# NOAA DIVING PROGRAM

# 2015 Annual Report

Cover photo: NOAA Diver Kelly Gleason eradicating crown-of-thorns sea stars at the National Marine Sanctuary of American Samoa.
Greg McFall, NOAA

# NOAA DIVING PROGRAM

> “The NOAA Diving Program establishes standards and implements procedures for conducting safe diving.”

The NOAA Diving Program, or NDP, is administered by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), and is headquartered at the NOAA Diving Center in Seattle, Washington. Its mission is to train, certify and equip scientists, engineers, and technicians, while promoting innovation of effective diving technologies, and safely performing underwater operations.

With over 360 divers, NOAA has the largest complement of divers of any civilian federal agency. The NOAA Diving Program establishes standards and safety procedures for conducting various types of diving in support of NOAA’s mission.

The NOAA Diving Program’s vision for the future is to lead the nation in the advancement of diving safety, education, training, innovation and execution of underwater operations in support of science, service and stewardship.

Black sea bass on sparsely colonized live bottom. Greg McFall, NOAA

PMNM divers during rebreather training, 2014.
Leon Scamahorn/Innerspace

# NO DIVING

## NMFS

Auke Bay, AK
Galveston, TX
Honolulu, HI
Kodiak, AK
La Jolla, CA
Long beach, CA
Miami, FL
Milford, CT
Panama City, FL
Pascagoula, MS
Sandy Hook, NJ
Santa Cruz, CA
Santa Rosa, CA
Seattle, WA
Silver Spring, MD
St. Petersburg, FL

## NOS

Beaufort, NC
Chesapeake, VA
Honolulu, HI
Seattle, WA
Silver Spring, MD

Channel Islands NMS
Cordell Bank NMS
Florida Keys NMS
Flower Garden Banks NMS
Gray's Reef NMS
Monitor NMS
Monterey Bay NMS
NMS of American Samoa
Pacific Island Region
Papahānaumokuākea MNM
Stellwagen Bank NMS
Thunder Bay NMS

# A A UNITS

## OMAO

Seattle, WA

NOAA Ship *Bell M. Simada*
NOAA Ship *Fairweather*
NOAA Ship *Ferdinand Hassler*
NOAA Ship *Gordon Gunter*
NOAA Ship *Henry B. Bigelow*
NOAA Ship *Hi'ialakai*
NOAA Ship *Nancy Foster*
NOAA Ship *Okeanos Explorer*
NOAA Ship *Oregon II*
NOAA Ship *Oscar Dyson*
NOAA Ship *Oscar Elton Sette*
NOAA Ship *Pisces*
NOAA Ship *Rainier*
NOAA Ship *Reuben Lasker*
NOAA Ship *Ronald H. Brown*

## OAR

Miami, FL

# PROGRAM OVERVIEW

Greg McFall
NDP Manager

# 2015

## From the Program perspective, the past year was highly productive and we've accomplished some major milestones along the way; here are a few of the highlights:

**Safety**

We had an incredible year in 2014 with only one reportable incident that, fortunately, resulted in a favorable outcome.

During a swimming test for a group of Scientific Diver candidates, one of the participants had a heart attack while in the pool. Recognizing that something was wrong, another participant brought the stricken candidate to the side of the pool where he was quickly removed from the water; the victim was not breathing and a pulse could not be detected. NOAA Divers Roger Mays, Joe Hoyt and Lauren Heesemann were topside and immediately went into action applying an AED and putting the patient on $O_2$ within one minute of extraction. The AED indicated that shock was advised and after delivery of the shock the patient resumed breathing and was transported to the nearest medical facility for evaluation and treatment. The data card in the AED showed that the victim's heart was in fibrillation and clearly shows the resumption of normal sinus rhythm after the shock was delivered. After several days in the hospital, the patient was released and allowed to resume normal activities. Were it not for the fact that the equipment was onsite, available and that the divers were well trained in its use, the outcome would not have been this positive. The actions taken by the NOAA divers during this incident demonstrated unequivocally the reasons for our training standards and the current requirements to maintain high levels of proficiency.

Besides this incident, which could not have been prevented by any action on our part, I credit the fact that we had no other incidents in the field to the training that we provide, the proficiency we maintain, and to the diligence of our Unit Diving Supervisors (UDSs), Divemasters,

> “The NDP’s request for alternate standards has finally been approved by OSHA ...”

and Divers in the field. Well done and keep up the great work into the coming years!

**OSHA Alternate Standards**

The NDP’s request for alternate standards has finally been approved by OSHA, however, they currently only apply to NOAA’s federal employees. Therefore, until we can get a variance (or other means of coverage) in place to include all our contract employees we will hold off implementing the changes because it would be difficult to manage the standards for some, while not allowing others to dive by them. Follow up meetings will be scheduled with OSHA and NOAA’s Safety and Environmental Compliance Office in order to reach a resolution on this issue by this summer. The alternate standards, among other things, will:

1. allow our outreach and education divers to dive under the scientific exemption;
2. allow NOAA to use NITROX gas mixtures on no-decompression working dives to a depth of 130 feet without the requirement for a chamber on site; and
3. provide relief from the rule that would otherwise require us to use horse-collar type buoyancy compensators on working dives.

**Additional Diving Medical Officer**

The NOAA Diving Program is excited to announce the addition of a second Diving Medical Officer. This addition will allow us to improve our customer service for diving physicals and diving medicine. LTJG Gary Montgomery comes to NOAA from his previous position as a Physician Assistant (PA) with the Federal Bureau of Prisons (BOP). Prior to becoming a PA and joining the US Public Health Service, LTJG Montgomery served as a Hospital Corpsman in the US Navy for 15 years. During that time he deployed with a Marine Reconnaissance unit where he was the sole medical provider during multiple diving operations (both open and closed circuit). He was also a Master Training Specialist (MTS) and helped develop and teach multiple courses while attached to the Defense Medical Readiness Training Institute. Courses tought included courses in Combat Casualty Care, Pre-Hospital Trauma Life Support (PHTLS), and Medical Management of Chemical, Biological, Radiological, Nuclear and High Yield Explosive. LTJG Montgomery has

Support vessel.
Greg McFall, NOAA

a Bachelor's degree in Health Science and a Master's degree in Physician Assistant Studies, both from The University of Texas Health Science Center, San Antonio, TX. LTJG Montgomery's presence will allow CDR Dulaigh to participate more in field missions and to engage in much needed diving medicine research for NOAA.

**NOAA Diver Training Program**

While the way we dive in NOAA has not changed much over the years, the reasons why we dive have changed. About two thirds of the dives logged for the last few years were scientific in nature. The way we train divers needed to be updated to reflect that. Input received from the NOAA Diving Control and Safety Board (NDCSB) as well as last year's Customer Satisfaction Survey suggested that the training offered by the NDC only satisfied the needs of one third of our divers and that our training should be changed to incorporate more scientific diving activities. The NDCSB also felt that we would attract more scientists to the training courses by implementing these changes. In response to this, our fundamental training course has been updated and is now known as "NOAA Diver" Training. We are still able to produce safe, highly competent, and highly skilled divers. These divers will know how to distinguish between dives that can be conducted under the scientific exemption to OSHA and those which are subject to the commercial working diver regulations. We conducted the first successful NOAA Diver training in September 2014. The training content and skills will continue to be dynamic and we'll incorporate changes as needed.

**Modularized Training**

> "We conducted the first successful NOAA Diver training in September 2014."

In order to save time and money for NOAA's programs and platforms, we have revised our three-week training course to accommodate divers with different levels of experience. A diver candidate with no prior diving experience can now start in the first-week module, while a diver who has been previously certified can join the training in the second-week module. During the third-week module, a previously certified NOAA diver who wants to become proficient in advanced working and scientific activities can join the training without having to participate during the first two weeks of training. This flexibility allows managers to save resources by not having to pay for the full three weeks of lodging and

> "The NOAA Diving Program and Diving Center have increased the level of field support to NOAA Programs ..."

per diem for previously certified divers who wish to dive in support of NOAA's programs and platforms.

**Field Support**

The NOAA Diving Program and Diving Center have increased the level of field support to NOAA programs that request assistance. In 2014, we sent staff out to the NOAA Ship Nancy Foster to support open-circuit science operations for Gray's Reef National Marine Sanctuary and also to help eradicate crown-of-thorns sea stars using closed-circuit rebreathers (CCR) (for longer bottom times) in the National Marine Sanctuary of American Samoa. We also provided CCR support to Thunder Bay National Marine Sanctuary during a mission to document two shipwrecks for the first time. Our staff also provided hyperbaric chamber support for all of the cruises conducted aboard the NOAA Ship Hi'ialakai. In anticipation of future support using closed-circuit rebreathers, four NDC staff members received CCR training in 2014 and will continue to increase their level of training and field support as they gain experience with the systems.

NOAA Diving Center (NDC) personnel during a rebreather training session in Seattle. From left to right: Nick Jeremiah (NDC), Katie Mahaffey (NDC), Leon Scamahorn (Innerspace Systems Corp.), CDR Joel Dulaigh (NDC), and LT Justin Keesee (NDC).
Greg McFall, NOAA

> “At some sites, AAUS reciprocity dives can equal almost four times the number of dives made by NOAA divers.”

