Hawai'i Division of Aquatic Resources

Mauka to Makai

Honokohau, Maui

The mission of the Division of Aquatic Resources is to work with the people of Hawai‘i to manage, conserve and restore the state’s unique aquatic resources and ecosystems for present and future generations.

Our staff are passionate and dedicated to fulfilling this mission in many ways — from providing sportfishing opportunities, engaging Hawai‘i residents and visitors through outreach and education, community engagement and partnerships, aquatic resources protection, ecosystem monitoring, fisheries management, restoration, and the prevention and control of invasive species.

Hawai‘i is faced with many challenges in fulfilling DAR’s mission as we see the impacts of climate change take hold in the islands – ocean “heat waves” and associated coral bleaching, sea level rise, and destructive storm events. We are currently working to adapt our management strategies to these new threats while still trying to address long-standing aquatic resources issues related to land-based source pollution, habitat degradation, unsustainable fishing practices, and invasive species.

But with these challenges also comes opportunity. We have recently updated the DAR mission statement to include the words “work with the people of Hawai‘i.” This represents the importance DAR places on involving Hawai‘i’s citizens with helping fulfill its mission. Aquatic resources are deeply tied to people through cultural and spiritual practices, sustenance, recreation, economics, and shoreline protection. The Division is embracing this idea of stewardship through co-management, partnerships, and community engagement. DAR cannot accomplish its mission without the support of Hawai‘i’s people.

The following pages provide a snapshot of DAR’s work to fulfill our mission from mauka to makai.

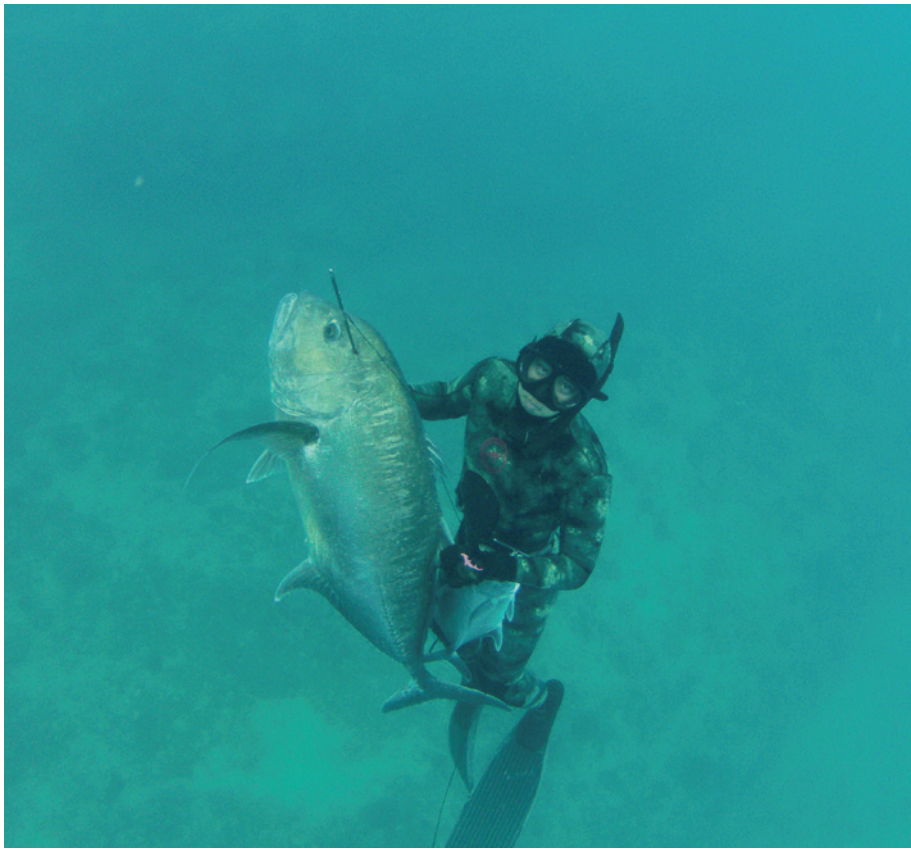
— Brian Neilson
Administrator

30x30 Initiative

In September 2016, Governor David Ige announced the state's commitment to effectively manage 30% of Hawai'i's nearshore ocean waters by 2030, aptly naming the effort the "30x30 Initiative." With guidance from fishers, cultural and scientific partners, and collaborative efforts of various communities and individuals, we can achieve this goal.

