

NOAA Diving Program

2012 Annual Report

31 December 2012

**NOAA Diving Center
7600 Sand Point Way NE
Seattle, WA 98115**



Summary

For over 40 years, NOAA divers have safely, efficiently, and cost-effectively collected data and performed tasks underwater in support of NOAA goals and objectives. Fiscal year 2012 was no exception.

FY12 continued to be a year of change and transition for the NOAA Diving Program (NDP). The NDP continued to implement and refine its standards, policies, and procedures to increase safety and ensure compliance with federal regulations. The Diving Unit Safety Assessment (DUSA) program completed 15 inspections of NOAA Diving units during 2012. In March, the NDP hosted a Unit diving Supervisor (UDS) conference that was attended by 34 UDSs from across the country. This conference was used to convey the current state of the NDP to the field supervisors, and served as a forum for these important stakeholders to give input for the future of the NDP. The NOAA Diver Management System was rolled out and replaced the antiquated and malfunctioning diver database. Though it has been plagued with initial development flaws, this system greatly improved the efficiency of electronic dive logging and diver tracking. A project to re-organize and standardize the NDP website was begun in late 2012. This project will result in a more user friendly and up-to-date resource for NOAA divers, other government diving agencies, and the diving community throughout the world. In March of 2012, the NDP authorized the use of the InnerSpace Magalodon closed-circuit rebreather by NOAA Divers. This marks a significant milestone for NOAA Diving as the use of rebreathers could revolutionize sub surface data collection in support of NOAA's mission.

This year, when compared to FY 2011, the Program experienced a 05% (23) decrease in the number of divers, a 13% (1,912)¹ decrease in the number of dives performed, and a 15% (1,315)¹ decrease in the total hours of bottom time logged by NOAA divers. These data do not include dives conducted by reciprocity partners which would have significantly impacted the totals in each category.

Of the total number of dives recorded (12,066), 69% (8,328) were classified as 'scientific,' 14% (1,630) were 'working,' and 28% (3,361) were 'training or proficiency' (see Chart 1). These data represent a 15% decrease in the number of scientific dives, a 17% decrease in working dives, and a 06% decrease in training and proficiency dives when compared to FY11. Should the proposed alternate diving standards, currently under review by OSHA, be approved, the Program may see an increase in the number of working dives performed each year due to the lessening of restrictions on Nitrox breathing mixtures and the ability to conduct working dives without a chamber on site.

From a safety standpoint, a total of two (2) diving-related incidents were recorded via the SECO on-line accident/incident reporting system. Of these, one involved oxygen toxicity, and one involved type 1 decompression sickness. Fortunately, all incidents were managed effectively with divers suffering no permanent signs or symptoms. The incident-free dive rate for FY12 was 99.99%, which was an improvement from FY11 (99.97%).

¹ The new NOAA Diver Management System was released on 10 August 2012. Many of the dives performed between 10 August and 30 September have not yet been recorded due to complications with the new system.

None of the aforementioned diving incidents were the result of missing or faulty diving equipment. Much of the credit for this statistic goes to the maintenance performed on all diver-worn gear issued by the Program's Standardized [Diving] Equipment Program. All 'life-support' components are serviced on an annual basis by certified technicians. This excellent equipment safety record is even more impressive considering over 1,100 pieces of gear are serviced annually.

The training of NOAA divers continues to be one of the hallmarks of the NDP. The three-week 'Working Diver' course continues to set the standard for the training of occupational divers as seen by the continuous requests to attend this training by other federal, state, and local government agencies.

In June of this year, Dave Dinsmore, the Manager of the NDP since 1997, retired from a lifetime of federal service. Dave left behind a legacy of diving excellence and leadership.

Presented in this report are highlights of some significant events and achievements accomplished by NOAA divers during fiscal year 2012.

National Marine Fisheries Service (NMFS)

The National Marine Fisheries Service (NMFS) supports 36 diving units across all regions of the country. As in previous years, the Pacific Islands and Southeast Fisheries Science Centers had the highest tempo of diving activity, although critical projects were completed in all regions. NMFS continued to lead other Line Offices (LOs) in the number of divers (168), the number of dives (6,261) and the amount of bottom time (3,964 hours) (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 under which diving activities were conducted this year. A heightened awareness of, and attention to, safety exemplified by 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 NMFS divers.

Table 1: FY12 Line Office Diving Summary

Line Office	Divers	Dives	Bottom Time (Hours)
NMFS	168	6261	3963.8
NOS	137	4445	2619.85
OMAO	86	1283	672.2
OAR	6	49	30.87
USEC	3	39	27.48
TOTALS	400	12077	7314.2

Administrative task loading on Unit Diving Supervisors (UDSs) continues to increase with this trend likely to persist in FY 2013 as the Dive Unit Safety Assessment (DUSA) program increases its inspection frequency. The NOAA Diving Safety Program completed DUSA inspections at fifteen (15) units in 2012. The lessons learned during these inspections helped improve the safety and accountability of these units. Several NMFS UDSs participated in the Scientific Diver Trainer program for certifying new scientific divers. This will ensure all future locally trained divers have a standardized skill set and level of training. The establishment of a LODO budget by NMFS HQ in FY2010 has allowed units to request and receive upgrades of safety equipment and most requests were met in FY2011 and FY2012. It is hoped the FY2013 budget will allow the completion of the safety upgrades.

The largest number of NMFS 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: pinto abalone,

conch, staghorn and elkhorn coral, hake, lingcod, mutton snapper, red king crab, several species of rockfish, lionfish (invasive on east coast), scallop, sturgeon, several salmon species and several grouper species. Over 20 peer reviewed publications and numerous presentations at national and international scientific meetings were made possible by data collected by NMFS divers.

Near Juneau, AK, divers at the **Auke Bay** diving unit supported two major coral-related projects; the continuation of a growth and survival study on shallow water gorgonians which have been subjected to simulated trawl disturbance and a project on the reproductive ecology of deep-sea red tree corals in glacial fjords. Visiting divers from the Channel Islands NMS, the University of Maine, and the University of Hawaii participated in these projects which also resulted in several published reports were published and peer-reviewed scientific publications. A cooperative research program was initiated with the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game on sockeye salmon spawning habitats in Alaskan lakes. The unit also coordinated dive activities with the Alaska Region (NMFS) to produce habitat assessments used as part of the Section 10/404 permitting process with the U. S. Army Corp of Engineers and UAFWS. Dive support was given to outreach projects designed to educate the public, particularly children, about the oceans and living marine resources. A DUSA inspection of the Auke Bay unit was completed during the fourth quarter of FY 2012.