**Partnerships**

We had a very successful year in 2014 continuing to build partnerships with other federal agencies and academic institutions. On the federal side, we had very insightful meetings with the U.S. Navy's Experimental Diving Unit (NEDU) and with our civilian counterparts at Naval Sea Systems Command (NAVSEA), both of whom are interested in future partnerships. NEDU is interested in the potential for NOAA to conduct some equipment testing and evaluation, while NAVSEA would like to help us re-convene the Federal Diving Conference. The Bureau of Ocean and Energy Management (BOEM), the National Renewable Energy Lab (Department of Energy), the Environmental Protection Agency, the Army Corps of Engineers and civilian divers from the U.S. Army each have all approached us to discuss the possibility of providing training to them now and into the future.

Much of the diving that NOAA conducts is in partnership with academic reciprocity divers affiliated with the American Academy of Underwater Sciences (AAUS). AAUS dives for NOAA vary wildly. At some sites, AAUS reciprocity dives can equal almost four times the number of dives made by NOAA divers. Much of the work AAUS divers do and the data they collect for our various programs is in direct support of NOAA's mission and mandates. This relationship has existed for many years and the time has come to better engage with their organization and codify the relationship by working more closely with them. To this end, I gave a presentation at the AAUS Annual Symposium on our OSHA Alternate Standards. The NDP is currently considering becoming an Organizational Member of AAUS.

**NDC Renovations**

If you walk into the NOAA Diving Center after April of this year, you will find that it has changed completely. The NOAA Diving Center has outgrown its usable space and we've had to renovate in order to better accommodate the needs of our staff, our training, and our equipment. The renovation will occur in three phases, the first of which started late last year. The plans for Phase 1 are to extend the 2nd floor deck over what was the mezzanine in the main entrance to the Center and take advantage of the open space to create a continuous floor. Doing


The NOAA Diving Center entrance on January 2015. NOAA

this will allow us to create an open-office area on the second floor and increase the size of the training room on the main floor. The remaining two phases will make the Center more updated and habitable and will focus on the implementation of long standing accessibility and building code issues including proper stairwells and an elevator.

**Social Media**

Last year the program began its foray into social media with the creation of a NOAA Diving Program Facebook page. Whether or not you are a personal fan of social media, it does provide an excellent opportunity to highlight the great science that is conducted by our divers and helps keep track of your colleagues' accomplishments across our geographically disparate program. In addition to the internal benefits of communication, it highlights the value of the work we do and serves as a conduit that teachers, students, future employees, and our constituents can use to learn more about the depth and breadth of NOAA diving and the many fascinating programs it supports. We want to showcase the incredible work and science that NOAA conducts and we encourage you to send us your pictures and a short write up of your accomplishments so we can post it for others to appreciate.

https://www.facebook.com/NOAADivingProgram

# BY THE NUMBERS:
## A quick look at NOAA dives in 2014

The majority of dives at NOAA are conducted by the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS) and the Office of Marine and Aviation Operations (OMAO). NMFS continues to lead all other Line Offices in number of divers, dives and bottom time.

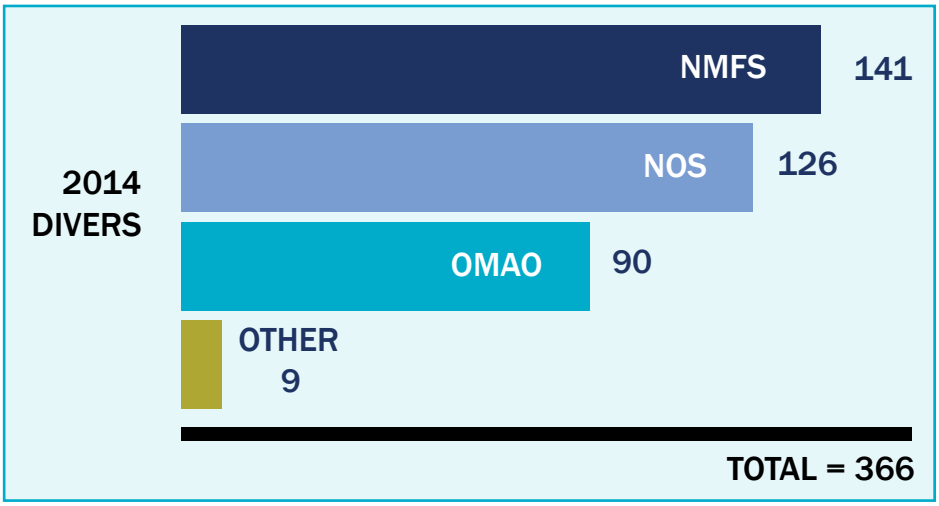



Figure A. Number of divers by Line Office in 2014.

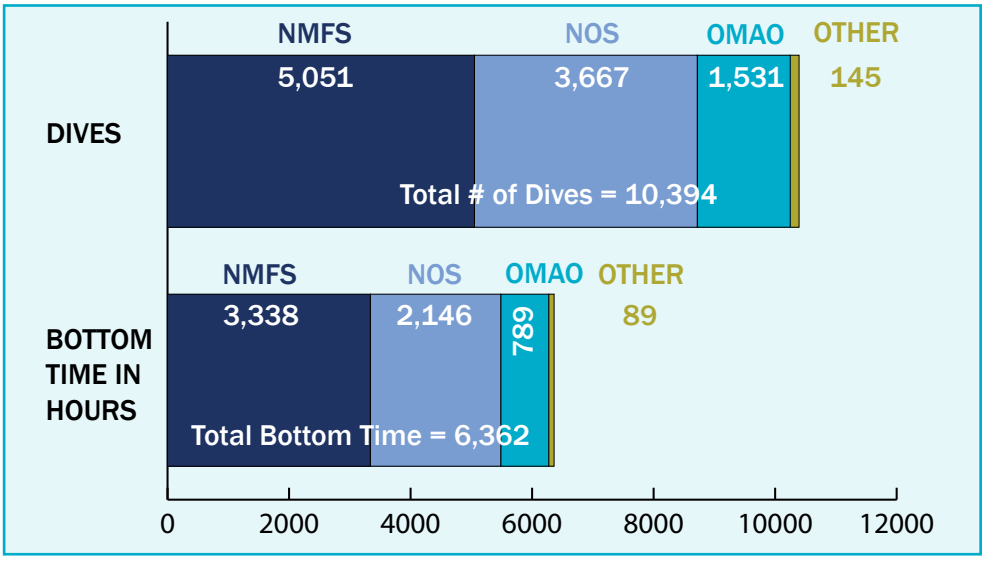



Figure B. Number of divers and bottom time hours by Line Office in 2014.

> "When compared to the last five years...this was the first year with increases in all of our metrics."

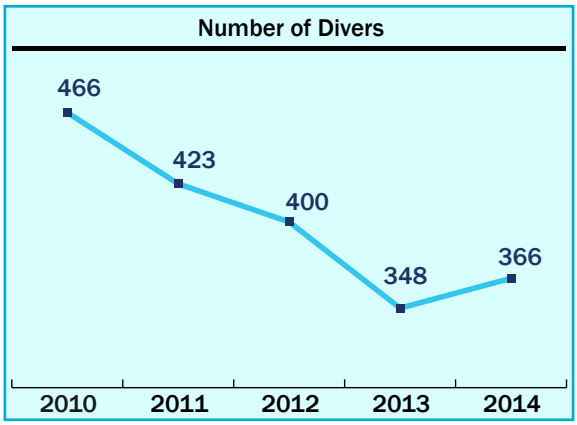



Figure C. Total number of NOAA Divers from 2010 to 2014.

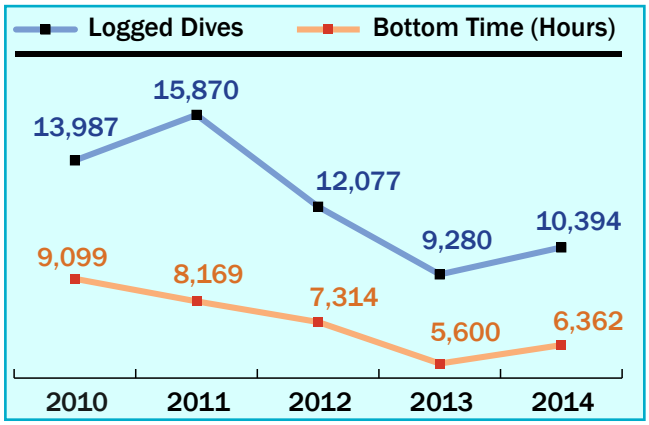



Figure D. Total number of logged dives and bottom time from 2010 to 2014.

The numbers for 2014 show improvement across all areas of the NOAA Diving Program. Compared with 2013, the total number of divers who logged dives in 2014 was up 5.2% to 366 divers. The number of dives logged also rose 12% to 10,394 dives. This resulted in a total bottom time of 6,312 hours which is up 13.6% from last year. These numbers do not include reciprocity divers conducting dives with our programs or from our vessels, and reflect only dives by NOAA employees and volunteers. When compared to the past five years, we are happy to say that this was the first year with increases in all of our metrics, as illustrated in Figures C and D.

Across the program, scientific dives continue to account for two-thirds of our diving activities as shown in Figure E. The Line Office conducting the majority of the OSHA-classified working dives continues to be OMAO. This is attributed to the need to inspect and maintain NOAA Ships.

