NOAA DIVING PROGRAM

2010 Annual Report

NOAA Diving Center

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Executive Summary

This report highlights some of the significant events and achievements accomplished by NOAA divers throughout the world during fiscal year 2010. NOAA divers perform a wide variety of underwater tasks in support of NOAA's mission. During the year NOAA divers, and reciprocity partners, conducted dives across the globe, from the Red Sea to Alaska, Rhode Island to Wake Island, the Gulf of Mexico to the Gulf of California, and the Caribbean Sea to the Puget Sound. Numerous technical reports, peer-reviewed publications and presentations at national and international scientific meetings were made possible by data collected during these operations.

Statistically FY10 was a very safe and productive year for the NOAA Diving Program (NDP). Despite a 4% decrease in number of divers (466), the Program experienced a 4% increase in the number of dives performed (13,987) and a 12% increase in total hours of dive time (9,099). Of these dives, 71% (9,873) were associated with scientific observation and/or data collection; 16% (2,247) involved non-scientific tasks, such as mooring installation or maintenance, and 13% (1,869) were non-duty dives including those associated with dive training and maintenance of dive proficiency (see Chart 1).

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From a safety standpoint, the Program experienced three cases of ear/sinus barotrauma and one laceration requiring stitches, none of which resulted in loss of work time. No cases of decompression illness were reported.

The activities in this report represent a small fraction of the operations conducted by NOAA divers on a daily basis. Diving is a hazardous, yet vitally important activity used to help NOAA accomplish its mission and NOAA divers are to be commended for volunteering their services in support of this effort. It is due to the dedication of these individuals that NOAA continues to be the premiere Federal civilian diving organization in the country.

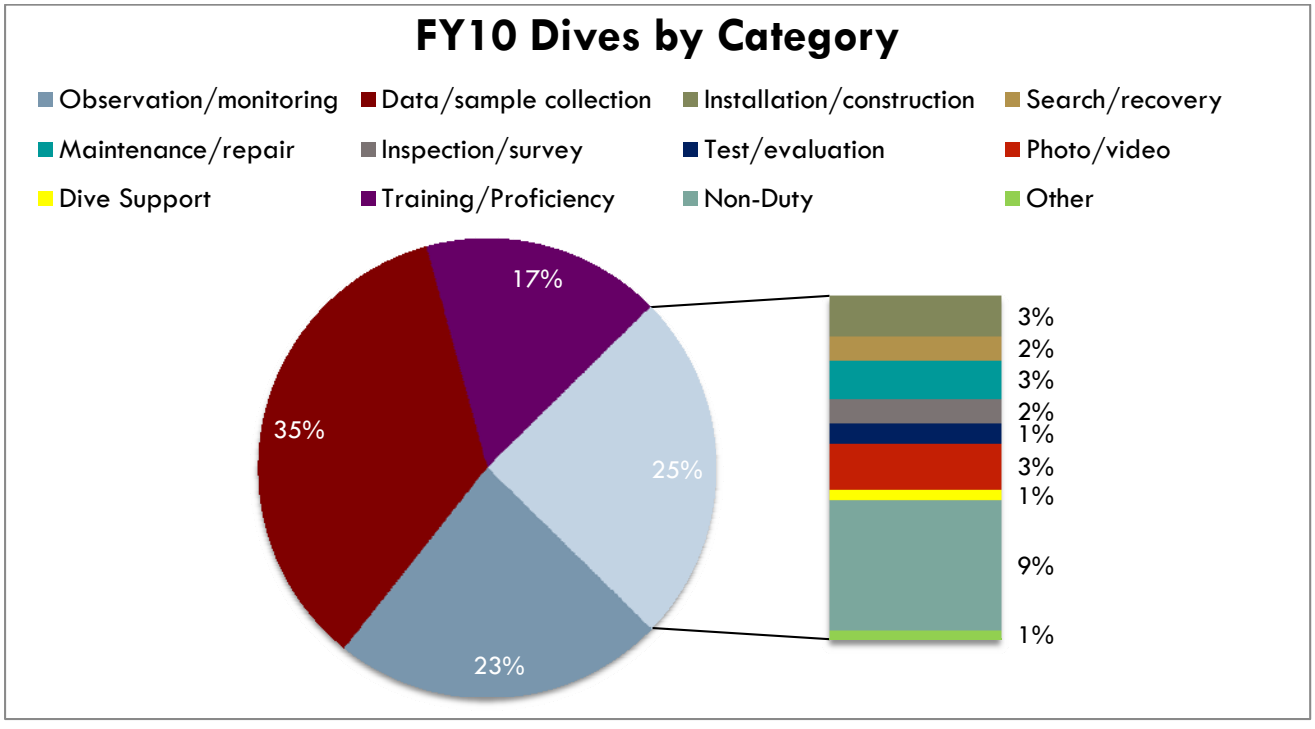

Chart 1- FY10 Dives by Category (dive purpose).

