at the levels of human use to better understand our impacts on marine ecosystems
- Economic research to understand the value of MPAs and how to offset their costs

Education and outreach

DLNR's efforts to work with the community on marine issues include:

- Participating in community programs that monitor human use, biological impacts and enforcement matters
- Scheduling volunteer beach litter cleanups
- Working with community volunteers to remove alien seaweeds from MPAs
- Supporting the Living Reef campaign to inform the public about the importance of coral reefs to our island lifestyle
- Supporting various marine education initiatives throughout the state
- Providing information to the public in a variety of ways about MPAs and other management issues

National discussion

DLNR is an active participant in the national discussion on MPAs. Through this discussion, Hawai'i is able to:

- Bring our unique perspective to the federal level
- Work collaboratively with federal partners to improve MPA management



The Department of Land and Natural Resources' efforts to work with the community on marine issues include a variety of community programs that monitor human use, biological impacts and enforcement matters.

Other efforts

Examples of other ways in which DLNR has been involved recently in managing MPAs include:

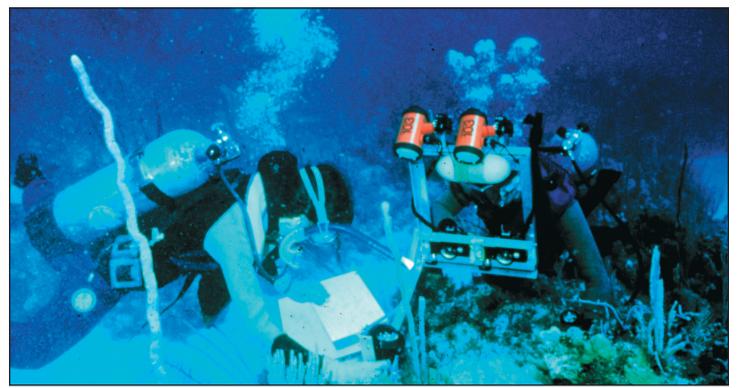
- Establishing a new MLCD at the Wai'opae Tidepools, Island of Hawai'i
- Improving the rules at the existing Pupukea MLCD on O'ahu to make them easier to enforce
- Consulting with legal officials to address enforcement concerns
- Reviewing area management tools for ways to improve them

A community process

DLNR's Administrative Rules process ensures you can participate in MPA discussions. DLNR conducts an interactive process, with community involvement at all stages of developing and implementing management changes. So whatever is done with MPAs in the future will be discussed extensively with people on each island. We will share our ideas and make a



sincere effort to understand the perspective of local communities before any new Administrative Rules are drafted. Once we decide whether or not change is needed, and what should be done, DLNR will work with you to implement appropriate management measures. We want and need your involvement in order to make sound and responsive decisions.



Reviewing the Status of Hawai'i's MPAs

Since 1967, when Hanauma Bay on O'ahu became Hawai'i's first Marine Life Conservation District (MLCD), MPAs have been established here with different goals (biological, economic and social). In some cases, MPAs have been tailored after the fact to address various impacts as they arose. This has resulted in unique regulations for each of our MPAs.

The science of MPAs has grown rapidly in the past five years. Research has provided new insights as to how MPAs can better manage ecosystem concerns, shown us the processes other states and countries have used to establish MPAs, provided examples of what happens after they're established, etc.

Hawai'i's system of marine managed areas would benefit greatly from a re-evaluation in light of new information. So DLNR conducted a review of all existing MPAs with the purpose of:

- Developing a framework that simplifies MPA jargon,



Waimea Bay on O'ahu was added to the Pupukeya MLCD when it was expanded in 2003.

grouping areas with common management goals into clearly-defined categories

- Examining how to protect the best of Hawai'i's MPA system and improve management of areas that would benefit from it

- Using Hawai'i's most successful marine managed areas as models of how to improve MPA management throughout Hawai'i

- Exploring creative methods of balancing public use and ecosystem conservation goals in Hawai'i's MPAs

- Investigating zoning options to satisfy different MPA purposes in adjacent areas

- Considering other innovative approaches to better protect Hawai'i's marine resources using MPAs and other management tools.