A NOAA Diver works with a seafloor sensor installed in a patch reef. (Photo Credit – Greg McFall)

Diving activities performed by divers at the **Galveston, TX** unit were focused in the US Caribbean supporting conch, reef fish and coral projects. One project involved tag-and-recapture studies and sonic tracking of conch, another examined fish behavior in and escapement from fish traps, and a third determined productivity of staghorn coral (*Acropora cervicornis*) habitat and impacts from natural and human disturbance. There were cooperative research projects with the University of the Virgin Islands and the St. Thomas Fishermen's Association which resulted in contributions to SERO and CFMC stock assessments and formed the basis for three scientific publications.

The largest unit in the NOAA Diving Program is located in **Honolulu, HI**. NOAA divers in this unit completed numerous projects in 2012. Dive supported Rapid Assessment and Monitoring (RAMP) cruises were completed at the Equatorial Pacific Islands (Howland, Baker and Jarvis Islands), American Samoa, Palmyra Atoll, Kingman Reef, Kwajalien Atoll and the Northwestern Hawaiian Islands. The marine debris removal program removed 49 metric tons of debris in the Northwestern Hawaiian Islands and is increasing monitoring of debris from the Japanese Tsunami. Unit divers cooperated with local governments in Guam and the Northern Marianas Islands, along with the USFWS, on surveys of Apra

Harbor. A new capability was developed in 2012 – hydraulic coral coring, with training provided by university partners and protocols developed for future NOAA operations with this equipment.

Assistance was provided in the training of technical divers for the Papahānaumokuākea National Marine Monument and with the first NOAA training of rebreather divers (two unit divers were also certified on the Megalodon CCR in this class). Data collected from surveys and instruments have been published in a variety of peer reviewed scientific journals and are utilized by local governments to make management decisions. A DUSA inspection of the Honolulu unit was completed during the summer of 2012.

The NMFS diving unit located in **Kodiak, AK** completed a four year study on red king crab habitat use and other aspects of crab behavior utilizing acoustic tags, an array of remote acoustic receivers, and diver observations. A larval settlement study required divers to recover 80 collectors deployed in 4 local bays. In addition, two crab habitat surveys were conducted in remote bays in conjunction with a multi-agency crab enhancement effort. Divers also collected marine organisms for other researchers and the laboratory's interpretive displays which had over 14,000 visitors in 2012. Dive support was provided to the Alaska Department of Fish and Game in recovery of remote acoustic receivers and temperature

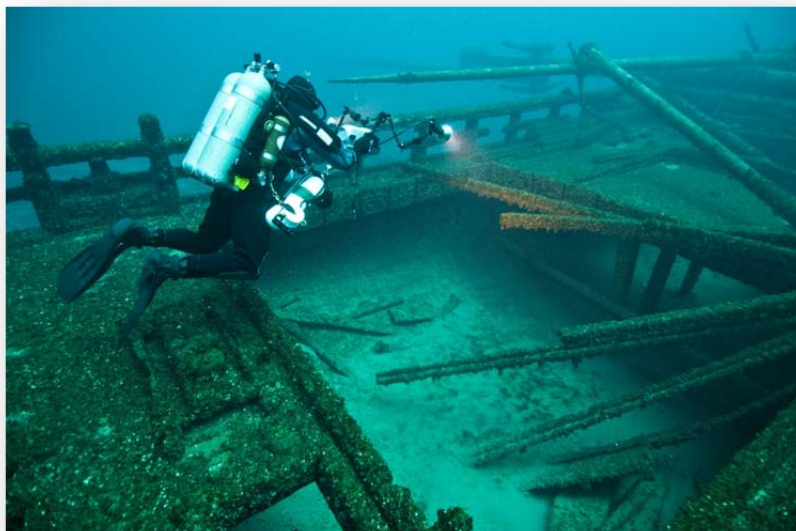


NOAA Divers collecting bathymetric data along a transect line.
(Photo Credit – Hans Van Tillburg)

monitors. Unit dive activities revealed a significant level of ghost fishing by lost crab traps in a local bay considered to be a nursery area for crab stocks. This discovery led to a local non-profit group securing grant funding for a pilot project aimed at removal of lost traps utilizing side scanning sonar and an ROV. The removal of these ghost fishing pots will greatly reduce crab mortality and benefit local crab populations. The Tier One DUSA was completed near the end of FY 2012.

The dive team in **La Jolla, CA** focused on outreach, gear testing and training this year. Divers volunteered at the Birch Aquarium educating the public on kelp forest communities, provided safety divers for an underwater camera testing project and conducted annual checkout dives and rescue training. The unit had its first DUSA Inspection and Evaluation this year.

The dive unit located in **Long Beach** continued several ongoing diving projects, conducted all required training and participated in a DUSA Inspection and Evaluation.



NOAA Diver Doug Kesling collecting video data of the wreck *Audubon* in the Thunder Bay National Marine Sanctuary. (Photo Credit – Tane Casserly)

Approximately 4000 dives were completed in support of seven major projects in the south Florida and U.S. Caribbean areas in 2012. NOAA divers from the **Miami, FL** Unit conducted 1228 of these dives, illustrating the importance of reciprocity diving to the NOAA Diving Program. 93% of unit dives were scientific in nature and 64% utilized nitrox as the breathing gas. The Miami Unit is supported by reciprocity divers from

University of Florida, Florida International University (FIU), Nova Southeastern University, FKNMS, NURC, UNCW, Florida Fish and Wildlife Conservation Commission, National Park Service the the University of Miami (RSMAS), University of Florida, Florida International University (FIU), Nova Southeastern University, University of North Carolina – Wilmington, FKNMS, Florida Fish and Wildlife Conservation Commission, National Park Service and other AAUS organizations. The collection of data by diving is critical to monitor reef fish populations and for coral and habitat assessment. Fishery independent stock assessments for commercially important species, such as the snapper-grouper complex and endangered species research on staghorn and elkhorn coral have proven to be invaluable for management purposes including status assessment, recovery planning, and critical habitat designation. Twelve peer-reviewed scientific publications and numerous technical memos, reports and presentations resulted directly from diving activities. The Miami unit assisted the NDC with development of a new guest diver divelog for the tracking of non-NOAA divers working on NOAA projects.