NOAA Fisheries Service

The 17 diving units of the NOAA Fisheries Service (Fisheries) supported a wide range of projects across all regions of the country during FY2010. The Pacific Islands and Southeast Fishery Science Centers had the highest tempo of diving activity; however critical projects were completed throughout the region. Fisheries continued to lead other Line Offices (LOs) in the number of divers, the number of dives and the amount of bottom time (Table 1). Scientific dives outnumbered working dives nearly two to one. Direct observation and sample collection, habitat restoration, collection of telemetry data, ship husbandry, public outreach and safety/training were some of the categories of activities conducted this year. Diving skills training, rescue drills, fitness tests and check-out dives for new equipment and techniques were important factors contributing to a year without any significant diving injuries to Fisheries divers. The first on-duty dive by a NOAA Administrator was completed when Dr. Jane Lubchenco dove on a coral nursery in Key Largo, FL during Earth Day events supported by the Fisheries Diving Unit in St. Petersburg, FL.

Table 1: FY10 NOAA Diving Activity

	Divers	***Dives***	***Bottom Time (hours)***
Fisheries	182	7047	4941.22
NOS	162	4697	2971.13
OAR	9	126	63.18
OMAO	113	2117	1124.1
TOTALS	**466**	**13987**	**9099.63**

Administrative task loading on Unit Diving Supervisors (UDSs) continues to increase with this trend likely to persist in FY 2011 as the Dive Unit Safety Assessment (DUSA) inspection program becomes fully operational. A significant allocation of time remained devoted to training activities, particularly for reciprocity divers. FY2010 was the second full year of inclusion of diving activities in the performance plans for all divemasters and UDSs. Approximately 30% of UDSs accepted an offer by the Line Office Diving Officer (LODO) to brief rating officials on the conduct of their assigned diving duties. The establishment of a LODO budget by Fisheries HQ allowed all units to request upgrades of safety equipment and all requests were fulfilled in FY2010.

The largest number of Fisheries dives was in support of the Coral Reef Conservation Program (CRCP). Habitat conservation, fishery independent monitoring, and coral restoration were other significant beneficiaries of diving activities. An abbreviated list of the species studied includes: abalone, conch, staghorn, and elkhorn coral, hake, lingcod, mutton snapper, red king crab, rockfish, lionfish (invasive on east coast), scallop, several salmon species and several grouper species. Nearly 20 peer reviewed publications and numerous presentations at national and international scientific meetings were made possible by data collected by NOAA Fisheries' divers.

A brief synopsis of each diving unit's activities follows.

The *Auke Bay, AK* unit continued a project evaluating growth and survival of shallow corals after trawl disturbance and continued several projects on life history (corals and sponges), mapping (eelgrass), and stock enhancement (salmon post-release behavior). Aquaculture maintenance dives afforded considerable cost savings to the agency. A new study was initiated to evaluate the efficacy of sonar techniques to locate derelict crab pots, examine them

in situ, and remove them from the marine environment. Several reports were published and several peer-reviewed scientific publications are in press or preparation as a result of these diving activities.

The majority of the *Galveston, TX* unit's diving was focused in the Caribbean with projects on the recovery of conch populations in the United States Virgin Islands, productivity and disease in *Acropora* corals in the northern Caribbean, and improving trap designs to reduce bycatch mortality of reef herbivores. A cooperative project was also conducted with the University of the Virgin Islands to remove lost fish traps considered to be marine debris.

Honolulu, HI dive operations continued at a high level in 2010. Research cruises were completed to Johnston Atoll, Howland Island, Baker Island, American Samoa Islands, Jarvis Island, Palmyra Atoll, Kingman Reef, and the Northwestern Hawaiian Islands (NWHI). 40,000 lbs of marine debris were removed from the NWHI. Deep (trimix/decompression) surveys were completed on mesophotic coral reefs in the NWHI and Maui in a cooperative project with the State of Hawaii. Numerous dives were focused on the installation and recovery of oceanographic instrumentation (Figure 1). Data collected from many of these surveys were published in a variety of peer reviewed scientific journals.