The NOAA Diving Program continues its exceptional safety record with no significant injuries or accidents involving NOAA Divers.

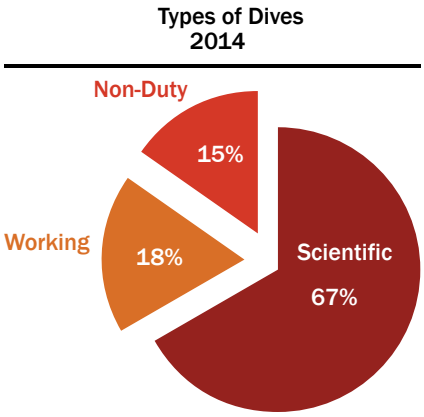



Figure E. Types of dives at NOAA in 2014, as classified by OSHA standards.

# NMFS

Andrew David
Line Office Diving Officer

## National Marine Fisheries Service (NMFS)

There are 16 diving units within the National Marine Fisheries Service (NMFS). Diving units are supported in all regions of the country, however, the highest operational tempo continues to remain in the Pacific Islands and Southeast Fisheries Science Centers.

As has been the case in recent years, Fisheries continued to lead other Line Offices (LOs) in the number of divers, the number of dives, and the amount of bottom time. In 2014 there were 141 Fisheries divers which represents 38.5% of the total number of NOAA divers. There was no change in the number of Fisheries divers from 2013, however, there was a 9.2% increase in the number of dives in 2014. A total of 5051 dives were completed by Fisheries divers, almost half (48.6%) of the 10,394 dives executed in the NOAA Diving Program (NDP). The largest change in diving at NMFS was the amount of bottom time logged. 3337 hours were logged underwater in 2014, a 16.4% increase over 2013 and just over half (52.5%) of total bottom time logged in the Program.

Scientific dives outnumbered working dives nearly four to one. Direct observation and sample collection, habitat restoration, collection of telemetry data, ship husbandry, public outreach and safety/training were some of the types of activities conducted this year. A heightened awareness of, and attention to safety, exemplified by diving skills training, rescue drills, fitness tests and checkout dives for new equipment and techniques were important factors contributing to a year free of any significant diving injuries to Fisheries divers. The use of nitrox as the breathing gas continues at a high rate, with nearly 40% of dives conducted using this mixture. Future use of nitrox is expected to increase as the Program's successful application to OSHA (for a series of Alternate Standards to the Commercial Diving Standards) will allow nitrox to be used on working dives in most instances.

The burden of administrative tasks on Unit Diving Supervisors (UDSs) was decreased slightly this year as the NOAA Diving Control and Safety Board (NDCSB) continued to eliminate redundant requirements and

Goatfish, Midway Atoll. Greg McFall, NOAA

simplified many forms. Discussions at the triennial UDS Conference, held in Seattle in March 2015, allowed NDP leadership at the program and unit levels to discuss new policies and exchange views on issues facing the NOAA Diving Program. 2014 saw the completion of the first round of Diving Unit Safety Assessment (DUSA) inspection. All units have now been inspected by specialists at the NOAA Diving Center (NDC) at least once, with the second round beginning in mid-2014. Deficiencies discovered during the inspections continue to decline in number and severity as units improve maintenance, training, and safety preparations.

The NOAA Diving Program component within Fisheries receives significant support at the highest levels. This includes travel support for diving supervisors and a dedicated budget to replace safety and operational equipment, as well as to acquire new equipment to expand capabilities.

The largest number of Fisheries dives were conducted 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: several species of 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 divers from NOAA Fisheries.

**“Over 20 peer-reviewed publications and numerous presentations at national and international scientific meetings were made possible by data collected by divers from NOAA Fisheries.”**

NOAA Corps Diver LT Lindsay Morrison. David Bryan, RSMAS

## Diving Units by Location

### Auke Bay, AK

This diving unit supported three major coral-related projects: the completion of a growth and survival study on shallow water gorgonians which have been subjected to simulated trawl disturbance, a project on the reproductive ecology of deep-sea red tree corals in glacial fjords, and a pilot project on ocean acidification impacts on corals. Visiting divers from the University of Maine and the University of California Santa Barbara participated in these projects and contributed several reports that were published (or are in review) in peer-reviewed scientific publications. Coordination continued with the U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers on habitat assessments with Section 10/404 permits. Divers also supported outreach projects designed to educate the public, particularly children, about the oceans and living marine resources. Considerable cost savings were achieved by unit divers performing maintenance on laboratory aquaculture facilities.

### Honolulu, HI

This unit is the largest in the NOAA Diving Program, and divers completed numerous projects in 2014. Diver-supported Rapid Assessment and Monitoring (RAMP) cruises were completed in the Main Hawaiian Islands, the Northwestern Hawaiian Islands, Wake Atoll, Kwajalein Atoll, Guam and the Northern Mariana Islands. Remote operations were conducted in East Timor. The marine debris removal program extracted 13.8 metric tons of trash in the Northwestern Hawaiian Islands, some of which originated from the Japanese Tsunami. In Guam and the Northern Mariana Islands, NOAA divers cooperated with local government divers on harbor surveys in preparation for the US military relocation from Okinawa. This unit also provided support divers during technical dive training for the Papahānaumokuākea National Marine Monument. Seven peer-reviewed publications were completed in 2014 based upon data collected by Honolulu divers.

NOAA Diver Bryant Chesney conducting a habitat survey at Huntington Beach Artificial Reef. Adam Obaza, NOAA

**Kodiak, AK**

The Kodiak unit began a multi-year study to evaluate the experimental release of hatchery-reared king crab near Old Harbor on Kodiak Island. Unit divers also participated in the second year of a multi-agency experimental release of king crab designed for stock enhancement. These projects relied upon the highly trained divers of the Kodiak Laboratory to detect and enumerate juvenile king crabs only a few millimeters in size in the complex rocky habitats surrounding the island. Divers collected marine organisms for other researchers and the laboratory's interpretive displays, which had over 14,000 visitors in 2014. Divers also provided support to the Alaska Department of Fish and Game in the recovery of remote temperature monitors.

**La Jolla, CA**

The diving team focused on outreach, gear testing and training this year. Divers volunteered at the Birch Aquarium to educate the public on kelp forest communities, provided safety divers for an underwater camera testing project and conducted annual checkout dives and rescue training. La Jolla divers also provided hull inspection services for the NOAA Ship Bell M. Shimada while waiting for the ship's new crew of divers to become ready for operations.

**Long Beach, CA**

The Long Beach diving unit continued an ongoing project to collect tissue samples from green abalone for genetic analysis, completed the second year of a four year kelp restoration project, and assisted in site selection for an artificial reef near Palos Verdes. Endangered white abalone were monitored at sites near San Diego. A survey of flora and fauna in the eelgrass ecosystem off Catalina Island was conducted in collaboration with divers from the University of Southern California. Eel

> "The marine debris removal program extracted 13.8 metric tons of trash in the Northwestern Hawaiian Islands, some of which originated from the Japanese Tsunami."

Extensive bleaching event in the Florida Keys, 2014.
David Bryan, RSMAS

grass transplants were placed in several sites in Morro Bay as part of a multi-year recovery plan. Non-native species in the fouling community of docks and other over-water structures in southern California were surveyed and a new device to remove non-native algae was tested. Collaborations with the National Park Service, academic partners and Non-Governmental Organizations continued.

**Miami, FL**

Nearly 3000 dives were completed in support of seven major projects in the south Florida and US Caribbean areas in 2014. Reciprocity divers made 53% of these dives, illustrating the importance of reciprocity diving to the NOAA Diving Program. Over 77% of these dives utilized nitrox as the breathing gas. The Miami Unit is supported by reciprocity divers from the University of Miami/Rosenstiel School of Marine and Atmospheric Science (RSMAS), Florida Fish and Wildlife Research Institute (FWRI), National Park Service (NPS) South Florida/Caribbean Network, Dry Tortugas National Park, Biscayne National Park, Nova Southeastern University (NSU), Florida International University (FIU), Pennsylvania State University, University of Buffalo, Florida Department of Environmental Protection, Mote Marine Laboratory, Florida Aquarium, and other American Academy of Underwater Sciences (AAUS) organizations. The collection of underwater data by divers 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 assessments, recovery planning, and critical habitat designation. Sixteen peer-reviewed scientific publications, technical memos, reports and presentations resulted directly from diving activities. David McClellan, one of NOAA's most accomplished divers, retired from the Miami unit at the beginning of 2014. By the time he retired, he had completed over

> "Nearly 3,000 dives were completed in support of seven major projects in the south Florida and US Caribbean areas in 2014."

3700 dives during a diving career which began in 1986. Mr. McClellan was an Advanced Working Diver and a former Unit Diving Supervisor; his contributions will be dearly missed. The increasing reliance upon contractors is becoming a greater concern at the Miami unit as retiring Full Time Employees (FTEs) are leaving the diving program. The institutional knowledge of long-term divers cannot be over-valued. While contracted divers can learn the required skills, the reduced job security and frequent job changes in this population may lead to future problems.

**Milford, CT**

This year, diving activities in the northeast centered on scientific surveys, ship husbandry and maintenance and training. An ongoing bay scallop project conducted in conjunction with the Stonington, CT Shellfish Warden was expanded to include surf clams. 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 in some areas required the use of acoustic pingers and diver-held pinger locators to locate gear and certain sampling sites. The Unit Diving Supervisor has been involved with discussions with the US Coast Guard regarding the establishment of a NOAA diving unit at the Coast Guard Academy, and further work toward this goal is planned.