Diving conducted out of the **Milford, CT** unit is centered on scientific surveys, ship husbandry and maintenance and training. An ongoing bay scallop project was continued in conjunction with the Stonington, CT Shellfish Warden. Visual census dives for nutrient studies were conducted in Great Bay, NH (in cooperation with U.S. EPA Region 1), and eelgrass monitoring dives were made in Gloucester, MA. Samples were also collected for an ongoing dinoflagellate cyst survival experiment. Support dives were made for hull and running gear maintenance on several NOAA vessels, inspection of intake pipes, cage recovery, data logger removal and installation, and the installation and servicing of acoustic arrays in Narragansett, RI. Low visibility required the use of acoustic pingers and diver-held pinger locators to locate gear and certain sampling sites.

Diving activities conducted by the **Panama City** unit in northern Florida focused on scientific support, aquaculture maintenance and training. Four unit divers travelled to Savannah, GA to assist Gray's Reef NMS divers with a reef fish tracking project which involved capture and *in situ* surgical implantation of acoustic transmitters. Gear evaluation was conducted for NDC. Ship husbandry diving has provided significant cost and time savings to Panama City and other SEFSC vessels. Maintenance of aquaculture systems and sea turtle holding pens have also benefited NOAA programs while producing cost savings.

The **Pascagoula, MS** unit continues to develop and evaluate fisheries conservation and utilization gear particularly pertaining to its impacts on threatened and endangered species collected as bycatch in commercial fishing operations. Evaluation of prototype Turtle Excluder Devices for shrimp trawl and fish trawl fisheries remains a major program. The unit expanded their work with bycatch reduction devices for the shrimp trawl fishery and was heavily involved in an international cooperative project evaluating lightweight shrimp trawls for the Mexican shrimp trawl fishery in an effort to reduce dolphin bycatch mortality. This unit conducts some of the most physically demanding dives in the NOAA Diving Program due to the difficulty of working on operating trawls at speeds approaching 3 knots.

The mission of the **Sandy Hook, NJ** dive unit is support of fisheries research projects, maintenance of laboratory research vessels and aquaculture systems and public outreach and education in the local community. However in-water dives were not conducted this year due to retirement from the dive team which left them short-staffed and a lack of research projects requiring dive support. Multiple topside training exercises as well as classroom training activities were conducted and divers gave presentations, on their own time, to local dive clubs and a high school class in the New Jersey area describing their operations, research goals and techniques. These presentations raised awareness and support of the Sandy Hook Laboratory and the NOAA Dive Program.

The northern California unit in **Santa Cruz** completed several significant projects in 2012 related to rockfish. The Monterey rockfish recruitment study monitors the juvenile rockfish population to help predict the number of adults available to the fishery in future years and to determine timing of settlement and overall health of the populations. The UDS has recruited volunteer divers from three different organizations to assist with this project. A rockfish community assessment survey was completed which included enumerating and identifying all habitats, algae, and animals in the transects.



NOAA Diver Paul Chetirkin collecting video data of marine life. (Photo Credit – Greg McFall)

Other projects assessed community changes in central California reefs along the southern border of Monterey Bay and completed a recruitment study for non-Sebastes species in the Monterey area. Collaborations were made with several civilian diving associations (REEF, BAUE, Central California Diving Council), universities (UC Santa Barbara, UC Santa Cruz, Cal State University-Monterey Bay) and governmental organizations (National Marine Sanctuaries, Cal. Dept. Fish and Game). The unit completed a DUSA Inspection and Evaluation this year.



NOAA Diver Tane Casserly diving with the Megalodon closed-circuit rebreather. (Photo Credit – Joseph Hoyt)

The **Santa Rosa** diving unit supports northern California NMFS field offices by documenting existing conditions of riverine and estuarine habitat and by evaluating in-river structures that may negatively affect adult or juvenile salmonids and sturgeon. This includes recording fish habitat and fish behavior data near fish screens via visual observations and video or still photography, and deployment and retrieval of fish monitoring equipment. Projects this year focused on the Sacramento and American Rivers. Significant cost savings result from these operations as NMFS divers assist water users by identifying potential problems with their screens which helps prevent damage to the structures and/or pumps, potentially saving water users thousands of dollars. The unit assisted other government agencies in the deployment and

retrieval of data loggers, flow meters, and other scientific equipment in multi-agency projects. The data gained from these projects are important to NMFS in its mission to protect fisheries habitat. A Tier One DUSA Inspection and Evaluation was completed this year.

Most diving conducted by the **Seattle (Montlake), WA** unit is in support of research either through direct data collection or installation and maintenance of equipment and included fish & habitat surveys, specimen collection, installation, retrieval and replacement of acoustic monitoring equipment, ship inspection, inspection and maintenance of water intake system at the Mukilteo Field Station. Specific projects included analysis of six-gill shark, dogfish, chimerid and jellyfish movement behavior, marine mammal research, impact study of introduced eelgrass, lingcod aquaculture, and invertebrate settlement experiments in the Puget Sound area. Ship husbandry dives were completed in support of the Pacific Hake Acoustic Survey and the Combined Shelf and Slope Trawl Survey. Maintenance of the saltwater intake system at the Mukilteo Field Station supported numerous research projects. Two peer-reviewed scientific publications resulted directly from diving projects. NOAA achieved significant cost savings from unit ship husbandry and submerged instrument maintenance activities. The Seattle (Montlake) unit also completed a Tier One DUSA inspection during FY 2012.