Figure 1 – Instrument recovery by Hawaii diver Kevin Lino. Photo courtesy of the NMFS PIFSC.

Kodiak, AK completed the third year of a settlement study on larval and early benthic stage red king crab as a prelude to a possible stock enhancement program. General research on life history, behavior, and habitat use of red king and tanner crab and Pacific octopus continues. Unit divers supplied all marine organisms for the interpretive aquariums at the laboratory, which had over 17,000 visitors in 2010.

The *La Jolla, CA* unit continued the Point Loma Gastropod density and movement survey as well as a temporal dynamics study of giant seabass and other indigenous fishes in the La Jolla Ecological Reserve (the latter in collaboration with Scripps Oceanographic Institute). La Jolla unit divers also supported a white abalone identification and nearest neighbor project. Aquaculture maintenance and ship husbandry dives resulted in significant cost savings to the laboratory and the fleet.

Long Beach, CA continued monitoring of seagrass, kelp, and rocky reef habitats, evaluating the suitability of habitat enhancement and mitigation sites, and other on-going habitat assessment activities. Reports on seagrass surveys were shared with the Morro Bay National Estuary Program and the U.S. Army Corps of Engineers. Eelgrass samples were sent to the University of Groningen (Netherlands) for genetic characterization, which will ultimately lead to a cooperative research product. Information obtained from diving on natural reefs, artificial reefs, and other benthic characterizations are being used to guide placement of artificial reefs for the Montrose Settlement Program.

Projects at the *Miami, FL* laboratory utilized data from over 3,500 dives in 2010. Roughly 1,060 of these dives were conducted by NOAA divers with the remainder completed by reciprocity divers from a variety of academic and governmental agencies. The majority of projects were conducted in the Florida Keys including the Dry Tortugas and Riley's Hump. Fishery independent surveys of reef fishes and studies of all aspects of coral biology were the primary goals of most of these dives (Figure 2). Miami unit divers also conducted several missions in support of oil spill response activities related to the Deepwater Horizon (DWH) event in the Gulf of Mexico. Collaborative projects were undertaken with numerous academic, state, and federal partners. Several peer reviewed publications and technical memoranda resulted from diving supported activities.

Milford, CT and several associated sub-units conducted operations in support of NOAA's mission including bay scallop collections in cooperation with the U.S. EPA and the Stonington, CT Shellfish Warden. Samples were collected for a dinoflagellate cyst survival experiment. Other aquaculture support consisted of search and recovery of lost gear, installation and maintenance of acoustic arrays in Narragansett, RI, and ship husbandry on several NOAA vessels.

The *Panama City, FL unit* supported fishery research into sub-adult reef fish in the northern Gulf of Mexico, the Miami lab's Reef Fish Visual Census in the Dry Tortugas, the Pascagoula lab's Turtle Excluder Device and Bycatch Reduction Device projects, and the Auke Bay lab's Dungeness Crab Derelict Pot Removal project. Significant cost savings were achieved via underwater maintenance of an aquaculture facility and ship husbandry projects. Support was also given to U.S. Navy collaborative projects and to local academic entities.

Divers from the *Pascagoula, MS unit* focused most of their efforts on testing and evaluating commercial and recreational fishing gear (bycatch reduction in trawls and turtle escapement). An international collaboration was undertaken with the Instituto Nacional de Pesca (Mexico) to design gear and promote trawling in place of gill netting in a Gulf of California shrimp fishery in order to reduce take of endangered dolphins.

Figure 2 - Dave McClellan performing a RVC reef fish survey. Photo courtesy of SEFSC.

Sandy Hook, NJ divers fulfilled three primary missions in 2010: support of fisheries research programs; ship husbandry on laboratory vessels; and maintenance of aquaculture facilities. Increased manning requirements and the retirement of one unit diver hampered certain working diving operations, however, the unit maintained the accelerated pace of training for diving and rescue skills now mandated by the NDP. Several unit divers helped to raise awareness of the laboratory's research activities through presentations at dive clubs throughout the New Jersey area, often during off-duty hours.