Scallops on the bottom of Little Narrangansett Bay, CT.
Mark Dixon, NOAA

**Panama City, FL**

Diving activities in northern Florida focused on scientific support, aquaculture maintenance and training. Unit divers deployed, maintained and recovered an acoustic array in Crooked Island Sound used to

NMFS

NOAA reciprocity diver (AAUS) measuring a red abalone during a survey off Point Loma, CA.
Adam Obaza, NOAA

monitor the movements of tagged bull sharks in this estuarine nursery. Gear evaluation was conducted for the NOAA Diving Center. Ship husbandry by divers has provided significant cost and time savings to Panama City and other Southeast Fisheries Science Center (SEFSC) vessels. Maintenance of aquaculture systems and sea turtle holding pens have also benefited NOAA programs while producing cost savings.

**Pascagoula, MS**

The Mississippi unit continues to develop and evaluate gear used for fisheries conservation and utilization, 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 its work with bycatch reduction devices for the shrimp trawl fishery and began work on turtle excluding devices for the skimmer trawl fishery. Underwater video footage was collected for the production of an instructional tape on fish barotrauma and the use of fish descender devices. This unit conducts some of the most physically demanding dives in the NOAA Diving Program, diving from operating trawls at speeds approaching three knots.

> "The Pascagoula, MS unit conducts some of the most physically demanding dives in the NOAA Diving Program, diving from operating trawls at speeds approaching three knots."

**Santa Cruz, CA**

This northern California unit completed several significant projects in 2014 related to rockfish. The Monterrey 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. This year's survey revealed an average recruitment for the majority of species, however, halfbanded rockfish had a particularly high recruitment in 2014. The Unit Diving Supervisor (UDS) for this fisheries unit recruited volunteer divers from three different organizations (Reef

NOAA Reciprocity Diver Tracy Ziegler, from the National Park Service (left) and Volunteer Diver Dave Grenda, Dry Tortugas National Park. Jack Javech, NOAA

Environmental Education Foundation (REEF), Bay Area Underwater Explorers (BAUE), and Central California Diving Council) 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. 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. The unit also collaborated with several universities (UC Santa Barbara, UC Santa Cruz, Cal State University-Monterey Bay) and governmental organizations (National Marine Sanctuaries, California Department of Fish and Game).

This unit includes NMFS and National Ocean Service (NOS) divers, and has had a Fisheries UDS for nearly twenty years. With the departure of Tom Laidig as UDS, this trend will be reversed: the new UDS, Steve Lonhart, is a NOS diver from Monterey, CA. Mr. Laidig's tireless efforts on behalf of the NOAA Diving Program are greatly appreciated.

**Santa Rosa, CA**

The Santa Rosa diving unit supports the 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 and juvenile salmonids and sturgeon. This work includes recording fish habitat and fish behavior data near fish screens via actual visual observations, and video or still photography, and deployment and retrieval of fish monitoring equipment. Projects this year again focused on the Sacramento and San Joaquin Rivers. Diving has allowed NMFS

NMFS

> "Diving has allowed NMFS engineers to learn about the performance of fish protection devices first hand, which has contributed to position them as experts in the field of fish screen design in California."

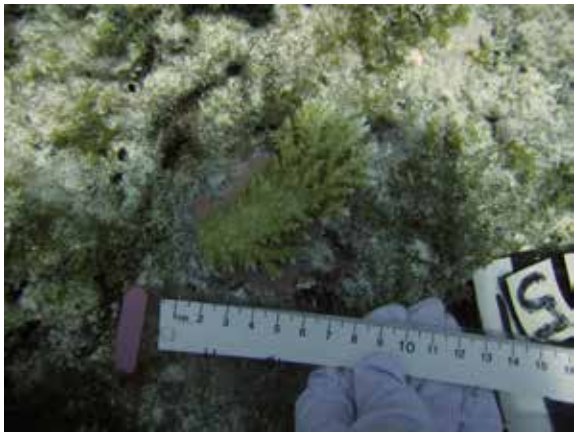
engineers to learn about the performance of fish protection devices first hand, which has contributed to position them as experts in the field of fish screen design in California. NMFS divers potentially save water users thousands of dollars by identifying potential problems with their screens to help prevent damage to structures and/or pumps. In 2014 NMFS divers identified deficiencies in several fish screens that could result in killing endangered or threatened fish species. Two divers from the Santa Rosa unit participated in an eel-grass planting effort in Morro Bay, California, harvesting and planting eel grass for three days.

**Seattle (Montlake), WA**

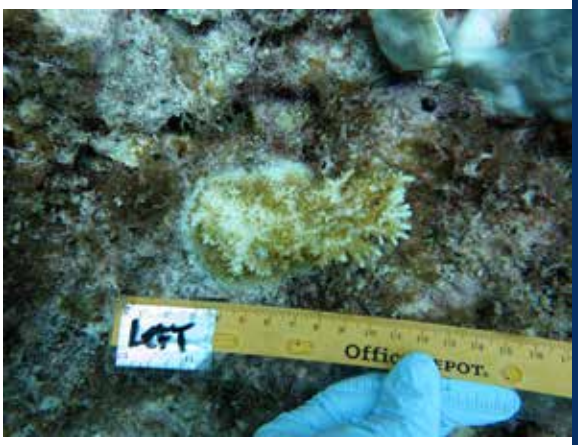
Most of the diving at the Northwest Fisheries Science Center (NWFSC) supports research either through direct data collection or installation and maintenance of equipment. Research this year included: fish and habitat surveys, specimen collection, installation, and retrieval and replacement of acoustic monitoring equipment. Divers also make significant contributions during ship inspections and inspection and maintenance of the water intake system at the Mukilteo Field Station. Specific projects for this year included acoustic tracking of shark, salmon, chimerid, seastar and jellyfish movement behavior, marine mammal research, and an impact study of introduced eelgrass in Puget Sound. 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. NOAA achieved significant cost savings from unit ship husbandry and submerged instrument maintenance activities. A project examining the effects of urbanization on the survival of herring eggs in Puget Sound was conducted jointly with the Washington Department of Fish and Game, University of Washington and the Puget Sound Research Initiative.

**Silver Spring, MD**

This unit has divers from multiple line offices (NMFS, NOS, Office of Exploration and Research (OER), OMAO, NOAA's Satellite and Information Service (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



Elkhorn coral planted in June 2014, Florida Keys. NOAA



Same coral, partially bleached, September 2014. NOAA

photo documentation which requires the support of divers. 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.

**St. Petersburg, FL**

The main mission of the central Florida unit is to conduct emergency response and restoration diving activities to support Natural Resource Damage Assessment (NRDA) cases. These include 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 the relocation of endangered corals adjacent to the Miami ship channel, which were imperiled due to a dredging operation to deepen the channel. Thanks to NOAA Restoration Center's relationship with this unit, they have gained the ability to recruit diving volunteers and contractors to insure compliance with NDP and OSHA standards.

> "This year, projects included the relocation of endangered corals adjacent to the Miami ship channel, which were imperiled due to a dredging operation . . ."

# NOS

Kimberly Roberson
Line Office Diving Officer

**National Ocean Service (NOS)**

The National Ocean Service (NOS) supports 17 diving units in every region of the country, in the Pacific and Atlantic Oceans, and the Great Lakes. In 2014, 126 NOS divers conducted 3,367 dives (not including volunteer and reciprocity divers). NOS divers represented about a third (34%) of the total number of NOAA divers and conducted an equal portion (35.3%) of all NOAA dives. NOS program offices that use divers regularly to support NOAA's mission are: the Center for Operational Products and Services (CO-OPS), the National Center for Coastal Ocean Science (NCCOS), and the Office of National Marine Sanctuaries (ONMS). 2014 saw an addition of 9 new NOS divers, a 7.7% increase from 2013.

These NOS offices have a wide variety of missions: CO-OPS focuses on oceanic instrument installation and maintenance, and NCCOS and ONMS's emphasis is on research, monitoring, resource protection, and outreach and education. NOS divers participated in research missions that included biological monitoring and sampling, invasive species studies, climate change, damage assessment, restoration and monitoring of coral and sea grass habitats, and maritime archaeological surveys. Many of these NOS diving units seek to actively engage the public in NOAA's mission through live broadcasts and documentary films on diving, training of NOAA volunteer divers, and installing mooring buoys to allow safe access to diving sites and to protect habitats and maritime archaeological resources. NOS divers and their respective offices work in collaboration with dozens of partners to accomplish their missions including federal and state agencies, universities, and non-profit organizations.

**"NOS divers represented about a third of the total number of NOAA divers and conducted an equal portion of all NOAA dives."**

Fishes and Gorgonians, Gray's Reef NMS. Greg McFall, NOAA

**Diving Units by Program Office and Location**

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

CO-OPS provides 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. Divers install, maintain and remove underwater components for tidal and current measurement stations. They primarily service the National Water Level Observation Network (NWLON) and the National Current Observation Program (NCOP), including the Physical Oceanographic Real Time Systems (PORTS), hydrography, and special projects.