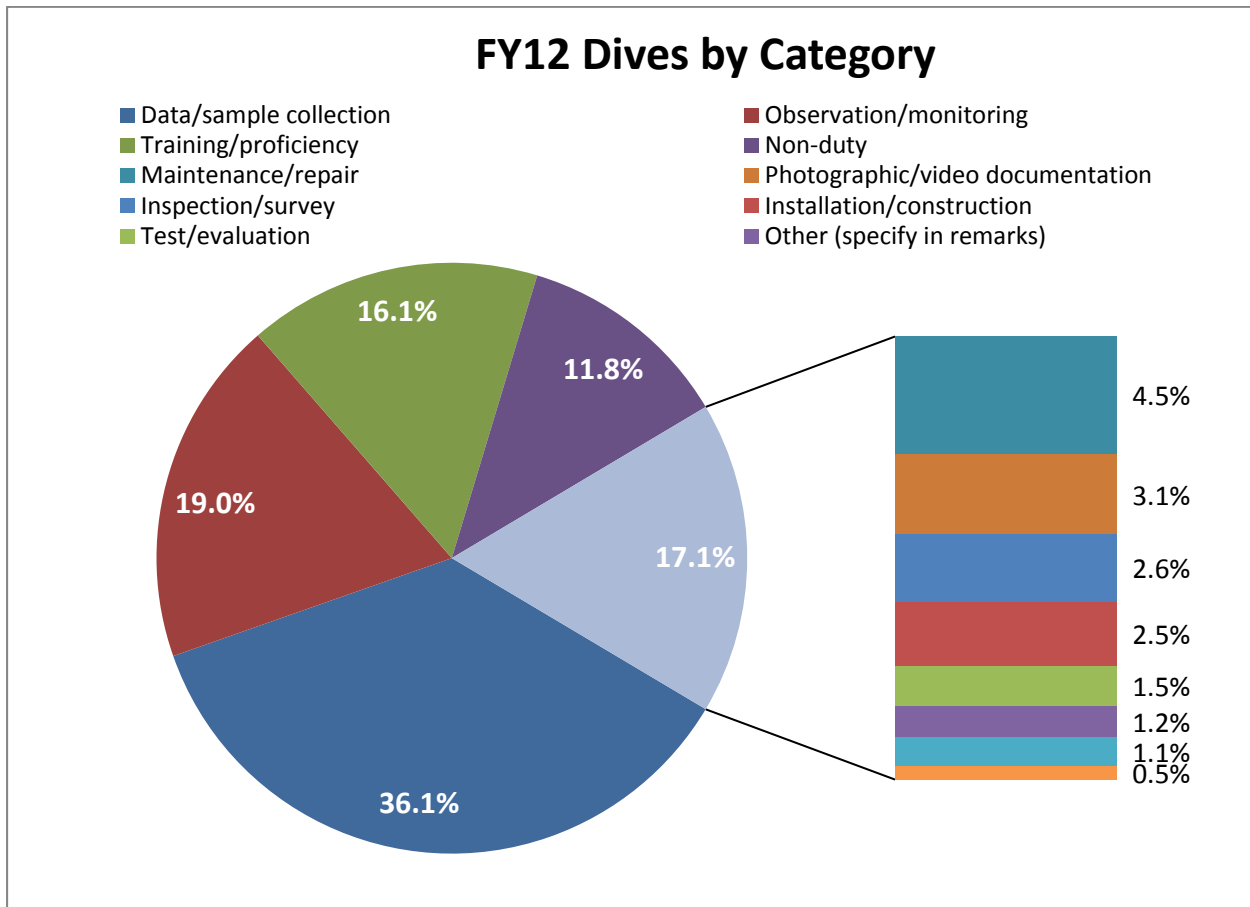


Chart 1 – Fiscal year 2012 dive percentages by category

The NMFS diving unit in **Seattle (Sandpoint), WA** suspended operations in 2012 due to budgetary concerns and a reduction in active diving projects. Some unit divers have joined the NDC unit to assist with training and gear evaluation. The unit may be reconstituted if laboratory needs warrant dive support.

The **Silver Spring, MD** unit has divers from multiple line offices (Fisheries, NOS, OER, OMAO, NESDIS, and the NOAA Office of Communications) and while each has varying missions and tasks, there are consistent themes of observations and monitoring, sampling and photo documentation which require dive support. The unit continued to combine divers with two other Silver Spring-based units for required annual training sessions - consisting of classroom refresher training, underwater checkout skills, physical fitness and swimming tests. Monthly training sessions are jointly scheduled to maximize opportunities for unit divers. A significant project involved deploying reef balls to provide oyster habitat and conducting site surveys for an oyster restoration project in the Magothy River, Chesapeake Bay. A unit diver has provided instruction for public safety divers in underwater search methods.

The main mission of the central Florida NMFS unit, located in **St. Petersburg**, is to conduct emergency response and restoration on diving activities in support of NRDA cases such as ship groundings, oil spills, chemical spills and other catastrophic events under the jurisdiction of the Office of Response and Restoration and the Restoration Center. This year projects included removal of vessel debris from Mona Island, Puerto Rico (with USCG), coral recruitment monitoring at Margara and Sperchios grounding sites, post-restoration monitoring at the LNG-C Matthews grounding site, expansion of *Acropora* coral nurseries in Puerto Rico and the Virgin Islands (over 1500 new colonies planted), instruction of a class of Scientific and Scientific Volunteer divers in Puerto Rico, and inspection and survey of marine debris sites on east coast of Florida. The unit's relationship with the NOAA Restoration Center has afforded the latter the ability to manage volunteer and contracted dive operations to insure compliance with NDP and OSHA standards.



NOAA Diver prepares to descend on a mooring in Stellwagen Banks National Marine Sanctuary. (Photo Credit – Stellwagen Banks National Marine Sanctuary)

National Ocean Service

This year 137 NOAA divers from the National Ocean Service (NOS) conducted 4,445 dives (see Table 1) in support of NOAA's mission. The NOS diving units exist within three different program offices: the Center for Operational Oceanographic Products and Services (CO-OPS), the National Centers for Coastal Ocean Science (NCCOS), and the Office of National Marine Sanctuaries (ONMS). The diving activities that occurred under these program offices are highlighted below.

National Centers for Coastal Ocean Science (NCCOS)

The mission of the National Centers for Coastal Ocean Science (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.