Santa Cruz, CA completed several community assessments and the 27th consecutive annual recruitment survey of rockfish off central California. Diver collected data was essential for completion of a recently accepted manuscript on the early life history of blue rockfish. Increased manning requirements for diving have limited data collection for some projects. Collaborations with several academic, state, and federal partners are helping fill gaps in surveys.

Santa Rosa, CA documented conditions in riverine and estuarine habitat and evaluated structures which may negatively affect adult or juvenile salmonids and sturgeon. Surveys were conducted for the cities of Redding and Sacramento, CA to assist with determination of impacts to fishes of municipal water plants. Staffing levels allowed only scientific dives to be conducted; collaborations with reciprocity agencies were required to conduct working dives.

Seattle – Montlake, WA focused on six research areas in 2010: a lingcod movement study; analysis of sixgill shark movement; tracking of PIT tagged salmon; population dynamics of salmon; capture and tagging of jellyfish in Hood Canal; and marine mammal investigations. Significant ship husbandry, aquaculture maintenance, and specimen collection for outreach activities were also completed. Major cost savings resulted from the ship husbandry and aquaculture maintenance operations. NOAA fisheries diving was essential to two scientific publications this year.

The *Seattle–Sand Point, WA unit* continued its fisheries and marine mammal research support. Project funding limitations curtailed some diving activities, however, rescue and skills training were completed on schedule. All dives conducted in 2010 were conducted under the scientific diving regulations.

With divers from most of the NOAA line offices, the *Silver Spring, MD Fisheries unit* conducted a wide variety of operations. The principal focus of activities was in the Chesapeake Bay with oyster restoration projects in Virginia and Maryland, and dive support for the Chesapeake Bay Interpretive Buoy System (CBIBS). Coral reef assessment dives were also conducted in the U.S. Caribbean. There was a high level of cooperation with the other line office diving units in the D.C. area to offer monthly training dive opportunities.

In addition to supporting the diving activities of the NOAA Administrator, other diving by the *St. Petersburg, FL unit* primarily supported emergency response and restoration for ship groundings in the southeast and U.S. Caribbean. Restoration efforts were undertaken at the Magara, Suez Matthew, and Port Stewart sites in Puerto Rico. Emergency coral restoration work was also conducted in Culebra, PR in the wake of Hurricane Earl. Unit divers developed innovative techniques to assess seagrass damage resulting from the DWH event without putting divers at risk to exposure to oil or dispersants.

National Ocean Service

This year 162 National Ocean Service (NOS) divers conducted a total of 4,697 dives (see Table 1) to support NOAA's missions through the Center for Operational Products and Services (CO-OPS), the National Centers for Coastal Ocean Science (NCCOS), and the Office of National Marine Sanctuaries (ONMS). Below, diving activities are summarized by NOS program office.

The mission of CO-OPS is to provide the national infrastructure, science, and technical expertise to monitor, assess, and distribute tide, current, water level, and other coastal oceanographic products and services that support NOAA's mission of environmental stewardship and environmental assessment and prediction.

NOS Divers K. Gleason and T. Casserly mapping the NWHI's. Photo courtesy of Robert Schwemmer.

The *Field Operations Division (FOD)/Atlantic Region Office (ARO)* divers based out of Norfolk, VA maintain the National Water Level Observation Network (NWLON) of tide wells along the entire eastern seaboard and in the Great Lakes. They installed, repaired, and cleaned the intake pipes or wells that measure the tides or lake levels. This involved rebuilding the intakes underwater and repairing the wells as needed. In Mona Island, Puerto Rico, they installed new plates on a well in San Juan. In the Great Lakes, one team had to 'jet-out' intakes that had 4 to 5 feet of silt built up over the intake; this was made even more difficult due to zero visibility conditions.

In addition to maintenance of NWLON infrastructure, the *FOD/Pacific Region Office (PRO)* divers, based out of Seattle WA, are responsible for the National Current Observation Program (NCOP) which includes the Physical Oceanographic Real Time Systems (PORTS) and National Weather Service Tsunami Warning Center infrastructure. NWLON and NCOP data also output tidal and current predictions used by the entire maritime community. This unit installed beams, brackets, and mounts to support stilling wells, and pressure orifices and tubing for new tide gauges. Divers cleaned, inspected, maintained and replaced wells and orifices and support structures for existing

tide gauges. In addition to work in the lower 48 states, this team traveled to sites as remote as Guam, Barbuda, and Alaska.