The complete report of this MPA review was presented to the 2005 Legislature and is available on the Web at www.Hawaii.gov/DLNR/DAR. The following table summarizes the simplified MPA categories under consideration.

Summary of Categories, Management Objectives and Site Criteria

CATEGORY/EXAMPLE	PRIMARY GOALS	CONSERVATION OBJECTIVES	HUMAN USE MANAGEMENT & OBJECTIVES
Marine Reserve	Preservation	Protect unique habitats, restore/conservate biodiversity, restore natural communities and avoid human impacts	Biological reference site for science, boats/anchoring may be restricted, all public access may require permit, no extractive use/fishing and commercial uses restricted
Marine Refuge	Conservation	Protect unique habitats, conserve examples of valuable ecosystems, restore/conservate biodiversity, restore natural communities and avoid human impacts	Biological reference site for science, boats/anchoring may be restricted, all public access may require permit, extractive use/fishing extremely limited and commercial uses restricted
Marine Park	Conservation/Recreation	Restore populations, restore/conservate biodiversity, restore/maintain ecosystem and minimize human impacts to habitat	Limited recreation activities allowed, boats/anchoring may be restricted, day-use mooring encouraged, no extractive uses/fishing and regulate commercial uses
Marine Life Conservation District (MLCD)	Conservation/Multiple Use	Restore populations to high levels, restore/conservate biodiversity, minimize human impacts and minimize impacts to protected species	Boats/anchoring may be restricted, no fish feeding or alteration of habitat, regulate commercial uses by permit to avoid impacts to resources or to public uses of resource, low-impact fisheries by registration, some recreational use allowed
Fishery Management Area (FMA)	Resource Allocation/Fishing	Sustain aquatic resources for fishing, reduce habitat damage from fishing and manage over-fishing where it occurs	Resolve fishing conflicts, allocate resources by gear type/group, recreation/subsistence fishing allowed, some non-consumptive recreation allowed and regulate commercial uses
Public Fishing Area (PFA)	Fishing	Sustain aquatic resources for fishing, increase stocks by habitat enhancement or fish stocking programs	Resolve user conflicts to favor fishing, improve quality of fishing experience, discourage interference with fishing and regulate commercial uses



Dispose of trash and other wastes properly, and avoid dumping anything into storm drains.

What can you do?

