

# **NMFS SOUTHWEST FISHERIES SCIENCE CENTER HONOLULU LABORATORY**

## **OVERVIEW**

The Honolulu Laboratory (HL) was established in 1948. Over the past five decades HL has had an illustrious history of performing fisheries exploration and development, conducting fisheries research, and providing scientific information and expertise in support of the management of fisheries and the recovery of protected species in the central and western Pacific. The main HL facility is located on the University of Hawaii (UH) campus at Manoa. HL also has a smaller research facility with seawater capabilities for conducting research on live large pelagic fishes, monk seals, and sea turtles. That facility is located at Kewalo Basin, about 3 miles from HL.

### **Mission of Honolulu Laboratory**

The mission of HL is to conduct the science to support the stewardship of fisheries and protected species in the central and western Pacific. It is linked to the National Oceanic and Atmospheric Administration (NOAA) Strategic Plan to Build Sustainable Fisheries, Recover Protected Species, and Maintain Healthy Living Marine Resource Habitats and to the Department of State's priorities concerning international management of Pacific highly migratory species (HMS).

### **Goals of Honolulu Laboratory**

The goals of HL are to provide scientific information and advice to:

- Manage domestic fisheries in the U.S. Exclusive Economic Zones (EEZs) in the central and western Pacific.
- Support U.S. interests related to the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific.
- Recover and manage populations of the highly endangered Hawaiian monk seal and protected Pacific sea turtles and assess and mitigate seabird mortality resulting from fisheries interactions.
- Maintain healthy living marine resource habitats.

### **Geographic Area of Responsibility**

The geographic area of responsibility of HL (Fig.1) is the largest of all U.S. fisheries laboratories and, perhaps, the largest of all fisheries research laboratories in the world. The vast area is bounded by the entire Hawaiian Archipelago in the north, American Samoa and U.S. possessions in the south, and the Marianas Archipelago in the west. The area of these EEZs is more than 1.7 million square nautical miles, which is slightly larger than the total EEZ of the entire U.S. mainland and Alaska.

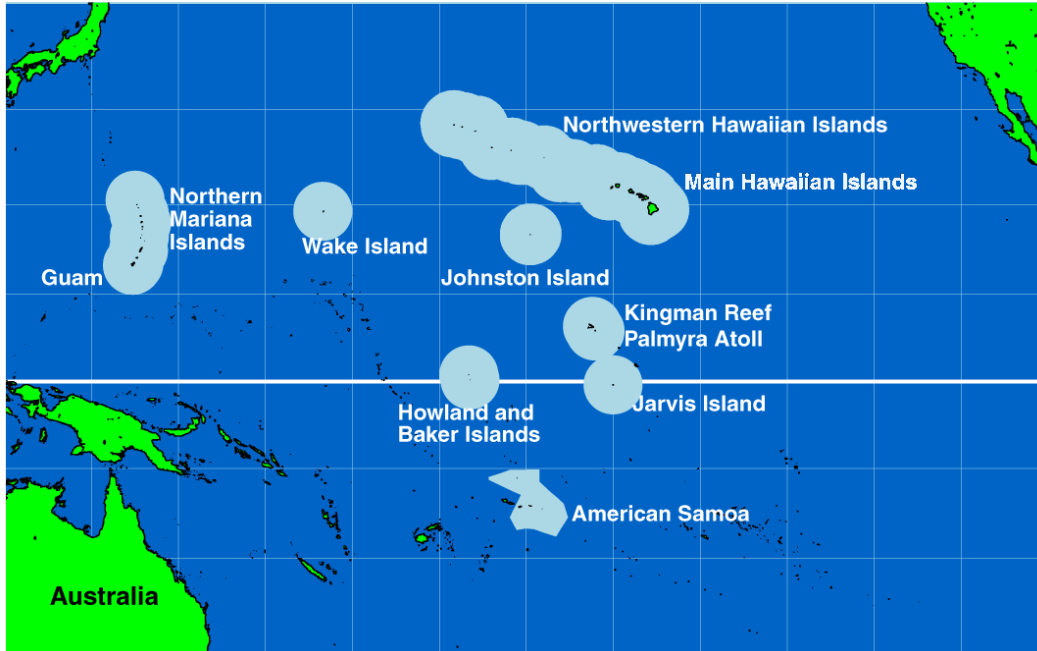


Fig. 1. Geographic area of responsibility for the Honolulu Laboratory.