The mission of the NCCOS is to support achievement of NOAA's coastal missions by providing cutting–edge research, scientific information and tools that help balance ecological, social, and economic goals. In support of the NCCOS, the Center for Coastal Monitoring and Assessment (CCMA) performs assessment and forecasting of coastal and marine ecosystem conditions through research and monitoring. By conducting field observations on regional and national scales, the center provides the best available scientific information for resource managers and researchers.

In support of CCMA, *Silver Spring* divers conducted baseline assessments of Guanica Bay, Puerto Rico in support of watershed restoration; continued work on a Caribbean Coral Reef Ecosystem Monitoring Project to spatially characterize and monitor the distribution, abundance, and size of reef fishes and macro-invertebrates; assisted the National Park Service in the St. John study area to remove invasive lionfish from within the Park boundaries; and conducted biogeographic characterization of fish communities and associated benthic habitats within the Flower Garden Banks National Marine Sanctuary in cooperation with divers from NCCOS's Center for Coastal Fisheries and Habitat Research (CCFHR).

The responsibilities of CCFHR are to address the impacts of global climate change on ecosystems in the coastal ocean; provide scientific guidance to preserve and restore NOAA trust resources; and implement integrated ecosystem assessments of key and accessible ecosystems of importance to the nation. Divers from the *Beaufort, NC CCFHR* facility supported the NRDA Submerged Aquatic Vegetation Technical Working Group to characterize the extent and damage caused by the Deepwater Water Horizon oil spill, completed a twelve year mapping and change analysis of eelgrass abundance in Massachusetts, collected data from Gray's Reef Florida Keys and the Flower Garden Banks National Marine Sanctuaries, conducted experimental evaluation of a technique for the restoration of tropical seagrass meadows injured by motor vessels, and engaged in restoration and management of biodiversity in the marine park site at Arrábida-Espichel, Portugal. Technical divers from this facility also helped to document maritime heritage sites in a joint project with ONMS and continued a characterization study of invasive lionfish populations off the North Carolina Coast.

NCCOS's Center for Sponsored Coastal Ocean Research (CSCOR) provides quality research in support of coastal management decisions through competitive, peer-reviewed research and holistic ecosystem studies. CSCOR also participates with other NCCOS centers and other parts of NOAA in collaborative field research activities as appropriate. *Silver Spring* divers supporting CSCOR were engaged in the Hawaii Coral Reef Initiative Research Program (HCRI) and worked with the National Coral Reef Institute (NCRI) to identify gaps and constraints in scientific knowledge of reef structure and function as they relate to issues of assessment, monitoring, and restoration. They worked on a research program entitled "From Science to Management/Micronesia" that used results

Figure 3 - TBNMS Diver Tane Casserly swims by the propeller from the Montana. Photo courtesy of the TBNMS.

from the Coral Reef Ecosystem Studies Program to expand and implement integrated watershed management and with the Caribbean Coral Reef Institute (CCRI) to build a new capability for coral reef research in Puerto Rico and the wider Caribbean.

The ONMS mission is to serve as the trustee for the nation's system of marine protected areas, to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy. ONMS manages 13 sanctuaries and one marine national monument encompassing more than 150,000 square miles of U.S. Ocean and Great Lakes waters.

Figure 4 - Stellwagen Bank NMS divers D. Marx and Ben Haskell wait to be picked up by the R/V Auk. Photo by Matthew Lawrence.

Starting in the Northeast Region at Lake Huron, the *Thunder Bay NMS* divers deployed 22 seasonal mooring buoys, archaeologists taught a Nautical Archaeology Society (NAS) course to the US Naval Sea Cadets, and the site's divers hosted three "live dive" webcasts from the shipwreck *Montana* (Figure 3).

At *Stellwagen Bank NMS*, divers conducted archaeological site investigations, documented and investigated the various habitats of the sanctuary, and installed dive moorings (Figure 4). On one particular dive to investigate a gravel and boulder habitat they found what they believed to be the former site of the Helgoland undersea habitat which operated in that area during the 1970s.

At the *ONMS headquarters* location in Silver Spring, MD, divers engaged in a variety of activities in support of scientific efforts at the field sites and worked throughout the year providing opportunities to maintain their proficiency and skills. Of particular note were the efforts to begin training NOAA Administrator Dr. Jane Lubchenco as a NOAA Scientific Diver.