In consultation with partners, stakeholders, and the community, DAR has constructed a framework that maps future efforts for success. It includes four components:

- Place-based planning will build a network of marine managed areas.
- Education and outreach will encourage pono practices with respect to fishing and other use of nearshore waters.
- Prevention and restoration will focus on efforts to prevent damage to fragile ecosystems and restore areas in need.
- Monitoring will collect data on current conditions and track progress, which will be analyzed to evaluate the success of management goals and objectives.



Within the four components, the roadmap identifies actions to success. These actions pave a road to restoring healthy ecosystems that will benefit the community for many years.

DAR is initiating a series of meetings across the state to provide information for what we are calling "Holomua: Pathway to 30x30". Communities and stakeholders are invited to become part of a public process and begin working with us to work toward our shared goal of a healthy nearshore ecosystem.

Marine Monitoring

Routine marine monitoring is essential for tracking trends in reef health and fisheries, and has been an important component of our fisheries management efforts for over 50 years. Previously, monitoring concentrated on using in-water visual assessments to measure resource fish stocks and changes to those stocks within marine managed areas and at artificial reef sites. Recent efforts have been multi-faceted, focusing on refining research methods, increasing the frequency of surveys, expanding the areas covered by assessments, and evaluating marine management strategies across a range of management zones.

Pūpūkea Marine Life Conservation District

Watershed Restoration

Heʻeia watershed and estuary were recently designated as a National Estuary Research Reserve, the focus of major community-led revitalization efforts of ecological, cultural, economic, and human health impacts through projects from ridge to reef. DAR is a participant in this effort to restore wetlands, hillsides, streams, coral reefs, and a traditional Hawaiian fishpond. We are providing technical support to Heʻeia project partners, with the goal of decreasing nutrient and sediment loads, reducing freshwater pulses during storm events, and enhancing resiliency and recovery of corals on nearshore reefs.

Heʻeia stream mouth

DAR is also working with community partners to restore the Honoluiluli stream mouth at West Loch. The goal of this project is to reduce effects of flooding and restore native estuarine and freshwater habitat. This is being accomplished through removal of non-native mangrove and invasive vegetation, replanting of native vegetation, and education and engagement of the local community.

Heʻeia wetland mangrove removal area, Oʻahu

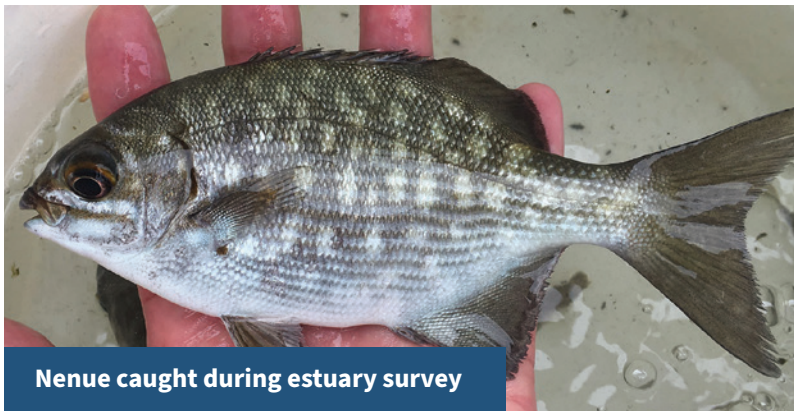
Estuaries

Estuaries (muliwai) form wherever freshwater mixes with saltwater. They are critical nursery grounds for coastal species, and valued for fishing and cultural practices, as well as for their biological diversity. Estuaries are highly productive ecosystems that provide various and abundant food resources needed by juvenile fish for rapid growth. In addition, the diversity of habitats found in estuaries provide juvenile fish with refuge from their predators.

There are three types of estuaries in Hawaii: riverine or stream-mouths, bays, and lagoons. Even on the arid Kona Coast of Hawai'i Island coastal groundwater creates estuaries. With about 150 estuaries supporting over 120 species of fish, these waters are critical to Hawaiian ecosystems. Some of the species supported are endemic, found only in Hawai'i. One of the most common juvenile fish in Hawaiian estuaries is the endemic āholehole, or Hawaiian flagtail. Endemic stream 'o'opu (native freshwater gobies) swim through estuaries in both directions as part of their life cycle.