**Atlantic Operations Branch (AOB), Chesapeake, VA**

AOB dives included installation, inspections, and maintenance of tide gauges and water level observation stations in the Atlantic Ocean, Gulf of Mexico, Caribbean Sea and all 5 Great Lakes. They keep over 100 water-level recording platforms fully operational at all times, providing data for the Department of Commerce (DOC). They successfully and safely completed over 60 dives in 2014. A significant project for this unit was oceanographic instrument maintenance: divers inspected and cleaned PVC wells that contain delicate instruments for observing water levels.

**Pacific Operations Branch (POB), Seattle, WA**

POB divers safely completed 151 dives in 2014. The POB diving unit maintains several sets of instruments that provide data on water levels, tides, sea level, currents and waves. Divers maintained the NWLON system which provides data for publishing predicted tide tables and determining sea level datums. Data from the NWLON stations is used by

> "CO-OPS divers from the Atlantic Operations Branch keep over 100 water-level recording platforms fully operational at all times . . ."

NOAA Diver David McClellan and Reciprocity Diver Leanne Rutten (Nova Southeastern University) collect benthic data on a hardbottom survey for the National Coral Reef Monitoring Project, US Virgin Islands.
Shay Viehman, NOAA

the National Weather Service (NWS) Tsunami Warning Centers, tsunami researchers and modelers, and in long term climate change studies, global sea level research, storm surge warnings, maritime boundary determination, and nautical charting. The PORTS system supports users with real time tide, current, wave, and meteorological conditions. Short term tide stations were installed to support Marin County, CA and the Tulalip tribes of Washington. Repairs and upgrades to the gauge in Pago Bay, Guam were completed. Special projects established tidal datums for other government and civilian agencies including Army Corps of Engineers, US Navy and National Geodetic Survey.

## National Centers for Coastal Ocean Science (NCCOS)

### Headquarters, Silver Spring, MD

Most of this unit's diving is scientific and occurs at partner sites including the US Virgin Islands, Puerto Rico and the Great Lakes. Diving occurs from shore, small boats, and NOAA ships. Diving depths range from 1-110ft, in both fresh and sea water, and in varying conditions from warm, clear Caribbean waters to cool, dark, turbid Great Lakes waters. In 2014, a total of 10 divers from NCCOS, Center for Coastal Monitoring and Assessment (CCMA), Biogeography Branch (BB), and Coastal Ocean Assessments, Status and Trends (COAST) completed 320 dives with a 100% safety record. Two divers maintained their NOAA Divemaster

> “79 divers conducted over 230 dives, collecting data on coral reef fishes and habitats to gauge changing conditions of US coral reef ecosystems.”

status; two maintained their NOAA working diver status, 12 maintained their NOAA scientific diver status, and one new scientific diver joined the team.

This year, NCCOS Silver Spring divers successfully implemented NOAA's Coral Reef Conservation Program's National Coral Reef Monitoring Program throughout Puerto Rico, partnering with University of Puerto Rico, US Fish and Wildlife Service, Puerto Rico Department of Natural and Environmental Resources (DRNA), and University of the Virgin Islands. Seventy nine divers conducted over 230 dives, collecting data on coral reef fishes and habitats to gauge changing conditions of US coral reef ecosystems, which are among the most biologically diverse and economically valuable ecosystems on earth.

Divers continued to support the Great Lakes Mussel Watch Project, a multi-agency effort to assess baseline contaminant conditions throughout the Great Lakes. Highlights of the 2014 efforts include sampling the Niagara River Area of Concern with the support of the US Army Corps of Engineers (ACOE), Buffalo District diving team. The ACOE conducted 22 dives to collect indigenous mussels used in bio-monitoring chemical contaminants. Divers were successful in obtaining both mussels and sediments throughout the study area and visually characterizing, through video, each of the sampling sites. Partners in this project include the US Environmental Protection Agency's Office of Research and Development and New York State's Department of Environmental Conservation.

NOAA Diver Chris Taylor during a safety stop in North Carolina, after conducting a visual fish census. NOAA

**Beaufort, NC**

The Beaufort diving operations support projects focused on biological monitoring and collection of specimens for identification and classification. Work is conducted in close collaboration with the Office of National Marine Sanctuaries (ONMS), specifically Florida Keys, Gray's Reef, Flower Gardens and Monitor National Marine Sanctuaries. Other partners included US Geological Survey (USGS), Florida Fish and Wildlife Conservation Commission, Rosenstiel School of Marine and Atmospheric Science (University of Miami), University of North Carolina Chapel Hill, University of North Carolina Wilmington, Duke University, Georgia Southern University, University of Connecticut,

Todd Kellison, from the NCCOS Beaufort unit, with fish trap and lionfish. Brad Teer, NOAA

Oregon State University and Reef Environmental Education Foundation (REEF).

Divers worked on a variety of projects and in several geographic locations. At Kwajalein Atoll, in the Marshall Islands, divers worked with USGS to ground truth satellite data for habitat classification. Divers also collected data as part of NOAA's National Coral Reef Monitoring Program (NCRMP) in Puerto Rico, participated in the Southeastern Fishery Independent Survey comparing methodologies, identified reef fish spawning aggregations in collaboration with the Florida Fish and Wildlife Conservation Commission (FWC) in the Florida Keys National Marine Sanctuary (FKNMS), surveyed lionfish removal sites in the Florida Keys to assess removal effort effectiveness, and conducted baseline ecological assessments of wind energy areas in collaboration with the Bureau of Ocean Energy Management (BOEM) and the University of North Carolina (UNC).

The Center for Coastal Fisheries and Habitat Research (CCFHR) co-hosted the 5th annual Scientific Diver Symposium at the North Carolina Aquarium. This symposium provides a venue for scientific and educational divers to highlight contributions diving made to their institution's research and education. The diving unit also conducted outreach events and gave numerous presentations to area elementary schools.

## Office of National Marine Sanctuaries (ONMS)

### Headquarters, Silver Spring, MD

Divers from this diving unit conduct operations around the country in support of their own programs as well as other NOS and NOAA Programs. There are over 40 divers in the three units based in Silver Spring, including working divers, science divers, Divemasters and advanced working divers; divers from these units fill a wide array of

NOAA Diver Mitchell Tartt taking a 360˚panorama, Florida Keys NMS.
Catlin Seaview Survey

roles in conducting missions. Most of the operations conducted by Silver Spring divers are off site and collaborative in nature, including maritime heritage operations on the RJ Walker shipwreck, the mussel watch sampling project, coral reef conservation, support of technical diving operations in the Flower Garden Banks National Marine Sanctuary (FGBNMS), and remote area site characterizations in the National Marine Sanctuary of American Samoa (NMSAS).

The diving units partnered with the US Secret Service Training Facility and conducted bi-monthly operations in their training tank. Each session included review of basic and advanced skills as well as completion of a rescue scenario. Because most of the operations are off site, these training sessions prove to be an invaluable opportunity to collaborate on techniques and maintain proficiency in skills. To maintain proficiency in more relevant conditions, divers access a local quarry; this opportunity offers a more instructive example of diving conditions.

This year, ONMS entered into a collaborative partnership with Catlin Seaview Survey to create underwater 360˚ photographs that will be displayed in Google's Street View website. The partnership began with work in NOAA's Florida Keys National Marine Sanctuary. ONMS divers trained on two separate cutting-edge 3D systems and conducted dives at multiple sites throughout the upper keys, surveying over 10 miles of habitat. The team collected imagery to support science, education and management programs at the sanctuary, including characterization of

**“This year, ONMS entered into a collaborative partnership with Catlin Seaview Survey to create 360˚ photographs that will be displayed in Google's Street View website.”**

> “(At CINMS) this year, divers maintained moorings at 13 locations to provide safe access to diving sites.”

the reef tract in Sanctuary Preservation Areas and two ship wrecks, with final 3D products displayed online at a variety of venues, including sanctuary visitor centers and museums.The project is estimated to have been seen 900 million times through international media coverage, national TV network coverage, and extensive social media attention, equaling an estimated $5 million in advertising value. The goal of the collaboration is to continue to collect imagery throughout the sanctuary system, following with coral reefs and then branching into temperate and freshwater ecosystems.

**Channel Islands National Marine Sanctuary (CINMS)**

CINMS diving operations support projects that help the CINMS better understand living marine resources and their ecosystem. Diving operations also produce materials that are used in educational and outreach programs. This year, divers maintained moorings at 13 locations to provide safe access to diving sites. These moorings are critical to both NOAA and recreational diving operations. CINMS and reciprocity divers conducted PISCO (Partnership for Interdisciplinary Studies in Coastal Oceans) benthic visual survey training along 30m transects on the sanctuary's rocky reefs. Divers conducted swath sampling to determine the density of kelps and macroinvertebrates and Uniform Point Contact (UPC) to estimate benthic cover and substrate characteristics which contribute to long term Marine Protected Area (MPA) monitoring. CINMS and partner divers also maintained the West Coast Observatories Moorings that serve as platforms for temperature loggers, Acoustic Doppler Current Profilers (ADCPs), and Vemco VR2 acoustic receivers. This program helps to monitor animal movement and connectivity between sanctuaries, water temperature and movement, and potential larval transport across MPA boundaries.