Moving down the coast to the *Monitor NMS*, dives were made to characterize ships which were sunk by German U-Boats in World War II in a project termed "The Battle of the Atlantic Expedition". These efforts were supported from the newest ONMS vessel *SRVx*. In the Southeast region of ONMS, divers at *Gray's Reef NMS* conducted working dives to install permanent invertebrate monitoring plot rods using a surface-powered pneumatic drill. They also conducted dives in support of the ongoing acoustic fish tagging program, deployed and recovered seafloor sampling devices, and supported AAUS partner institution scientific diving investigations.

In the upper region of the *Florida Keys NMS, Key Largo* divers surveyed numerous coral reef sites for the Florida Reef Resilience Program (FRRP) (Figure 5) and conducted surveys for the Deepwater Horizon Natural Resource Damage Assessment (NRDA). Divers also supported coral and seagrass habitat surveys, coral and seagrass damage assessment and restoration and submerged cultural resource protection and surveys. One diver was

Figure 5 - FKNMS Damage Assessment and Restoration (DARP) Diver Bill Goodwin documents coral mortality following a cold water event in the Sanctuary's Upper Region. Photograph by B. Altmeier.

deployed on a temporary duty assignment to Juneau, AK where he assisted biologists from Auke Bay Marine Laboratory in retrieving 75 derelict Dungeness crab pots. In the lower Keys region, in *Key West*, FL, divers were kept busy with mooring buoy maintenance and installation, coral reef monitoring and restoration, grounding damage assessment, enforcement efforts, and lionfish eradication. Into the Gulf of Mexico, the *Flower Gardens Banks NMS* divers were involved in fish and benthic surveys, repetitive photostations, video transects, photostation installation, mooring attachment, hydrocarbon detection device deployment (SPMD's), maintenance and downloading of acoustic receivers, maintenance and downloading of water quality instruments, water sampling, sediment sampling and coral sampling.

In the Western region of ONMS, divers at *Channel Islands NMS* were engaged in annual surveys of shipwrecks in support of regional cultural heritage, support of Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) kelp forest monitoring of living marine resources and habitat with parallel support of MPA monitoring, completion of field work for a David Smith Post Doctoral Fellow in Conservation to perform experimental, work on ecosystem responses to MPAs within CINMS and periodic scheduled maintenance and ship husbandry of the R/V *Shearwater*. Up the coast to *Monterey NMS*, divers conducted operations off of the R/V *Fulmar* in cooperation with PISCO. Research included quantitative characterization of algae, invertebrates, fishes, and habitats. They also supported quarterly maintenance and acquisition of scientific data of West Coast Observatory moorings and characterized the diversity and abundance rockfish populations.

Across the Pacific to Hawaii, the *Papahanaumokuakea Marine National Monument (PMNM)* divers were engaged in mesophotic reef, maritime heritage, and alien invasive species surveys; hull inspections; and the retrieval and deployment of autonomous reef monitoring equipment in partnership with the NOAA Fisheries-PIFSC-Coral Reef Ecosystem Division. Diving accomplished by the *Pacific Islands Region* office included conducting NOAA annual diver skills refresher training for regional NOAA divers as part of NOAA ONMS Safety Week, organizing and conducting mandatory bi-annual diver rescue skills workshops, simulating diver rescues and extractions, and completing NOAA science training and certification for new divers.

At the *Hawaiian Islands Humpback Whale NMS*, a diver supported operations for the Division of Aquatic Resources fish habitat survey.

It was a very successful year for the NOS Technical Diving Team who in partnership with the Cooperative Institute for Ocean Exploration Research and Technology (CIOERT) at the University of North Carolina at Wilmington (UNCW), accomplished deep diving missions in Thunder Bay. These divers characterized maritime heritage resources off the coast of North Carolina, for the Battle of the Atlantic Expedition, looking at ships which were sunk during WWII. They also assisted in Lionfish surveys conducted by NCCOS/NOAA Fisheries divers. Technical divers from ONMS and partner institutions conducted diving in the PMNM and safely made 111 dives in 28 days without any reported accidents or injuries. In cooperation with CIOERT/UNCW, the very first dives by NOAA ONMS divers were made at *Cordell Bank NMS* to characterize the bank's resources, collect specimens and conduct picture and video transects down to a depth of 200 feet.

Office of Oceanic and Atmospheric Research

The mission of the Office of Oceanic and Atmospheric Research (OAR) is to conduct research, develop products, provide scientific understanding and leadership and conduct outreach towards fostering the evolving environmental and economic mission of NOAA. OAR divers, scientists, engineers and technicians provide critical support in the design, testing, deployment, maintenance, and retrieval of oceanographic monitoring and data collection instrumentation. This includes the field testing of various new and novel underwater data collection systems deployed as primary components of major oceanographic programs.