### **Research and Activities Related to Management of Domestic Fisheries**

HL is responsible for conducting biological, ecological, and economic fisheries research and for performing fisheries stock assessments required to provide scientific information and guidance for five Fishery Management Plans (FMPs). HL is also accountable for the collection of fisheries statistics and for fisheries monitoring activities that are essential for managing fisheries. The latter include operations related to fishing logbooks mandated by Federal regulations and to the Western Pacific Fishery Information Network (WPacFIN). FMPs include the following:

- Pelagic Fisheries of the Western Pacific
- Crustacean Fisheries of the Western Pacific
- Bottomfish and Seamount Groundfish Fisheries of the Western Pacific
- Precious Coral of the Western Pacific
- Coral Reef Ecosystems

### **Activities Related to the Convention on the Conservation and Management of Highly Migratory Species in the Western and Central Pacific**

HL has been assigned responsibility for providing scientific information to support U.S. interests in the international management of HMS in the western and central Pacific. This responsibility requires that HL engage in biological, ecological, and economic research, as well as stock assessments for tunas, billfishes, sharks, and eventually other pelagic species incidentally caught or with target species.

HL plays leadership roles in international organizations related to the international management of Pacific HMS, including the Multilateral High Level

Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific (MHLIC), the Interim Scientific Committee for Tuna and Tuna-Like Species in the North Pacific (ISC), and the Secretariat of the Pacific Community/Standing Committee on Tuna and Billfishes (SPC/SCTB).

**Research and Activities Related to the Recovery of Protected Species**

HL has comprehensive research programs related to the recovery and management of the endangered Hawaiian monk seal and protected Pacific sea turtles. In addition, HL has responsibilities related to fisheries interactions with sea turtles and seabirds. Research and operations related to the Hawaiian monk seal include investigations of the biology, ecology, population assessment, factors acting to retard recovery of the monk seal population(s), and the development and application of actions to mitigate the latter. Biological, ecological, and population assessment research is conducted on Pacific sea turtles, with emphasis on the Hawaiian green sea turtle. There is a major emphasis on research to develop “sea turtle safe” pelagic longline fishing.

**HONOLULU LABORATORY BUDGET AND STAFFING**

**Honolulu Laboratory FY 2002 Budget**

The FY 2002 budget for HL is about 19.2 million. NMFS base funds allocated to HL by the SWFSC cover about \$4.0 million of this budget. The balance comes from several sources including add-on funds from the NMFS office of Protected Species and NMFS Southwest Region (SWR) amounting to about \$1.92 million, from Congressional Programs, Projects, and Activities (PPAs) totaling about \$1.24 million, other PPA \$1.75 million, and other NOAA funding about \$10.37 million. A summary of the budget by funding source is provided in Table 1.

Table 1. Honolulu Laboratory FY 2002 Budget

<b>Funding Source</b>	<b>Amount (\$1,000)</b>
NMFS base	\$3,953.4
NMFS add-on	1,915.6
Other NMFS Base	1,747.9
PPA Congressional	1,240.4
Other Funding	10,371.9
<b>Total Funding for Honolulu Laboratory</b>	<b>\$19,229.2</b>

### Honolulu Laboratory Staffing

HL staff includes 66 NOAA/NMFS employees, 1 NOAA Corps officer, and 58 University of Hawaii/Joint Institute for Marine and Atmospheric Research (UH/JIMAR) employees. Most of the UH/JIMAR staff members are paid with HL funds that are awarded to UH/JIMAR's Pelagic Fisheries Research Program (PFRP) through a competitive process. (See section on Honolulu Laboratory Relationships with the University of Hawaii for further discussion). Thirty-five UH/JIMAR staff members are full time, 4 are part time, and 19 are student assistants. Thirty-one staff members are hired through Aquatic Farms as contractors. Nine Aquatic Farms staff members are full time and 22 are seasonal hires. The number of staff members by category appears in Table 2.