The responsibilities of the **Center for Coastal Fisheries and Habitat Research (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. This year, a collaborative effort between NOAA's CCFHR and CONANP (Comisión

Nacional de Areas Naturales Protegidas, Mexico) has determined that lionfish densities in the MPAs are smaller suggesting that control efforts are not only reducing the number of lionfish but the ecological impact on the fish community. CCFHR divers also continued to identify and assess reef fish spawning aggregations (FSAs) in the Florida Keys focusing on multiple sites in the lower and middle Keys to assess whether reported FSA sites are characterized by similar habitat characteristics and whether fish utilization patterns are similar in the

FSA sites. Scientific divers from this unit also led a collaborative team of researchers from CCFHR, Harbor Branch Oceanographic Institute, and Flower Garden Banks National Marine Sanctuary (FGBNMS) to assess fish and benthic community structure on the Sanctuary's shallow coral caps as part of a comprehensive approach to establish baseline information useful to managers to designate, monitor and evaluate a proposed experimental fishing closure within the sanctuary. Divers from NMFS, CCFHR, Florida Fish and Wildlife Conservation Commission, University of South Florida, Reef Environmental Education Foundation (REEF), and Florida Keys National Marine Sanctuary completed field work utilizing



NOAA diver Rich Pyle filming fish at Midway Atoll. (Office of National Marine Sanctuaries)

active and passive acoustics to assess grouper spawning aggregations in the Tortugas South Ecological Reserve in order to determine whether acoustic data can provide the same quality information as divers in situ. NMFS divers from this unit published results from field research conducted at the recently designated Marine National Monument and National Wildlife Refuge, providing reproductive estimates and spawning site characterization of two keystone labroid fishes, IUCN vulnerable bumphead parrotfish (*Bolbometopon muricatum*) and IUCN endangered Napoleon wrasse (*Cheilinus undulatus*).

The **Center for Coastal Monitoring and Assessment (CCMA)** meets NCCOS's goals through the 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. NCCOS/CCMA divers completed projects in association with several internal and external partners, including but not limited to NOAA's Coral Reef Conservation Program (CRCP), National Marine Sanctuaries Program (NMSP), Southeast Fisheries Science Center (SEFSC), Center for Coastal Fisheries and Habitat Research (CCFHR),



A NOAA Technical Diver runs a tape transect line across a coral reef in the Flower Garden Banks National Marine Sanctuary. (Photo Credit – Greg McFall)

Great Lakes Restoration Initiative, US Environmental Protection Agency, US Department of Agriculture, US Department of the Interior (specifically National Park Service), local and territorial government agencies, non-profit agencies (e.g. The Nature Conservancy) and several universities (e.g. University of Hawaii, University of the Virgin Islands). CCMA mission-related diving during Fiscal Year 2012 was conducted by 10 CCMA divers and included scientific dives to collect ecological data

on US Caribbean and Gulf of Mexico marine fauna associated with shallow water (< 99 fsw) coral reef seascapes (mosaics of coral reefs, seagrasses, sand and mangroves) as well contaminants in the Great Lakes. The information collected from these dives allows resource managers to establish the efficacy of MPA management decisions and determine how best to manage their areas (national parks, marine reserves, etc).

NCCOS's **Center for Sponsored Coastal Ocean Research (CSCOR)** is responsible to provide the highest 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. This year, divers from NCCOS/CSCOR continued work with the Hawaii Coral Reef Initiative Research Program (HCRI) which has

established a strong monitoring and research program to provide information to resource managers, NGOs, local government, and the general public in raising awareness to protect Hawaii's reef resources. They also worked with the National Coral Reef Institute (NCRI) whose mission has been to identify gaps and constraints in scientific knowledge of reef structure and function as they relate to issues of assessment, monitoring, and restoration and to facilitate hypothesis-based scientific research in emerging reef issues and technologies. Additionally, they worked on a project called From Science to Management/Micronesia; a research program that uses results from the Coral Reef Ecosystem Studies Program to expand implement integrated watershed management efforts in Micronesia. Divers also worked with the Caribbean Coral Reef Institute (CCRI) to continue building capability for coral reef research in Puerto Rico and the wider Caribbean.

Office of National Marine Sanctuaries (ONMS)

The Office of National Marine Sanctuaries (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.

In addition to supporting many training activities for the region, **Pacific Island Region** divers completed the "Wreck of the SS Kauai" twelve-day collaborative (NOAA/UH) field survey project on the island of Hawaii. Activities included training UH science-diver students in the basics of underwater archaeological surveying, and then documenting the 100-year old historic steamship wreck site. PIR staff also taught classroom portions of the UNESCO 2012 Underwater Cultural Heritage Foundation course, Port Royal Jamaica; talks with NAS, UNESCO, and Jamaica Coast Guard staff included consideration of the UNESCO course's diving protocols.



NOAA Diver Kelly Gleason inspects an anchor at Midway Atoll. (Photo Credit – Office of National Marine Sanctuaries)

At the **Papahānaumokuākea Marine National Monument (PMNM)**, divers were involved in annual expeditions to include the survey, collection and documentation of fish, benthic habitats, marine alien species, maritime heritage resources and assessments of environmental events. In July-September of 2012, PMNM divers completed three research expeditions on the NOAA R/V Hi'ialakai including investigation of shipwreck sites, ecological surveys and outreach/educational events, fish surveys using 25 & 30 meter transects using Stationary Point Count (SPC) and Belt methods, while benthic surveys were conducted using photoquadrat and line point intercept (LPI) methods. The divers further

conducted inspections of vessel hulls for alien species under PMNM vessel entry permitting requirements and completed surveys and collections of marine alien species from reef, lagoon and harbor locations in the monument.

Across the Pacific, at the **Monterey Bay National Marine Sanctuary (MBNMS)**, divers were only able to conduct a total of 45 research dives (by NOAA and reciprocity divers) due to budget constraints which was down from a high of 496 in 2010. Additionally, MBNMS staff conducted several dozen shore dives, dives off of other (non-NOAA) vessels, and personal dives without incident. MBNMS staff conducted regular monthly dives within Monterey Harbor to assess the growth and distribution of an invasive species of bryozoan. MBNMS also had their first Diving Unit Safety Assessment (DUSA) and only had minor findings to report.