Protecting and respecting our unique estuaries is vital to overall ecosystems. Healthy estuaries are essential for sustainable fisheries. DAR has a team of researchers dedicated to understanding and improving management of them. Currently, DAR's estuary team conducts quarterly sampling of juvenile fish in 11 estuaries statewide, with a focus on management of invasive non-native species.

'O'opu nōpili, an endemic stream fish



Nenue caught during estuary survey

Honomanū Estuary, Maui

Cast net sampling at Waiohue estuary

Anchialine Pools

Hawai‘i has more than 600 anchialine habitats in pools, fissures, sink holes, caves and lava tubes — the highest concentration and most isolated worldwide. These landlocked habitats, connected to the ocean below the surface, rise and fall with the tides, and contain water of varying salt content. Endemic species of microbes and invertebrates thrive in these environments, including the culturally important ‘ōpae ‘ula, (*Halocaridina rubra*). New records and significant range extensions of rare anchialine crustaceans have been recorded by DAR.

Natural changes to coastlines and geological activity destroy and create new anchialine habitats simultaneously, but these ecosystems are inherently resilient to such processes. Human activity, invasive animals and plants, over-extraction of groundwater, and pollution put additional strain on the resilience of these ecosystems, causing a net loss of anchialine habitats.

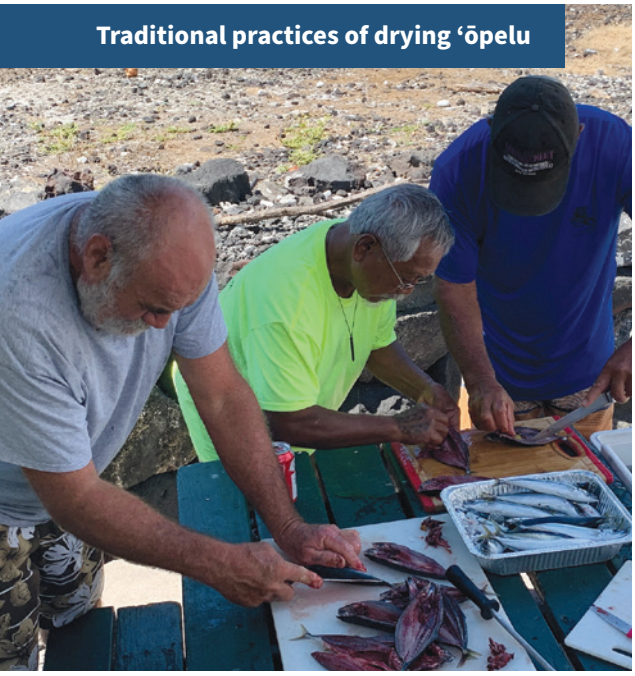
Anchialine pool at Hanamanioa, Maui

‘Ōpae ula grazing on algae in an anchialine pool

Community-Based Subsistence Fishing Areas

The Community-Based Subsistence Fishing Area (CBSFA) program represents a path for communities to mālama ʻāina through the rule-making process. The DLNR integrates CBSFA management recommendations for nearshore marine areas based on customary and traditional native Hawaiian practices, as these have effectively sustained the health and abundance of marine resources over generations.

CBSFA designation is community-driven and place-based in nature, representing a bottom-up approach to fisheries management and rulemaking. As of 2019, Hāʻena is established as a CBSFA, with Moʻomomi (Molokaʻi), Kipahulu (Maui), and Miloliʻi (Hawaiʻi Island) currently in the process of designation.