**Florida Keys National Marine Sanctuary (FKNMS)**

The FKNMS is a world renowned Marine Protected Area and encompasses the only living barrier reef in the United States. Over a million visitors come to the Sanctuary every year. Managing this and protecting the resources of the sanctuary is a constant balance that Sanctuary staff must maintain. With over 20 vessels and 60 staff, diving support by partners and volunteers is still a critical component to the management of the Sanctuary. The primary focus of work by divers is centered on scientific research (both biological and maritime heritage), supporting a mooring buoy program, and underwater ship husbandry.

Installation of new sight line guides along the boundaries of the long-term monitoring site at Flower Garden Banks NMS.
G.P. Schmahl, NOAA

FKNMS provided $175,000 worth of in-kind support to research projects that benefited the site, a high proportion of which was directly related to diving support (small boat operations, tank fills, and providing divers). FKNMS divers completed coral bleaching and disease surveys in support of The Nature Conservancy-managed Florida Reef Resilience Program. Divers helped to maintain the coral nursery and also regularly surveyed the area for signs of health related conditions of corals and sponges. Additionally FKNMS divers assisted in NOAA fisheries research on coral spawning observation and coral larvae collection. Divers completed damage assessment, restoration, and monitoring of coral and seagrass habitat subject to vessel groundings or other human-induced injury. Long term monitoring of these sites is critical to evaluating successes of restoration efforts.

FKNMS continued to collaborate with Nova Southeastern University in support of the "SCREAM" project which completes rapid ecological surveys of benthic communities throughout the FKNMS. Partnerships such as this are vital to the diving support necessary to manage the FKNMS.

In addition, the FKNMS Unit Diving Supervisor (UDS) qualified Cammy Clark, an Associated Press staff reporter for the Miami Herald, as a NOAA Observer Diver. She accompanied the FKNMS two-week scientific expedition to the Dry Tortugas aboard the NOAA vessel Nancy Foster. After the cruise, she posted three headline stories documenting the science conducted during the mission, including personnel interviews, still photos and videos.

**Flower Garden Banks National Marine Sanctuary (FGBNMS)**

Located off the coasts of Texas and Louisiana, these underwater communities rise from the depths of the Gulf of Mexico atop underwater

NOAA Diver John Embesi installs a placozoan collection rack on top of a long-term monitoring photostation rod in the Flower Garden Banks NMS. Marissa Nuttall, NOAA

mountains. FGBNMS currently uses a state of the art diving platform that can support over 15 divers for extended overnight missions to the sanctuary. The work of FGBNMS divers supported research, monitoring, response, management, and education and outreach.

Through long term monitoring cruises, data were collected through repetitive photographic stations, random transects, fish counts, urchin counts, lobster counts, and water quality tests. Long term monitoring projects have contributed to a data series of over 20 years. Divers involved in the annual spawning project also studied, filmed, and photographed coral spawning events. Special projects included coral reef monitoring (using stratified random surveys down to 100ft) in collaboration with ONMS and NCCOS. Divers also installed and maintained mooring buoys in the FGBNMS to provide safe access for boats to diving sites and to protect reef resources. FGBNMS divers conducted sample collection for ciguatera and mercury analysis, removal of invasive species (primarily lionfish; 388 removed), equipment maintenance and installation, and study site refurbishment and pin installation.

In 2014, FGBNMS Unit Diving Supervisor Emma Hickerson was inducted into the Women Divers Hall of Fame for her outstanding contributions to the exploration, understanding, safety and enjoyment of the underwater world. She has logged more than 1250 dives, supervised over 5000 dives during 155 sanctuary research cruises, led research utilizing scuba, ROVs and manned submersibles, and is passionate about studying and protecting the marine environment by interpreting science through multimedia, including photography, videography and art.

LTJG Jared Halonen (front) and Team Ocean Volunteer Randy Rudd with an Autonomous Underwater Vehicle (AUV), Gray's Reef NMS. Alison Scott, NOAA

**Gray's Reef National Marine Sanctuary (GRNMS)**

The primary mission of diving operations at GRNMS is to support research and monitoring activities in and around the sanctuary. A secondary mission for GRNMS divers is to support education and outreach activities. This year, there were several diving operations to support numerous research and monitoring projects, including an ongoing telemetry project designed to track fish movement in the sanctuary, surveys to investigate fish and invertebrates inside and outside the Gray's Reef Research Area, and surveys of algal recruitment. Divers worked to remove invasive lionfish using pole spears. This has shown direct benefit to the ecosystem of the sanctuary, as have investigations into other invasive species in GRNMS. Divers collected data for projects related to $CO_2$ levels in the sanctuary. These data will aid in understanding potential climate change and its impacts to the resources of Gray's Reef. In addition, several university graduate and undergraduate students collected data and samples necessary for the pursuit of their degrees. GRNMS divers also supported diving operations conducted by partner organizations and institutions including Georgia Southern University, the University of Georgia and NOAA's NCCOS. Several scientific reports and publications have resulted from GRNMS' unit dive operations.

GRNMS depends upon the support of volunteer divers certified as NOAA Science Divers as part of the "Team Ocean" program. These divers are critical to the accomplishments of the GRNMS diving program.

**Monitor National Marine Sanctuary (MNMS)**

Due to its location off the coast of North Carolina, diving operations are typically conducted from the MNMS' 85-foot research vessel, SRVx Sand Tiger. MNMS divers, in conjunction with reciprocity divers from the Bureau of Ocean Energy Management (BOEM), University

> "...data (related to $CO_2$ levels in the sanctuary) will aid in understanding potential climate change and its impacts to the resources of Gray's Reef."

NOAA Diver Fred Engle swims over the wreckage of *Caribsea* to reach the area he will be surveying, Monitor NMS. Lauren Heesemann, NOAA

of North Carolina (UNC) Coastal Studies Institute, and East Carolina University conducted the sanctuary's primary diving missions engaging in archaeological surveys and documentation of submerged heritage sites. These consisted predominantly of photo-video documentation, diver deployed instrumentation, measuring and creation of scaled drawings, and observation. These operations also employed a number of diving modalities that included basic non-decompression open circuit scuba and Closed Circuit Rebreather (CCR) decompression diving. This range of diving approaches and partners allowed MNMS to access several sites, including several World War II U-boat casualties associated with the Battle of the Atlantic. MNMS divers also supported archaeological research projects off the coast of New Jersey on the US Coast Survey's *Robert J. Walker* shipwreck and a deep water shipwreck survey using closed circuit rebreathers at the Thunder Bay National Marine Sanctuary. The *Caribsea* shipwreck site documentation project and the *RJ Walker* shipwreck survey both provided coordination and support to avocational groups. These missions allowed MNMS to collect valuable archaeological information, while conducting meaningful education and outreach with primary stakeholder groups.

**Monterey Bay National Marine Sanctuary (MBNMS)**

One of the largest National Marine Sanctuaries, MBNMS stretches from Marin to Cambria Counties in CA. The Sanctuary has a limited diving staff, and operates two vessels that support day and overnight operations. The diving team at MBNMS primarily conducts or participates in operations that characterize or monitor the near shore habitats (primarily kelp forest ecosystems) within and adjacent to MBNMS. A total of 132 research dives (by NOAA and reciprocity divers) were conducted off

> "Digital photos and videos created by the Monterey Bay NMS divers (hosted on www.sanctuarysimon.org) are continually used by the public . . ."

the sanctuary's research vessels. Additionally, MBNMS staff conducted more than 150 dives from shore, from other non-NOAA vessels, and non-duty dives. PISCO (Partnership for Interdisciplinary Studies in Coastal Oceans) subtidal surveys (and complementary MBNMS Big Sur nearshore surveys) have successfully established a baseline and an overall picture of variability of nearshore ecosystem resources and characteristics. A historical record of pre-existing conditions (species densities and diversities of fishes, algae, and invertebrates), and how they change over time, are critical to assess the impact on marine reserves. The MBNMS searched for critically endangered species, such as black abalone, at or near a large landslide along the Big Sur coastline which was enlarged by CalTrans with additional roadside and mountain debris, in an effort to determine if such debris deposition would pose a danger to the abalone's habitat.

Digital photos and videos created by the sanctuary divers (hosted on www.sanctuarysimon.org) are continually used by the public, including many publications, textbooks, and other non-commercial uses. Much of the video is now part of an MBNMS-produced segment on kelp forests, currently showing at the Smithsonian's Sant Ocean Hall exhibit, among numerous other venues (BLUE Ocean Film Festival, various marine life ID resources, magazines, newspapers, etc.)

Monterey Bay NMS diver and Giant kelp. Chad King, NOAA

**National Marine Sanctuary of American Samoa (NMSAS)**

The NMSAS supports the greatest diversity of tropical marine life in the Sanctuary System, including a wide variety of coral and other invertebrates, fishes, turtles, marine mammals and marine plants. The sanctuary protects extensive coral reefs, along with deep water reefs, hydrothermal vent communities, and rare marine archaeological resources. The sanctuary is also the most remote location within the system and the only unit south of the equator. NMSAS diving activities support research and monitoring objectives contained within the NMSAS site management plan. Impacts monitored by the diving team include crown-of-thorn outbreaks, hurricanes, coral bleaching, and anchor damage. NMSAS divers also conduct biological surveys to establish a resource baseline that is essential for understanding changes over time and the protection of Sanctuary resources.