Pacific Marine Environmental Laboratory (PMEL) and Atlantic Oceanographic and Meteorological Laboratory (AOML) Research Diver units provide diver services as a collateral duty to their scientific and administrative assignments.

In 2010, *PMEL, Seattle, WA* supported the deployment of a CO2 monitoring buoy off of Heron Island, Australia, which included the creation of a training curricula for the start of an Australian buoy network; conducted transducer and hull inspections and cleaning of the NOAA Ships *Fairweather* and *Miller Freeman*; recovered gear for PMEL, the NOAA Diving Center, and various NOAA ships from around the Western Regional Center (WRC) pier; relocated oil boom mooring anchors around WRC pier; conducted multiple diving drills and training; collected marine debris from Lake Washington as part of Earth Day cleanup (Figure 6); and participated in NOAA Science Camp educating children on NOAA's mission.

Figure 6 - PMEL divers Capt. Mark Pickett and Noah Lawrence-Slavas collect debris from Lake Washington as part of the WRC Earth Day clean-up. Photo Courtesy of NDC.

AOML, Miami, FL installed an Acoustic Doppler Current Profiler (ADCP), a device that measures how fast water moves across an entire water column, off of Cape Sable, FL; replaced current transponders and ADCPs in three locations along the west coast of Florida and the Florida Keys; replaced and/or maintained coral reef monitoring instrumentation associated with Coral Reef Early Warning Systems (CREWS) in St. Croix, Puerto Rico, and Little Cayman and turbidity monitoring instrumentation in Biscayne Bay, FL; recovered a thermistor array and conducted site surveys for potential ADCP locations off of Hollywood and Boca, FL associated with Florida Area Coastal Environments (FACE); assisted Southeast Fisheries Science Center with Florida Keys reef fish monitoring; and conducted reef fish surveys in cooperation with the University of Miami and the Florida Fish and Wildlife Service.

During FY2010, nine OAR divers conducted 126 dives (Table 1).

Office of Marine and Aviation Operations

The mission of the Office of Marine and Aviation Operations (OMAO) is "to safely and efficiently operate NOAA ships and aircraft, incorporate emerging data acquisition technologies, and provide a specialized professional team responsive to NOAA programs". OMAO divers support this mission by performing maintenance on vessels, collecting scientific data, evaluating new diving equipment and technologies, and training other divers to conduct safe and efficient dive operations in accordance with policies and regulations. In FY 2010, 113 divers conducted 2,117 dives (Table 1). Of these divers, eight are assigned to the NOAA Diving Center, eight are located at the Marine Operations Centers, and the remaining 97 are distributed throughout the NOAA fleet. The mission of the NOAA Diving Program is to train, certify, and

Figure 7 - May 2010 Working Diver Training, Seattle WA. Photo courtesy of NDC.

equip scientists, engineers and technicians to perform a variety of underwater tasks in support of NOAA's mission and to ensure all diving operations are conducted safely, efficiently and economically.

As a part of that mission, the *NOAA Diving Center* (NDC), located at NOAA's Western Regional Center (WRC) in Seattle, WA assists in establishing standards and procedures, and investigating and implementing new diving technologies and techniques. The NDC is responsible for training and certifying NOAA and other governmental agency divers (Figure 7), providing educational outreach, and supporting field operations with equipment, personnel, and expertise. NDC divers conducted 228 dives during the year, at depths ranging from 6 ft-256 ft. The majority of dives involved training NOAA and Public Safety (Police, Fire, and EPA) divers. NDC divers also conducted surface-supplied and chamber dives in support of the NOAA/Undersea & Hyperbaric Medical Society (UHMS) Physician's Training in Diving Medicine course. Other dives included equipment testing (diver recalls, Liquivision dive computers, and RASS alternate configurations) and public outreach via tethered comms diving for NOAA Science Camp. Finally, NDC divers provided field support to NOAA Ship *Hi'ialakai* as support divers and chamber operators (Figure 8) along with supporting five NOS Special Dive Operations with the use of the SOS Hyperlite Hyperbaric Stretcher and Treatment System.

Figure 8 - Divemaster Jim Bostick gives the pre-dive briefing to divers aboard NOAA Ship Hi'ialakai. Photo courtesy of Ray Boland.