Traditional practices of drying ʻōpelu

Community removes invasive fish species

Learning life cycles and spawning seasons of local fish

Education and Outreach

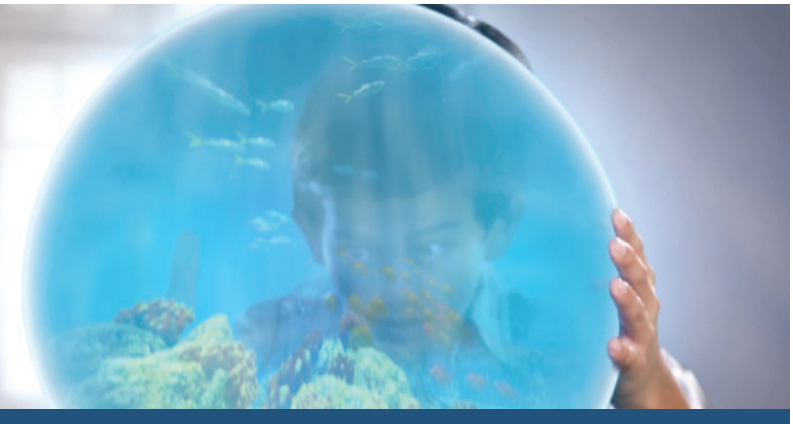
Education and outreach efforts are essential to managing, conserving, and restoring Hawai‘i’s unique aquatic resources. Cultivating a conservation ethic and encouraging pono practices among resource users are crucial to resource management in Hawai‘i. DAR’s education program is designed to

- enhance public understanding of Hawai‘i’s unique aquatic environments,
- develop responsible attitudes and a sense of stewardship toward them,
- encourage public involvement in conservation issues, and
- promote safe and ethical aquatic resource-based recreation.

These goals are achieved through a diversity of projects. DAR’s education staff conduct classroom presentations, teacher training, and give talks to community groups and fishing clubs. Our fishing education program teaches fishing skills to keiki and adults, with emphasis on conservation, safety, and pono practices. We also develop various outreach products, maintain the Division’s websites, and run 30-second conservation messages on television.

The Marine Wildlife Program (MWP) also conducts outreach and education efforts, focused on endangered Hawaiian monk seals, hawksbill sea turtles, and false killer whales, as well as threatened green sea turtles. The MWP promotes pono fishing practices and encourages ocean users to utilize barbless hooks.

Fishing education class at Coconut Island, Hilo



Scene from “The Gift” public service announcement

Staff hand out educational materials at public event

Hawai‘i Marine Recreational Fishing Survey

Fishing is one of the most popular recreational activities in Hawai‘i. Its economic value to the state far exceeds that of commercial fishing. Since 2001, the Hawai‘i Marine Recreational Fishing Survey (HMRFS) has been the primary mechanism for monitoring marine recreational fishing activities in Hawai‘i. HMRFS is a collaborative project between DAR and the National Oceanic and Atmospheric Administration (NOAA) Fisheries, with additional financial support from the federal Sport Fish Restoration Program.

HMRFS surveyors interview private boat and shoreline fishers throughout the state. Unlike commercial fishers who are required to report their catch monthly, mandatory reporting does not apply to recreational fishers. Collecting this information for recreational fishing is critical for managing Hawai‘i’s fisheries. Important data such as trip length, area fished, gear/method used, and species landed is collected by trained staff. This information provides managers with data that supports effective fishery management decisions.

Surveyor collects catch data from fisher

Freshwater Recreational Fishing

Recreational fishing is an important aspect of Hawai‘i’s culture and life. In order to provide freshwater fishing opportunities for Hawai‘i’s residents and visitors, several species of sport fish have been intentionally introduced into a few isolated reservoirs, which were then designated as Public Fishing Areas (PFAs). These PFAs are great places for family activities, and for keiki to hone their fishing skills.

A young angler at Koke‘e

The Kōke‘e PFA on Kaua‘i provides premiere rainbow trout fishing opportunities, and is generally open to fishing from mid-June through the end of September. This has become one of the most popular fishing events in the state, and brings in anglers from the mainland for the sole purpose of catching trout. During the 2019 season, 3,500 anglers caught a record number of 31,261 trout.

About 100,00 rainbow trout eggs are imported from California every year. They are hatched and raised to fingerling size at Sand Island, O‘ahu, then air shipped to Kaua‘i and stocked in Pu‘u Lua Reservoir at Kōke‘e. The vast majority of fishing takes place at the reservoir, but the PFA also includes approximately 13 miles of fishable streams.