Divers of the **Channel Islands National Marine Sanctuary (CINMS)** also experienced a drastic reduction in dives as compared to past years but were able to conduct an annual survey of shipwrecks in support of the regional cultural heritage coordinator's office, conduct maintenance of West Coast Ocean Observatories Moorings (temperature loggers, ADCP's and VR2's) and effect periodic scheduled maintenance and ship husbandry of the R/V Shearwater. Divers spent many hours in training and preparation for their first DUSA which resulted in a couple of very minor findings.

In the Gulf of Mexico at the **Flower Garden Banks National Marine Sanctuary (FGBNMS)**, divers were able to: conduct dives in support of East and West Flower Garden Banks and Stetson Bank Long Term Monitoring cruises, including water quality cruises; conduct a study site refurbishment cruise at the West FGB; facilitate mooring buoy maintenance; effect fish and benthic baseline surveys at shallow coral caps in coordination with CRCP and NCCOS; participate in coral spawning research cruises and; conduct mapping of the USS Hatteras in conjunction with BOEM, BSEE, Tesla, the State of Texas, and private Foundations.

Down at the **Florida Keys National Marine Sanctuary (FKNMS)**, divers were involved in projects such as coral bleaching and disease surveys, rapid ecological surveys of benthic communities, damage assessment, restoration, and monitoring of coral and seagrass habitat, thermograph deployment and recovery, coral nursery health and maintenance surveys, coral spawning observations and larvae collection, deployment of Autonomous Reef Monitoring Structures (ARMS), maintenance of FKNMS buoy systems and the installation and maintenance of EConcrete settlement plates, as part of an international partnership of NOAA ONMS and Tel Aviv University (Israel). The unit also participated in conjunction with the National Association of Black Scuba Divers (NABS) where they surveyed the ship wreck of the "El Infante," a maritime heritage resource in Key Largo, FKNMS and surveyed and identified the ship wreck known locally as "Mike's Wreck" as the steamship "Hannah M. Bell."

At **Gray's Reef National Marine Sanctuary (GRNMS)**, dives were conducted to maintain and enhance the acoustic fish tagging array to track fine and large scale movements of snapper and grouper. In partnership with NMFS Panama City, Florida FWRI, PMNM and Flower Gardens NMS divers a total of 12 fish were tagged underwater which resulted in zero mortality of targeted species. Dives were conducted from the NOAA Ship Nancy Foster to facilitate research in the newly established Research

Area within the sanctuary boundaries and supported research conducted by NMFS and NCCOS Beaufort and academic partners in areas such as invertebrate colonization and succession, predator-prey interactions, fishery bioacoustics and visual fish censuses. Working dives were conducted to facilitate maintenance and repairs to the site's data buoy and to assist with at-sea teacher workshops.

Further up the coast at **Monitor National Marine Sanctuary (MNMS)**, divers were engaged in the "Battle of the Atlantic" research project which is a documentation of WWII shipwrecks in collaboration with the East Carolina Archaeology Field School. The teams were able to produce photomosaics of the

wreck sites in addition to conducting baseline surveys to produce archaeological site plans. They also conducted documentation of near shore wrecks.



NOAA diver Christian Clark taking benthic photos at Pearl and Hermes (Photo Credit – Office of National Marine Sanctuaries)

Ten divers with the **ONMS Headquarters Office** and **Coral Reef Conservation Program** are stationed in Silver Spring, Maryland. Outside of running local monthly proficiency and training operations in the rejuvenating waters of the Chesapeake Bay, local quarries and pools, these divers plan support and lead dive operations across the country. In 2013, these divers engaged in NOAA operations in the Caribbean, Northwestern Hawaiian Islands, Florida, the Great Lakes, Texas, and New England. The diversity of these missions ranged from benthic characterizations to documenting fish spawning aggregations, supporting NASA training operations to conducting shipwreck surveys. They are a rag-tag crew, but love to get the job done.

At **Stellwagen Bank National Marine Sanctuary (SBNMS)**, divers conducted documentation and monitoring dives on a variety of different

sanctuary habitats and shipwrecks. Anecdotal reports indicated that fishing behavior had markedly changed in the sanctuary due to recent changes in fishery regulations. Dives on certain sanctuary habitats and shipwrecks on Stellwagen Bank noted fewer groundfish and reduced epibenthic invertebrate abundance and habitat complexity. Further study of this issue is warranted and will be conducted in subsequent years. SBNMS divers also partnered with University of Connecticut reciprocity divers to conduct a habitat survey to compare to past surveys and to install a commemorative plaque on the site of the 1975 FISSH project that utilized the Helgoland saturation habitat. The project saturated scientists for several weeks in one of the deepest and coldest science focused saturation diving missions ever undertaken in the US. SBNMS plans to interpret the Helgoland's location and remnant features as

a recreational dive site. Divers installed the commemorative plaque on one of the Danforth anchors used to moor the saturation habitats power and compressor buoy.

In the Great Lakes at **Thunder Bay National Marine Sanctuary (TBNMS)**, divers conducted a “Live Dive Broadcast from the Grecian” which was funded by the Preserve America Initiative and in conjunction with partners from the University of North Carolina’s Coastal Studies Institute and Monitor NMS; the project brought together high school kids from Alpena High School and Hatteras High School in NC who were instructed on mapping and mosaic techniques and who then shared their experiences together during the broadcast and highlighted local maritime heritage resources. They also conducted dives in support of the shipwreck mooring buoy program by aiding in the installation of over 30 buoys within the sanctuary. In partnership with the State of Michigan Department of Environmental Quality, divers conducted scientific research dives in Lake Huron and assisted researchers with the installation of lake trout and whitefish traps and environmental sensors on several shipwreck sites and offshore reefs to aid in fish propagation and spawning.

Center for Operational Oceanographic Products and Services (CO-OPS)

The mission of the **Center for Operational Oceanographic Products and Services (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. CO-OPS provides operationally sound observations and monitoring capabilities coupled with operational Nowcast Forecast modeling.