Marine Operations Center (MOC) units provided support to the ships and local units including training, ship husbandry, and outreach. *MOC Pacific* divers assisted the NOAA Diving Center with training classes, dive tower preparation, and the annual NOAA Science Camp. Divers from this unit also coordinated the oil boom mooring project at the NOAA Western Regional Center (WRC). During this project, three of the mooring float and anchor assemblies were repositioned and a 150 ft section of boom was inserted into the existing boom. The relocation of these moorings directly impacts the Sand Point piers environmental protection for Lake Washington. These modifications allow for easier access for the ships of the NOAA fleet who utilize the berthing available as well as creating an easier access for small boat traffic entering the boom to moor within the basin.

All vessel-based diving units conducted hull inspections and performed ship husbandry tasks (such as sensor and transducer installation and maintenance) to ensure vessel readiness in-port and while underway. These operations allow the Command, crew, and scientific personnel to make direct observations to determine the condition of the hull, propellers, and other underwater hardware at a fraction of the cost of hired commercial diving operations. Additionally, many ships require divers for mission support including sensor calibration for fisheries vessels and object verification and tide gauge installation/removal for the hydrographic missions.

Fleet Highlights:

Bell M. Shimada – The ship reduced costs and possibly prevented an unscheduled dry docking by using ship divers to replace zincs on the ship rudder. The ship's impressed current cathodic protection (ICCP) system was malfunctioning, causing the zinc anodes to deteriorate at an accelerated rate.

Delaware II – Divers completed dives for the maintenance of the Northeast Fisheries Science Center (NEFSC) Aquarium, contributing to public outreach. *Delaware II* divers also completed an assessment dive for NEFSC and the U.S. Coast Guard (USCG) in relation to the NEFSC breakwater and the USCG front range (marker positions). Unit divers also conducted a hull clearing and pre-drydock inspection for the USCGC TYBEE. Finally, the team completed an assessment dive of wrecks and re-established a dive mooring to aid in preservation of the site.

Kai'imimoana – Divers performed dives to swap sensors during maintenance of five Tropical Atmosphere Ocean (TAO) buoys. This allowed the ship to carry out her mission in support of the TAO Array in the Equatorial Pacific Ocean.

Miller Freeman – The ship's dive team provided the capability to investigate and correct problems with the ship's primary data collection platform, namely the centerboard-mounted acoustic transducers. Several instances were documented where the availability of divers resulted in a quick diagnosis and repair of problems with the acoustic systems, saving valuable project time and the expense of flying a dive team to remote locations. In addition to this troubleshooting, divers were required by several projects to inspect transducers and provide in-water assistance for their calibration. Ship divers also supported the NOAA Western Regional Center (WRC) by assisting in relocating and maintaining oil boom mooring anchors. As a result of their assistance, the WRC facility did not need to have the work done by commercial divers. An additional benefit of having ship's divers do the work was utilization of their experience to position the anchors so that NOAA ships could easily and safely maneuver to and from the pier.

Nancy Foster – This unit provided oversight and support of habitat characterization, fish and invertebrate counts, marine debris surveys, and gear installation and removal (Figure 9). Divers contributed to data collection for research and monitoring that lead to management within and around Gray's Reef and Florida Keys National Marine Sanctuaries, as well as the management of an invasive species off the North Carolina coast. Mission critical sensors were installed, inspected, and removed as necessary. Divers also participated in visual fish observations and photo documentation of surveys in progress.

Figure 9 - Divers from NOAA Ship Nancy Foster work to secure a sensor package to the ship's moon pool flange.

Oscar Elton Sette – Divers provided support for missions of the Pacific Island Fisheries Science Center. Divers conducted hull cleaning and inspections necessary for entry into the Papahanaumokuakea Marine National Monument. Ship's divers also acted as safety and decompression support divers for mixed gas scientific divers during a deep water coral survey. This survey was initially scheduled for cancelation due to a shortage of mixed gas divers. The ship's diving complement was able to provide additional divers and support personnel to meet the minimum requirements for mixed gas dive operations.

Okeanos Explorer – While inport in Bitung, Indonesia, the ship's sea chest became so clogged with debris that the ship lost an adequate supply of cooling water and therefore the ability to operate the main generators. Divers were able to clear the sea chest and restore cooling water flow, enabling the ship to get underway that same day.