House Finance Committee visits trout hatchery

Trout eggs are placed in hatching jars

Commercial Fisheries

Hawai‘i’s commercial fishery provides a major source of local food production, and is an important sector of our economy. The total value of the state’s commercial fishery is about $119 million annually. The longline fishery, which fishes in federal waters but lands fish at Hawai‘i’s ports, makes up the majority of this value. It also includes the marine aquarium and bottomfish fisheries, the two most economically valuable inshore fisheries.

Commercial fishers are required to purchase licenses and report fishing effort and catch. There are about 3,700 licensed commercial fishers operating in Hawaiian waters. The information obtained from their reports is used by both state and federal agencies to help inform management decisions.

The bottomfish fishery targets popular species like opakapaka, often featured on the menu of local high-end restaurants, and culturally significant “red fish” such as onaga and ehu. DAR works with federal partners to continuously assess the health of this fishery, imposing catch limits as necessary. DAR also has a network of Bottomfish Restricted Fishing Areas (BRFAs), where bottomfishing is prohibited. As a result of improved health of the fishery over the past several years, DAR was able to open four of the twelve BRFAs in July 2019. We are monitoring fishing effort and catch in these newly reopened areas for management purposes.

A nice onaga, and more

In recent years, Hawai‘i’s marine aquarium fishery has been the most economically valuable inshore commercial fishery in the State, worth up to about $2.2 million annually. The vast majority of aquarium collecting has occurred around O‘ahu and West Hawai‘i, where special aquarium collecting regulations are in place to manage for sustainability. Yellow tangs and kole are the most popular aquarium fish collected.

Fish at market

Yellow tangs and kole

Humpback Whale Sanctuary

Humpback whale breaching

The Hawaiian Islands Humpback Whale National Marine Sanctuary was created by Congress in 1992 to provide protected habitat for humpback whales. DAR has a cooperative partnership with NOAA's Office of National Marine Sanctuaries to co-manage this Sanctuary. DAR works with the federal Sanctuary staff to:

- conduct research on humpback whales and their habitat;
- promote ocean etiquette and best management practices among ocean user groups as it relates to humpback whales and other marine protected species;
- foster marine science student internships, citizen science and volunteer efforts; and
- educate the public about humpback whales and marine habitats.

Sanctuary staff work on Maui, Kauaʻi, Oʻahu, and Hawaiʻi Island. DAR is helping the Sanctuary expand its teacher education workshops, public education efforts, and on-water community partnerships to Molokaʻi.

DAR is also part of the Entanglement Response Network. Observers (e.g. agency crews, boat captains, tour operators, and others in the on-water community) report and monitor whales caught in or trailing fishing gear or ocean debris. Trained network responders work together to free entangled whales.

Papahānaumokuākea Marine National Monument

Endangered Hawaiian monk seal in the NWHI

Papahānaumokuākea Marine National Monument is situated in the northwestern portion of the Hawaiian archipelago. This vast, remote, and largely uninhabited marine region, one of the largest fully protected marine conservation areas in the world, encompasses an area of approximately 582,578 square miles. The Monument is dotted with small islands, islets, reefs, shoals, submerged banks, and atolls that extend from subtropical latitudes to near the northern limit of coral reef development.

Papahānaumokuākea Marine National Monument's designation added to the moʻo kūʻauhau, or genealogy, of the Northwestern Hawaiian Islands as a place of deep significance to kānaka ʻōiwi (Native Hawaiians), and now, to the United States and the world. It is important habitat for green sea turtles, Hawaiian monk seals, and abundance of fish, corals, invertebrates, and marine algae.

Aquatic Invasive Species

Settlement plates with invasive organisms

Hawaiʻi has documented over 300 introduced (non-native) aquatic species to date. Those which spread quickly and are harmful to economic, environmental, and human health are known as Aquatic Invasive Species (AIS). The goal of the AIS program is to prevent any further introductions, and control invasive species already here.

Biofouling (organisms growing on the outside of ships and boats) and ballast water (the water pumped inside vessels for stabilization) are responsible for almost 80% of marine introductions in the state. Our program advises on best management practices for ballast water and biofouling. We actively monitor harbors to catalogue organisms which may have arrived in Hawaii by ships and boats.