Table 2. Honolulu Laboratory Staff

Organization	Number
NOAA	
NMFS	66
NOAA Corps	1
Total NOAA	67
UH/JIMAR	
Full-time	35
Part-time	4
Student Assistants	19
Total UH/JIMAR	58
Aquatic Farms	
Full-time	9
Seasonal hires	22
Total Aquatic Farms	31
Total Non-NOAA	89
<b>TOTAL</b>	<b>156</b>

### Honolulu Laboratory Relationship with WPRFMC and SWR/PIAO

HL shares close working relationships with NMFS SWR/Pacific Islands Area Office (PIAO) and Western Pacific Regional Fishery Management Council (WPRFMC). WPRFMC prepares and recommends fishery management actions to NMFS. PIAO prepares fishery management regulations and is responsible for carrying out fishery management actions. HL provides scientific advice and input for domestic fishery actions to both WPRFMC and PIAO.

### Honolulu Laboratory Relationships with UH

HL is located on the UH Manoa campus and has extensive relations with UH, resulting in significant mutual benefits. Several of HL's senior investigators hold UH adjunct professorships or senior research fellow positions, lecture UH

courses in marine science and related topics, and serve as scientific advisers to undergraduate and graduate students. UH students serve as a source of talented and motivated temporary help for HL. HL computer Internet access and other computer communications are handled through the UH Computer Center, and the NOAA ship assigned to HL, *Townsend Cromwell*, is berthed and receives port support from UH. UH also provides some environmental compliance maintenance for HL as well as after-hours security. Most direct associations between HL and UH are through NOAA/UH/JIMAR.

HL has many interactions with UH/JIMAR including the opportunity for HL scientists to compete for funding that is awarded competitively by JIMAR/PFRP. JIMAR/PFRP administers funding received from Congress. In addition, HL and UH/JIMAR scientists conduct substantial complementary, collaborative, and cooperative research on pelagic fisheries.

HL utilizes the UH/JIMAR program by awarding grants to JIMAR for research in support of the mission of HL. In FY 2002 HL awarded grants totaling about \$2.7 million to JIMAR to support research and operations at HL.

#### **NOAA CoastWatch**

The NOAA CoastWatch site, which is funded by NOAA/National Environmental Satellite, Data, and Information Service (NESDIS), is located at HL. The site has direct readout of NOAA satellites (shared with NOAA/National Weather Service) and satellite image processing systems. Satellite-derived ocean data products are produced at the CoastWatch site for distribution to federal, state, and local agencies and university researchers involved in marine science, policy, and management. Over the past year there has been a significant expansion in the amount of satellite information available from the CoastWatch Site including new sea surface temperature, ocean circulation, ocean wind, and ocean color products. CoastWatch data products are increasing in use in HL fisheries and protected species research. (See the Oceanography section of this report for more details.)

#### **PUBLICATIONS AND SCIENTIFIC MEETING PRESENTATIONS**

Forty manuscripts have been approved, submitted for publication, in press, or published by HL scientists during FY 2002. The numbers of publications by category are as follows:

Fishery biology/ecology	9
Fisheries and fishery interactions	8
Physical and biological oceanography	8
Hawaiian monk seals	7
Sea turtles	6
Fisheries economics and social sciences	2

The Laboratory staff also prepared 55 administrative reports, abstracts, and workshop proceedings. In addition, HL scientists made 93 presentations at 76 scientific meetings, as well as more than 35 WPRFMC Plan Teams, Advisory Teams, Science and Technical Committees, and full WPRFMC meetings.