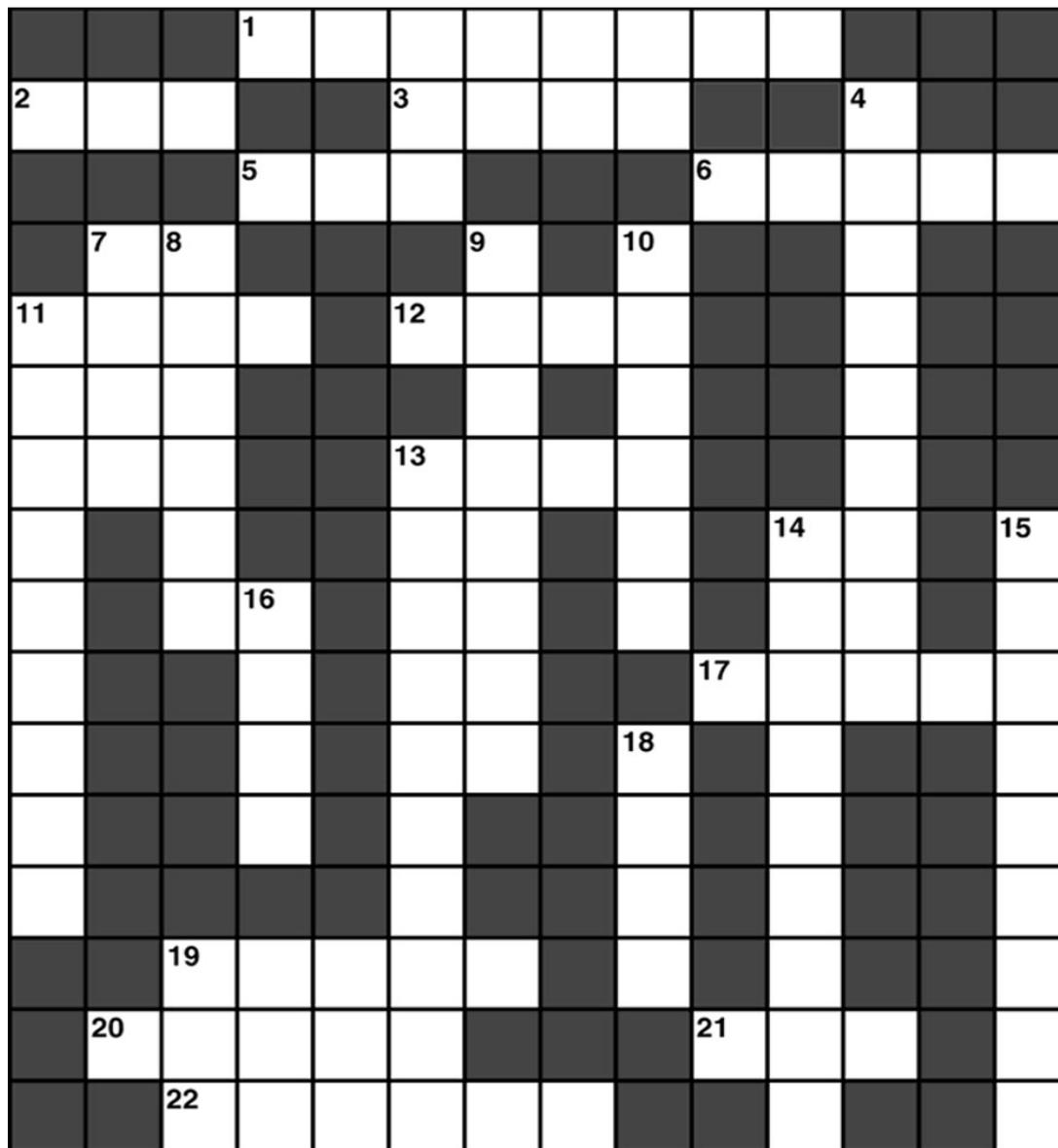
Take responsibility and help care for Hawai'i's natural resources.

We've seen that our actions from mauka to makai affect marine ecosystems in many ways. Each of us can make a difference by acting responsibly. You can help protect and conserve our marine resources if you:

- Learn Hawai'i's fishing regulations and follow them
- Take only what you need from the sea; release fish whenever possible
- Help out with stream and beach cleanups in your neighborhood and at your favorite spots
- Dispose of trash and other wastes properly; avoid dumping anything into storm drains
- Use care around corals; don't trample, touch or break them
- Don't release non-native animals, plants, or algae into the wild
- Help with fish tagging and other marine research projects
- Check out the Living Reef program and learn how to take better care of our coral reefs (visit www.hawaiiireef.org)
- Share this information with your friends and family.

Finally, get involved in DLNR's review and management of MPAs in Hawai'i. Tell us what you think, help us understand what is needed and tell us what MPAs in your area should look like. Share your mana'o and help us get it right! For more information, contact:

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Across

1. smothers coral and other marine life
2. traditional fishing area
3. country that uses Locally Managed Marine Areas
5. area established by law to protect marine resources
6. its marine parks are too small for ecosystem protection
11. that which nourishes
12. removal of marine life
13. assist
17. it's alive and fragile; don't trample or touch it
19. toward the sea
20. species not native to an ecosystem
21. feeding relationships make up a food ____
22. to care for

Down

4. flow of marine life out of refuges
7. "____ for the Future"
8. all ecosystems require a source of it
9. "shifting ____"
10. main source of stress on marine ecosystems
11. country with largest MPA in the world
13. to take responsibility
14. level at which MPAs protect resources
15. includes toxins and excess nutrients
16. Hanauma Bay was Hawaii's first one
18. set of rules that regulated early Hawaiians

Answers
Across: 1. sediment; 2. koa; 3. Fiji; 5. MPA; 6. Japan; 11. aina; 12. take; 13. help; 17. coral; 19. makai; 20. alien; 21. web; 22. malama.
Down: 4. spillover; 7. fish; 8. energy; 9. baseline; 10. people; 11. Australia; 13. hookuleana; 14. ecosystem; 15. pollution; 16. MLC; 18. kapu