We are working with community members on Kauaʻi to address growth of the aquatic fern (*Salvinia molesta*), in stream systems and a new expansion of blackchin tilapia in Hāʻena. We recently responded to a new non-native sea anemone by mapping its distribution and running pilot control techniques. Getting reports of non-native species is crucial to an effective rapid response, and we are enhancing our ability to engage community members with the easy-to-use phone app iNaturalist.

Sea Urchin Hatchery

Native Collector Sea Urchins (hāwa‘e maoli) are an important grazer of invasive and native seaweed. Invasive seaweeds once smothered coral reefs in Kāne‘ohe Bay. Now these herbivorous urchins are used as a biological control agent. They can eat algae in the small spaces of the reef and reclaim important habitat for young fish and other small organisms.

The DAR Sea Urchin Hatchery is key to invasive seaweed control and reef restoration in Kāne‘ohe Bay. The first hatchery raised urchins were released in 2011. Since then, the hatchery has outplanted over 500,000 of these short-spined invasive algae-eating urchins.

As a result of our efforts, invasive seaweed in Kāne‘ohe Bay has decreased significantly in the last five years. DAR habitat managers continue to strategically deploy urchins wherever invasive seaweed is found. This prevents a full-scale reinvasion from taking root again, and preserves the integrity of coral reef habitat. DAR will be expanding the use of sea urchins for invasive seaweed control to other sites in the near future.

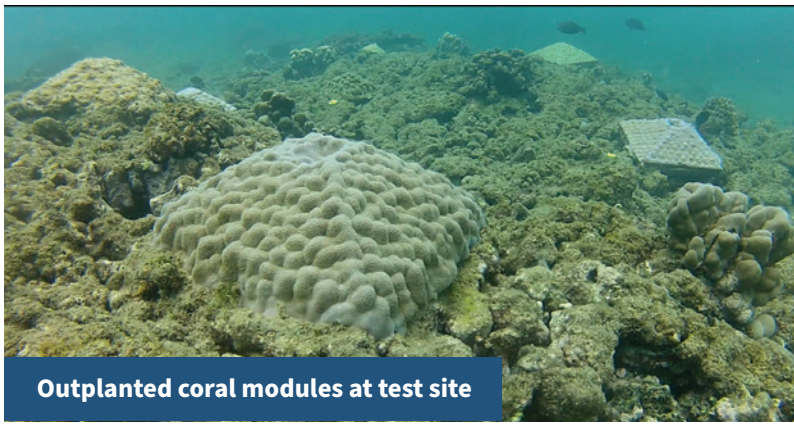
Trays of hatchery-raised urchins ready for outplanting

Smothering seaweed covers a Kāne‘ohe Bay reef

Collector urchins on reef

Coral Restoration Nursery

Corals in Hawai‘i are key to supporting reef ecosystems and protecting shorelines from wave action and storm events. Corals have been hit hard recently by repeated bleaching events, and recovery may take years. Hawaiian corals are extremely slow-growing and highly endemic. There is no replacement pool for our Hawaiian corals, and restoration in Hawai‘i requires specific conditions to address our unique environment and coral biology. DAR has created a one-of-a-kind land-based Coral Restoration Nursery to fast-grow Hawaiian corals under strict biosecurity protocols.



Outplanted coral modules at test site

The coral nursery uses source corals, generally from harbors, to rapidly grow large colonies for outplanting to damaged and degraded reef areas. It currently maintains over 60 Hawaiian coral species inhouse, 50 of which are maintained within the Rare Hawaiian Coral Ark. Through a suite of unique restoration tools and procedures, DAR can produce a couple hundred large coral colonies per year for outplanting, along with daily coral larvae for a limited number of Hawaiian species.

Microfragments starting to grow on a coral module

Coral fragment growout tanks

Hawai‘i Division of Aquatic Resources

Kaua‘i: 3060 ‘Eiwa St., Rm. 306, Līhu‘e 96766 808.274.3344
O‘ahu: 1151 Punchbowl St., Rm. 330, Honolulu 96813 808.587.0100
Maui County: 130 Mahalani St., Wailuku 96793 808.243.5294
East Hawai‘i: 75 Aupuni St., Rm. 204, Hilo 96720 808.961.9530
West Hawai‘i: 74-380B Kealakehe Pkwy., Kailua-Kona 96740 808.327.6226
dlnr.hawaii.gov/dar