## **A HISTORICAL PERSPECTIVE ON INSULAR ECOSYSTEM RESEARCH AT THE HONOLULU LABORATORY**

The HL has a rich history in conducting coordinated research on island-based ecosystems, including coral reef ecosystems. The most comprehensive effort began in 1975 when the HL/NMFS, U.S. Fish and Wildlife Service (USFWS), and the State of Hawaii's Division of Fish and Game (since renamed Division of Aquatic Resources) established a formal agreement to conduct a 5-year survey and assessment of the marine resources of the Northwestern Hawaiian Islands (NWHI). In 1977 the UH Sea Grant College Program joined this partnership. A steering committee of the local agency heads met regularly to coordinate the logistics and research. Virtually all the ship time of the NOAA ship *Townsend Cromwell* over the 5-year period was devoted to supporting this program. The research had a strong ecosystem focus with projects addressing sea birds, monk seals, sea turtles, coral reefs, coral reef fishes, lobsters, bottomfishes, deepwater shrimps, and oceanic and benthic primary productivity. This ecosystem perspective resulted in the development of an ecosystem modeling approach (Ecopath) and a quantitative ecosystem model of French Frigate Shoals FFS). The biological and economic research provided much of the data to support the development of the Crustacean and Groundfish Fishery Management Plans. The sea turtle and monk seal work initiated under this program represent the origins of the Laboratory's current Protected Species Investigation. In 1983 a 3-day symposium was held to communicate the results of this program. The symposium, attended by 211 researchers, managers, students, fishermen, and environmentalists, included dozens of research presentations, two panel discussions addressing optimum use scenarios, and a film showing the ecosystem and the research activities. A sense of the scope and results of the program can be gained from the Proceedings of the 2nd Symposium on Resource Investigations in the Northwestern Hawaiian Islands, Vols. 1,2. Edited by R. Grigg and K. Tanoue. 1984.

In 1982, as the NWHI field program was concluded, the HL embarked on a 4-year research program to assess the stocks of bottomfishes and deepwater shrimps around the Marianas Archipelago. The program, termed the Resource Assessment Investigations of the Marianas Archipelago (RAIOMA), was based on a focused experimental design. It used the NOAA ship *Townsend Cromwell* for 120 sea days each year to conduct comprehensive systematic surveys mapping the density of deepwater bottomfishes and shrimp throughout the Marianas Archipelago, and then used depletion experiments to convert the densities to biomasses. (Fig. 2). Long-term sustainable fisheries yields were



Fig. 2. The NOAA ship, *Townsend Cromwell*, nears an active volcano on Pagan Island in the Marianas while conducting research in the region. Photo by Jeffrey Polovina.

estimated for the archipelago as functions of the estimated biomasses that were used in fishery management plans. Other information produced included growth and mortality estimates for deepwater bottomfishes, descriptions of new species and range extensions, and new bathymetric charts of selected fishing banks. The RAIOMA program came at a time when there was widespread interest in the Pacific in developing deepwater bottomfish fisheries. Staff from the HL contributed bottomfish and general stock assessment expertise to numerous island nations all across the Pacific through various meetings, workshops, and technical assistance projects. This work culminated with the production of an edited volume on *Tropical Snappers and Groupers: Biology and Fisheries Management*.

It was also in the early 1980s that the HL began a program to provide database, computer hardware, sampling design, and data analyses assistance to fisheries agencies in Guam, the Commonwealth of the Northern Marianas, and American Samoa in collecting landings data on fisheries associated with coral reefs. This program, called the Western Pacific Fisheries Information Network (WPacFIN), continues to operate today and as a result, we have over two decades of data on fisheries landings covering many of the harvested species that comprise the coral reef ecosystem.