At the **Pacific Region Office**, CO-OPS divers effected the removal of a short term station in Mare Island, CA following support of hydrographic surveys being conducted in the area. In a cooperative effort between NOAA and Marin County they additionally established a short term station to support tidal datum determination and assess sea level trends. A new PORTS system was installed in Humboldt Bay using an existing NWLON station and four new current stations were established. All of the Alaska, West Coast and Pacific Islands Regions NWLON and PORTS water level stations were kept operational during this reporting period.

Across the continental US at the **Atlantic Region Office**, divers were engaged in cleaning PVC wells and conducting instrumentation and hardware inspections, checking for possible silting/shoaling near or on water level equipment, and removing coral and other marine growth which might otherwise affect the TIDES instrumentation. They also conducted current meter inspections looking at instrument positioning, cable position and effected recovery of current meters. Divers from this branch also completed a mission to accomplish in-water inspections, repairs and cleaning of stations which had previously been “maintained” by an outside contractor; the stations were found to be covered with thick marine growth and took the three divers 3 weeks to complete the 12 stations.

NOS Technical Dive Team

NOS technical divers conduct dives below the typical depths to which most scientific and working divers deploy (down to 300 fsw) and are trained and authorized to utilize decompression diving methods.

At the PNMS, technical dive training was conducted using Tri-mix and decompression gasses in order to increase the capacity of the Mesophotic reef survey team. Additionally, seven Monument divers completed training on the Innerspace Systems Corporation's "Megalodon" closed-circuit rebreather along with a diver from Gray's Reef, NMFS and the NOAA Diving Center. The Monument conducted a twenty-one mesophotic trimix open-circuit cruise and was able to accomplish some proficiency dives using the Megalodon at Midway Atoll.

Divers from Thunder Bay and Monitor NMS also participated in closed-circuit rebreather training along with an additional diver from NDC. In the 2012 Battle of the Atlantic Survey, which occurred off the coast of North Carolina in an area known as the Graveyard of the Atlantic, divers utilized the research vessel SRVX and conducted closed-circuit rebreather dives on WWII era wrecks. Thunder Bay divers joined a multi-agency dive team including representatives from Monitor NMS, Thunder Bay NMS, BOEMRE, National Park Service, East Carolina University, the State of North Carolina, and the University of North Carolina's Coastal Studies Institute.

In the Flower Garden Banks NMS, open circuit decompression divers from NCCOS/NMSF Beaufort joined with a rebreather diver from Gray's Reef to effect a study of the deep (150 fsw) coral areas of the East Flower Garden Banks NMS.



NOAA rebreather divers pose for a group shot at a shipwreck in Thunder Bay National Marine Sanctuary. (Photo Credit – Thunder Bay National Marine Sanctuary)

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. OER 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.

Divers at the Pacific Marine Environmental Laboratory (PMEL) and Atlantic Oceanographic and Meteorological Laboratory (AOML) units provide diving services as collateral duties to their scientific and administrative assignments.

The **Pacific Marine Environmental Laboratory (PMEL)** in Seattle, WA conducts field testing of various underwater mountings, moorings, acoustic releases, sensors, CTD systems, various types of sampling equipment, and profilers as required by PMEL scientists and engineers. A significant milestone was reached in 2012 involving the PICO mooring. The PICO mooring is a smaller, safer, greener, and more cost-effective ocean observation system that has been developed due to the logistical and financial challenges inherent in conventional oceanographic mooring systems and dive operations were necessary to set the baseline of the drop site, as well as confirm the results of each test. The PICO mooring had its first prime mission, as part of the NASA SPURS project, at the end of FY 2012, and although diving is not part of the project anymore, the project would not be where it is without the many dives that took place over the past five years. PMEL divers assisted in search and recovery operations for multiple pieces of scientific equipment and participated in an Earth Day clean-up of Lake Washington. Unit divers also assisted with the transducer removal operations on the NOAA Ship *Miller Freeman*. The PMEL unit completed a Tier One DUSA inspection during FY 2012.

The mission of the dive unit at the **Atlantic Oceanographic and Meteorological Laboratory (AOML)** in Miami, FL is to assist scientists and engineers in the design, testing, deployment, maintenance, and retrieval of oceanographic monitoring and data collection instrumentation and to collect biological and physical oceanographic data through direct diver observation and measurement. Two projects accounted for nearly all dives by the unit this year; the CHAMP project in La Parguera, Puerto Rico and Salt River, St. Croix and the FACE project in south Florida. The CHAMP project entailed replacement of worn equipment on instrumented dynamic pylons while the FACE project involved the replacement of bottom-mounted ADCPs in Hollywood, FL and the removal of side-facing ADCPs in Port Everglades, FL. Both projects resulted in considerable cost savings to NOAA through the use of in-house divers and equipment. Two peer reviewed scientific publications resulted directly from diving activities conducted by the unit in FY 2012. The AOML UDS retired in 2011, the unit is currently being served by the Fisheries-Miami UDS. The AOML unit participated with the Miami – Fisheries unit and the U.S. Coast Guard in a rescue drill involving the recovery of a diver with a simulated injury from the bottom of Biscayne Bay to a NOAA vessel for stabilization followed by air evacuation by a USCG helicopter.

Office of Marine and Aviation Operations

The **NOAA Diving Center (NDC)**, located 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 divers, providing educational outreach, and supporting field operations with equipment, personnel, and expertise. The majority of dives conducted by NDC divers involved training NOAA and other government agency (EPA, NAVY civilian) divers. NDC divers also conducted



NOAA Diver LT Lecia Salerno requires special rigging to counteract the strong currents while recovering sensors from a TAO buoy. (Photo Credit – Verne Murakami)

chamber dives in support of the NOAA/UHMS Physician's Training in Diving Medicine course. Other dives included equipment testing (a heads-up display facemask, an alternate BCD model that could be used for tethered communications integration) and public outreach via tethered comms diving for NOAA Science Camp. NDC divers provided field support to NOAA Ship *Hi'ialakai* as support divers and chamber operators along with supporting five NOS Special Dive Operations with the use of the SOS Hyperlite Hyperbaric Stretcher and Treatment System. They recovered five (5) transducers from the centerboard of the NOAA Ship *Miller Freeman*. Finally, while preparing for a dive operation in late 2012, NDC divers noticed an actively sinking vessel belonging to the Western Regional Center's facilities staff. They were able to use lift bags and rigging to right and de-water the sinking vessel.