Guests and hosts at the opening of the new scuba diving exhibit at the NMS of American Samoa. Left to right: Dean Hudson (Fletcher Construction), Leilei Peau (Deputy Superintendent of NMSAS), Dan Basta (Director, ONMS), Nainoa Thompson (President of the Polynesian Voyaging Society), Sylvia Earle (American marine biologist), Gene Brighouse (Superintendent of NMSAS), Jean-Michel Cousteau (French explorer). LT Charlene Felkley, NOAA

NMSAS has recently experienced a rapid increase in Crown-of-Thorn sea stars which prey on live coral. Sanctuary divers are actively surveying coral reefs and removing crown-of-thorn sea stars when they are found.

NMSAS divers frequently serve as mentors for young and new divers on the island, sharing safety skills and local knowledge to improve the overall safety standard on the island and in the community. In addition, a new diving exhibit was designed and placed in the National Marine Sanctuary Visitor Center.

**Pacific Islands Region (PIR)**

The PIR regional Unit Diving Supervisor provides training and oversight services in support of NOAA diving operations throughout the region. This primary diving mission includes scientific diver training and certification check out dives and bi-annual rescue and in-water skills training. The PIR regional maritime heritage coordinator also conducts assessment and training dives on submerged cultural resources, adding to the inventory of information collected from NOAA's submerged historic properties and enhancing outreach and education efforts for coastal and marine resources.

PIR collaborated with the University of Hawaii's (UH) Marine Option Program to teach a 10-day Maritime Archaeology Survey Techniques (MAST) course with UH scientific reciprocity divers, conducting non-invasive mapping, sketching, and creating photographic documentation of a WWII-era landing craft wreck site off Barber's Point, Oahu. Diving surveys of heritage resources, like the Landing Ship Medium (LSM) in the main Hawaiian Islands, provides field data that can be used in the development of the management plan for the Hawaiian Islands Humpback Whale National Marine Sanctuary.

PIR helps train divers to work on submerged cultural resources such as this one, a WWII naval aircraft (SB2C-1 Helldiver). Hans Van Tilburg, NOAA.

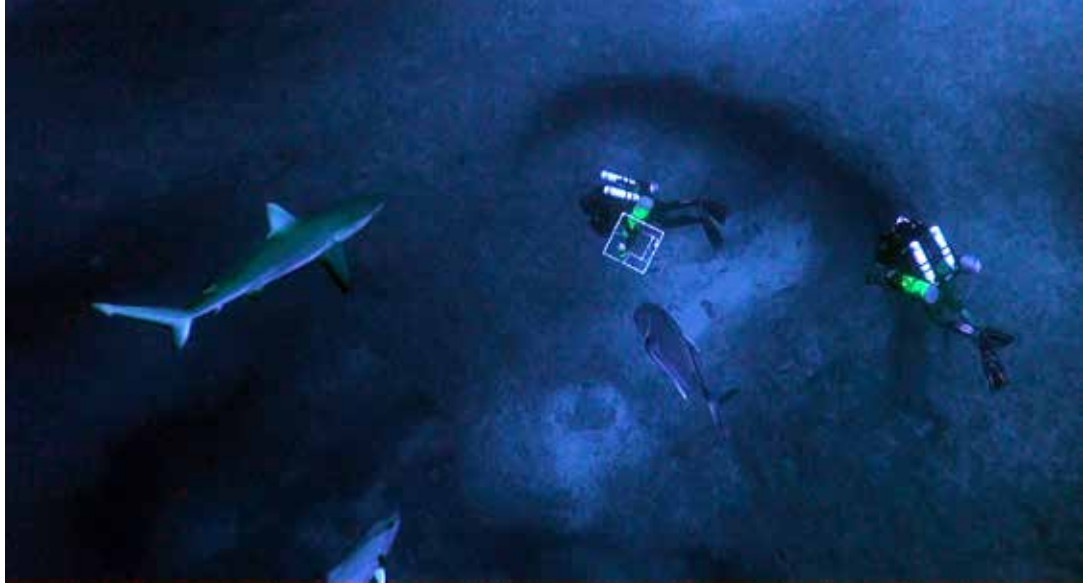
**Papahānaumokuākea Marine National Monument (PMNM)**

The PMNM diving unit conducts characterization, monitoring, and research of natural and maritime heritage resources in the Northwestern Hawaiian Islands (NWHI) in support of management objectives of the Papahānaumokuākea Marine National Monument. Diving operations include both standard scuba and technical diving operations using Closed Circuit Rebreathers (CCR) to characterize both shallow (0-130 ft) and deep reef (up to 280 ft) environments. Diving operations are primarily facilitated by NOAA Ship *Hi'ialakai*, which is supported by a diving chamber and operator. Additional diving operations conducted by PMNM divers include alien species inspections, diving classes and technical proficiency diving operations with internal and partner agencies such as the State of Hawaii, Bishop Museum, University of Hawaii and Hawaii Institute of Marine Biology.

In 2014, PMNM divers were trained in CCR hypoxic trimix by Innerspace Systems Corporation (ISC) and certified to a depth of 330 fsw. Supporting PMNM's mission to characterize the deep water habitats of the Monument, the team used CCR diving technology to survey mesophotic coral ecosystems (deep coral reefs at depths between 130 and 280 feet). These expeditions collected numerous unidentified organisms, including sea cucumbers, sea urchins, algae and fish. PMNM divers also participated in the American Samoa crown-of-thorns eradication efforts. The annual expeditions to PMNM included the survey, collection and documentation of fish, benthic habitats, marine alien species, maritime heritage resources and environmental events. Significant maritime heritage surveys were conducted this year in the PMNM including the discovery and documentation of a P-40K Warhawk (a World War II era aircraft), the documentation of an unidentified shipwreck site at Lisianski Island, and the collection of data of another World War II era aircraft, a Brewster Buffalo, to create a 3D model.

> "NMS of American Samoa divers are actively surveying coral reefs and removing crown-of-thorns sea stars [that prey on live coral] when they are found."

NOS



Conducting research at 250 ft., Papahānaumokuākea MNM.
Richard Pyle, Bishop Museum/NOAA

**Stellwagen Bank National Marine Sanctuary (SBNMS)**

SBNMS conducts dives to characterize, protect and interpret the sanctuary's natural and cultural resources. These surveys provide data and imagery which are also used in materials that help to interpret the sanctuary for the public through exhibits, websites, publications, and social media.

Sanctuary divers conducted documentation and monitoring dives in a variety of different sanctuary habitats and shipwrecks. Divers found that marine fishes were more plentiful at shipwreck sites than noted in previous years. This was likely due to the increased numbers of forage fish noted elsewhere in the sanctuary. SBNMS continued to implement its recreational diving mooring system with the placement of another mooring on the historic shipwreck, *Heroic*. Divers assessed the site for increased diver visitation and marked appropriate locations for the deployment of diving mooring.

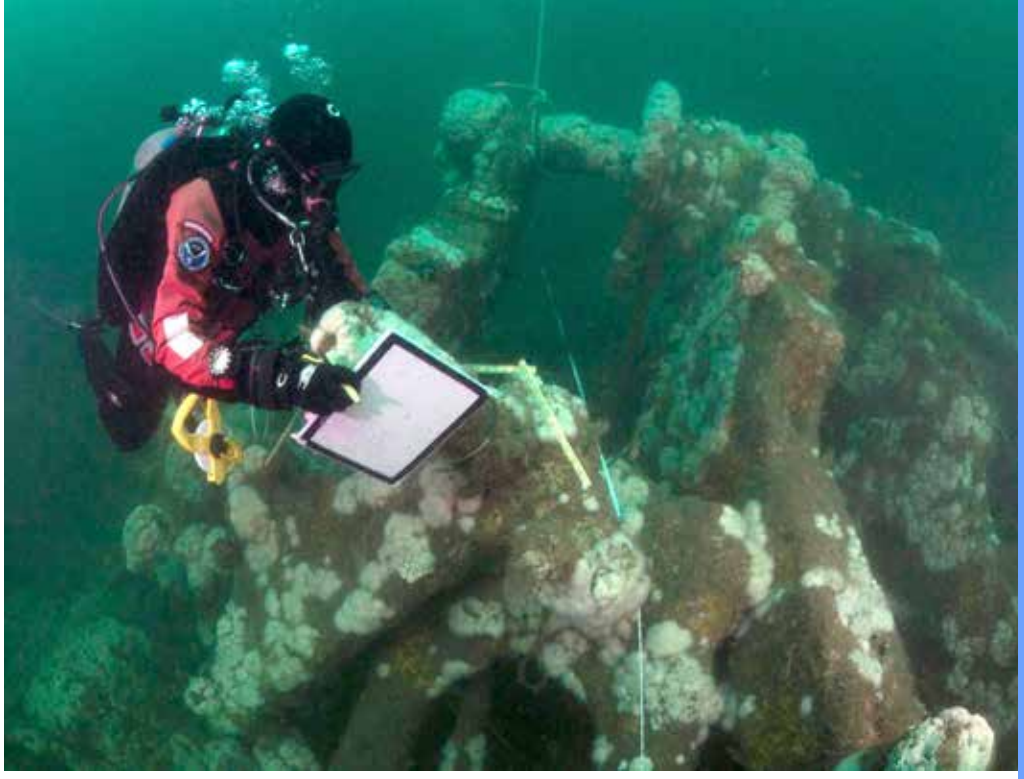
"... The [PMNM] team used CCR diving technology to survey mesophotic coral ecosystems (deep coral reefs at depths between 130 and 280 feet)."