After the RAIOMA field program ended, insular research returned to the NWHI to address needs arising from the developing lobster and bottomfish

fisheries. One research project, a survey of the benthic habitat of the lobster fishing grounds, required extensive dive work. To conduct this work, Laboratory staff developed the first NOAA diving program to work throughout the NWHI mapping lobster habitat with towboards, drop dives, and remote camera surveys. In recent years a major component of our insular research has focused on the forage ecology of the endangered Hawaiian monk seal. Many new technologies were brought to this work including cameras, temperature, depth, and location recorders attached to the animals to identify foraging areas, dive surveys to monitor forage densities requiring, in some cases, mixed gas diving to depths of about 80 meters, and fatty acid analyses of monk seal blubber to quantify diets. The new information coming out of this work is being used to update our ecosystem model developed in the NWHI program 20 years ago. Furthermore, the concept of decadal change in the NWHI ecosystem emerged from the biological time series begun in the NWHI program and maintained through the present.

About the same time the Laboratory was expanding its underwater capabilities, it also became a CoastWatch Node to bring remotely sensed technologies to support its research. The Laboratory has used satellite remotely sensed temperature, altimetry, ocean color, and winds to monitor the spatial and temporal ocean dynamics in the NWHI and to investigate ocean processes such as larval transport.

The Laboratory's current Coral Reef Ecosystem Investigation (CREI) represents a major new development in our insular ecosystem research. It draws from research skills, knowledge, and collaborations developed over the past 30 years and strive to produce new knowledge, tools, and partnerships.



**NMFS SOUTHWEST FISHERIES SCIENCE CENTER**  
**HONOLULU LABORATORY**  
**CORAL REEF ECOSYSTEM INVESTIGATION**

**EXECUTIVE SUMMARY**

The goal of CREI of the NMFS SWFSC HL is to conduct research that provides scientific information and advice to ensure the long-term viability of coral reef ecosystems in the U.S.-affiliated islands of the western Pacific, including the NWHI. The objectives of the Investigation are to conduct an ecosystem-based research program required for scientific support of the:

- Coral Reef Ecosystem Fishery Management Plan of the Western Pacific Regional Fisheries Management Council,
- National Action Plan to Conserve Coral Reefs,
- Coral Reef Conservation Act,
- Executive Orders related to Coral Reef Protection, Marine Protected Areas, and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve,
- Recovery of critically endangered Hawaiian monk seals and threatened green sea turtles.

The CREI uses comprehensive, multidisciplinary research approaches to address coral reef ecological assessment and monitoring, habitat mapping and characterization, oceanographic processes affecting coral reef ecosystems, and coral reef restoration through marine debris mitigation. In addition, several applied research activities are conducted including examining ocean circulation patterns, evaluating the potential effectiveness of marine protected areas, ecosystem modeling of trophic linkages, spatially structured population modeling, evaluating the impacts of lobster trapping on habitat, and developing techniques to assess exploitable bottomfish populations.

Ecological assessments are conducted for reef fishes, corals, other invertebrates, and marine algae. An array of tools and methods is used in coral reef ecological assessment and monitoring studies and in determining the oceanographic processes influencing coral reef ecosystems. These include the use of towboard and other diver surveys, instrumented oceanographic moorings and buoys, oceanographic research vessels, and satellite remote sensing technologies. Habitat mapping and characterization research employs single- and multibeam acoustic technologies, towed camera systems, and towed-diver surveys. Marine debris mitigation on coral reefs utilizes divers on multiple ships in multi-agency campaigns. Satellite and aircraft remote sensing technologies are being used to evaluate the feasibility of locating and efficiently removing concentrations of marine debris at sea before coral reefs and protected species are adversely impacted.

The FY 2002 budget for CREI is \$6.3 million (\$4.8M NMFS and \$1.5M National Ocean Service [NOS]); in FY 2001 it was \$5.6 million (\$4.9M NMFS and \$0.7M NOS). The number of staff is presently 39, of which 6 are NOAA/NMFS, 1 is a NOAA Corps Officer, 14 are hired through the UH JIMAR, and 18 are hired through a private contractor. One of these staff is a post-doctorate, six are first year graduate students and two are part-time undergraduates at the UH. CREI scientists work closely with staff from other research investigations at HL, colleagues elsewhere within NOAA, and partners in other federal, state, and territorial agencies and non-governmental organizations.