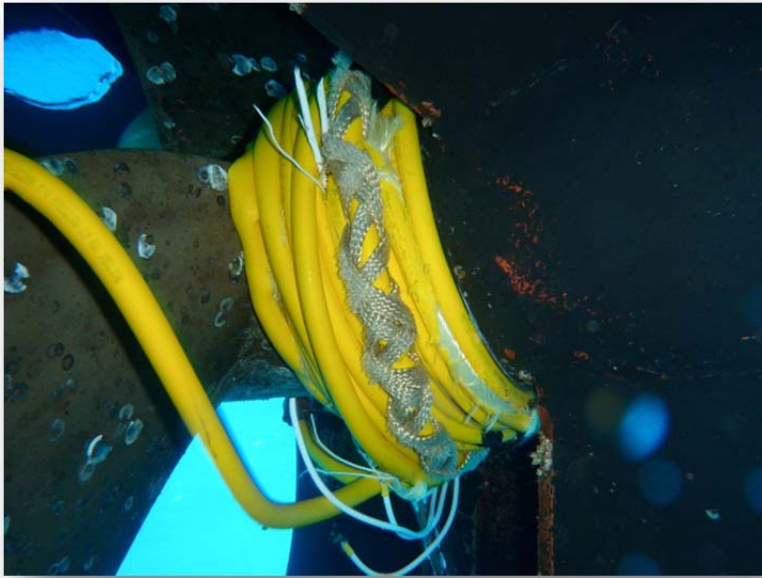
Fleet Highlights:

All ship-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, object verification, and tide gauge installation/removal for the hydrographic vessels.



NOAA Divers stationed aboard the NOAA Ship Henry Bigelow work to remove a lobster trap from the ship's propeller. (Photo Credit – Jim Burkitt)

Divers aboard the **NOAA Ship *Okeanos Explorer*** were able to replace the ship's Ultra-Short Baseline (USBL) transducer cable, thereby averting the need for the ship to be placed into emergency drydock. The *Okeanos Explorer* crew noticed a slight oil sheen that appeared to be originating from the ship under the waterline. Over the course of multiple dives under the ship, divers were able to isolate the source of the oil leak and facilitated an efficient cessation of the leak. While operating 200 nautical miles northwest of the Galapagos Islands, the ship's fishing gear became entangled in the ship's running gear. Ship divers were deployed and able to clear the entangled gear saving mission time and avoiding costly offshore tug costs in international waters.



NOAA Divers aboard *Nancy Foster* were able to free the ship's propeller from a ROV umbilical entanglement, effectively saving the government over \$1,000,000 in equipment loss and marine towing services. (Photo Credit – LT Joshua Slater)

(7) Sea Surface Temperature/Conductivity (SSC) sensors from TAO buoys during 2012. These SSC sensors provide valuable and comprehensive data to the public. This data is only available after divers recover the sensors once every 12 months. Divers aboard *Ka'imimoana* also conducted an emergency dive while underway in June to remove line that had become entangled in the ship's running gear.

Divers aboard the **NOAA Ship *Nancy Foster*** were able to remove the ship's Reson 7125 multi-beam sonar system and re-install it following repairs. During an ROV cruise in September, the ROV umbilical became entangled in the ship's z-drive, rendering *Nancy Foster* dead in the water. The ship's divers were deployed, and were able to clear the entangled umbilical. As a result, the ship was able to continue tracking, and ultimately recover, the missing \$1,000,000+ ROV.

This year, divers aboard the **NOAA Ship *Oregon II*** conducted an emergency dive while underway in to remove line that had become entangled in the ship's running gear. *Oregon II* also sent their divers to tethered communications training, effectively reducing the number of personnel required to conduct diving operations.

While underway, a lobster trap line became entangled in the **NOAA Ship *Henry Bigelow's*** propeller. The ship's divers were able to remove the fishing gear from ship's propeller allowing the ship to successfully complete the cruise.

Dives conducted in FY 2012 by divers stationed aboard the **NOAA Ship *Ka'imimoana*** allowed the ship to carry out her mission in support of the TAO Array in the Equatorial Pacific Ocean by ensuring the safe operation of the ship.

NOAA divers recovered seven

The **NOAA Ship *Oscar Elton Sette*** operates within the borders of the Papahānaumokuākea Marine National Monument. As a condition of attaining the necessary permit to operate there, the ship's hull must be inspected and cleaned on a regular basis by divers. The NOAA divers aboard *Oscar Elton Sette* provide a cost effective alternative to hiring commercial divers to perform this required task.



NOAA Divers stationed aboard the NOAA Ship *Rainier* work to install a tide gauge. (Photo Credit – Mike Gonsalves)

three out of its four bolts. The divers were able to remove the line and the cutter and continue the mission. Once in port, the divers were able to re-install the refurbished line cutter.

Divers aboard the **NOAA Ship *Rainier*** are essential to the hydrographic mission of the ship. Tertiary tide gauges are an essential part of *Rainier's* hydrographic survey instrumentation. Data from these gauges correct depths measured by *Rainier* and her launches to the chart datum (Mean Lower Low Water). Divers install and maintain the underwater portions of these gauges. Environmental restrictions, such as kelp and wave action, keep sonar or lead lines from determining depth in some locations. Submerged features such as piles may also fall below the resolution of *Rainier's* sonar systems. Without divers, accurate depth measurement would be impossible. Wreck dives also provide vital information to hydrographers, such as identification, position, orientation, and condition of a wreck. This additional data is crucial for the safe navigation of all vessels transiting the area as well as the gear deployment of fishing vessels.

Divers aboard the **NOAA Ship *Pisces*** were able to quickly and inexpensively respond to a number of potentially critical situations this year. The ship's divers were able to perform a reconnaissance dive prior to the recovery on an adrift buoy belonging to the National Data Buoy Center. This dive provided the ship's command with valuable information regarding the state of the buoy's still-attached mooring. While conducting an emergency dive to clear entangled line from the ship's running gear in Cape Cod Bay, it was noted that a line cutter on the propulsion shaft was missing