SBNMS divers also supported archaeological research projects off the coast of New Jersey on the US Coast Survey's *Robert J. Walker* shipwreck, and at the Florida Keys National Sanctuary, where they documented the historic shipwreck *Hannah M. Bell*, along with historic navigation markers deployed in the 1850s by the US Coast Survey.

**Thunder Bay National Marine Sanctuary (TBNMS)**

The primary focus of diving operations at TBNMS centered on the documentation and management of submerged cultural resources, education programs, and facilitating the research of partner organizations.

In Thunder Bay, divers completed the annual deployment, maintenance, and retrieval of 30 mooring buoys designed to support local divers and provide safe and efficient access to TBNMS shipwrecks. These buoys



Archaeologist Matthew Lawrence, from Stellwagen Bank NMS, documenting the *RJ Walker* wreck. Joe Hoyt, NOAA

are a critical component of TBNMS' efforts to engage and support the local diving community and tourism in the region. TBNMS divers conducted water quality and invasive species sampling with local and NOAA partners to characterize and monitor the invasive quagga mussel, and water quality within Lake Huron. TBNMS also partnered with the State of Michigan Department of Environmental Quality to conduct scientific dives to install Lake Trout and Whitefish egg traps and environmental sensors on several shipwreck sites and offshore reefs to aid in fish propagation and spawning. Additional projects included continued studies with university partners to characterize the unique sinkhole communities in Lake Huron.

TBNMS divers continued to integrate the use of the Megalodon Closed-Circuit Rebreather (CCR) whenever possible into NOAA scientific diving projects, demonstrating proficiency during their daily operations. TBNMS partnered with divers from the Monitor National Marine Sanctuary and East Carolina University to conduct decompression CCR dives to archaeologically document several shipwrecks in the 130-150 foot range. The data collected at these sites will be used for educational and outreach purposes and as a management tool for the shipwrecks.

Shipwreck of Schooner *EB Allen*, Thunder Bay NMS. Tane Casserley, NOAA

# OMAO

LT Justin Keesee
Deputy Staff Office Diving Officer

**Office of Marine and Aviation Operations (OMAO)**

OMAO diving operations are comprised of the NOAA Diving Center, where the NOAA Diving Program is also headquartered, and 15 ships in the NOAA fleet that have NOAA Commissioned Corps Officers, wage mariners, and survey technicians working as divers. During 2014, all NOAA ships except one, NOAA Ship Thomas Jefferson, had trained divers on board. There were a total of 90 divers working at OMAO in 2014.

**NOAA Ships**

The OMAO mission to support NOAA Line Offices and place trained divers on NOAA Research Vessels provides a unique opportunity for divers assigned to this Staff Office. Some OMAO divers get the privilege of participating in other Line Office sponsored projects as either a researcher or a support diver, but the primary function of OMAO divers is vessel support. The crews of these vessels take great pride in maintaining the condition of their vessel above water, and the unit divers take equal pride in maintaining what is below the water line. Shipboard divers conduct ship's hull inspections where they clean and maintain instruments, service equipment, and verify the condition of the hull, rudder, propeller, and transducers. Members of a diving unit have unique knowledge of the ship's hull, the sensitive instruments that are mounted to it and the proper techniques for maintaining them. Having a diving unit dedicated to the ship allows OMAO to reduce costs by performing routine and emergency inspections and maintenance.

All dives associated with ship husbandry are classified as OSHA working dives which is why OMAO preforms the majority of working dives within the Diving Program. An example of a routine task with significant impact that OMAO divers perform is regularly cleaning marine growth from the ship's hull. Removing this growth minimizes impacts to the ship's

Bigeye at Rapture Reef, French Frigate Shoals. Greg McFall, NOAA

acoustic signature and promotes optimal performance between drydock maintenance periods. Additionally, when working in marine protected areas, removing organisms from the ship's hull prior to entering these fragile ecosystems helps reduce the potential for transporting invasive species. The Hawaii ships working within the Papahānaumokuākea Marine National Monument save many thousands of dollars annually by conducting this task in house.

Below is a list of diving units aboard NOAA Ships.

NOAA Ship *Bell M. Shimada*
NOAA Ship *Fairweather*
NOAA Ship *Ferdinand Hassler*
NOAA Ship *Gordon Gunter*
NOAA Ship *Henry B. Bigelow*
NOAA Ship *Hi'ialakai*
NOAA Ship *Nancy Foster*
NOAA Ship *Okeanos Explorer*
NOAA Ship *Oregon II*
NOAA Ship *Oscar Dyson*
NOAA Ship *Oscar Elton Sette*
NOAA Ship *Pisces*
NOAA Ship *Rainier*
NOAA Ship *Reuben Lasker*
NOAA Ship *Ronald H. Brown*

The units which conducted operations of note this year are the *Hi'ialakai*, *Nancy Foster*, *Okeanos Explorer*, *Oscar Dyson*, *Fairweather*, *Henry B. Bigelow*, and *Ronald H. Brown*.

**"The crews of these vessels take great pride in maintaining the condition of their vessel above water, and the unit divers take equal pride in maintaining what is below the water line."**

NOAA Reciprocity Divers Paul Barbera and Jeff Renchen, working from the NOAA Ship *Nancy Foster,* surgically insert an acoustic tag in a grouper, Florida Keys NMS. Lt. Colin Kliewer, NOAA

**NOAA Ship *Hi'ialakai***

This ship is the most active diving platform within NOAA. This year alone, the *Hi'ialakai* supported 2,982 scuba dives, including technical dives to approximately 280 feet. Most of these dives were conducted by other Line Offices utilizing Days at Sea (DAS) aboard the ship, but the ship's dive locker is very active in both diving activities and diving support. This ship is the only vessel in NOAA's fleet that has a Hyperbaric Chamber onboard and several members of the ship's crew are certified Diving Medical Technicians (DMTs) to support hyperbaric treatments in the event of an emergency. Following a drydock repair, the ship's diving team was able to troubleshoot an unusual noise coming from the ship's bow thruster tunnel. This noise was discovered to be originating from the grates protecting the tunnel which were left loose during recent repairs. The team was also able to assess the damage to the rudder after mooring equipment for a research buoy was fouled during recovery.

Before the ship works in the leeward Hawaiian chain (Marine National Monument) the Sanctuaries group requires a thorough hull cleaning requiring about 40 dives and 3-4 days to complete. If completed by contractors, hull cleanings would cost between $10-15,000 per cleaning. In-house hull cleaning saves $20-30,000 per year.

**NOAA Ship *Nancy Foster***

The *Nancy Foster* is another vessel that supports many of NOAA's diving projects. This year, the ship supported the Gray's Reef National Marine Sanctuary's multi-annual population abundance, diversity, and distribution survey. The ship also supported Mapping of Essential Fish Habitat in the Southeast US to Support Offshore Energy Spatial Planning

> "In-house hull cleaning saves $20,000 to $30,000 per year."

and Ecosystem Management (in collaboration with the University of North Carolina (UNC) and the Bureau of Ocean Energy Management (BOEM), among others) where divers completed surveys to assess fish abundance, community assemblages, benthic invertebrates, and sedimentary characteristics of habitats over hard-bottom seafloor and shipwrecks or artificial reefs identified from sonar imagery. Nancy Foster divers also supported dives at the Florida Keys National Marine Sanctuary to install or service acoustic fish telemetry receivers, and to surgically tag trapped fish in situ with acoustic tags.

Additionally, 36 ship husbandry dives were conducted for hull cleaning, servicing transducers, and to improve diver proficiency levels.

**NOAA Ship *Okeanos Explorer***

This diving unit completed a major repair on the ship's Ultra Short Base Line (USBL) acoustic receiver unit. This was a very technical and complex task, and the divers had less than 24 hours to plan and execute the operation. In two dives they were able to successfully restore the equipment to operational status prior to scheduled departure. Had the ship's divers not been available, this repair likely would have negatively impacted the ship's ability to meet scientific mission requirements and may have delayed sailing. This ship also conducted two blue water hull dives to develop proficiency in this type of diving for divers and the ship's crew. A blue water dive is classified as an open ocean dive where the diver cannot safely reach the bottom because the water depth is too great. The challenge with this type of diving is that it can be very disorienting and you must maintain proper buoyancy and keep a reference to the surface. These proficiency dives were conducted to introduce divers to this environment as it is likely that during their career they will have to perform a ship maintenance dive in similar conditions.

Main propeller from the NOAA Ship *Hi'ialakai* during a maintenance dive.
ENS Steven Solari, NOAA

**NOAA Ship *Oscar Dyson***

Unit divers from the *Oscar Dyson* primarily conduct ship hull inspections and cleanings. The biggest challenge that divers face at this unit is their ability to maintain hull mounted sensors. Divers keep sensors clear of fouling organisms and relay hull inspection results to Midwater Assessment and Conservation Engineering (MACE) program personnel for verification of hull, rudder, propeller, and transducers condition.

NOAA Corps divers using tethered communications for a hull inspection dive, NOAA Ship *Oscar Dyson*.
ENS Benjamin VanDine, NOAA

Regularly cleaning the ship of this marine growth minimizes the ship's acoustic signature.

**NOAA *Ship Fairweather***

This ship's primary diving mission is to install tide gauges in remote areas for vertical control of hydrographic survey data. During the last year, the *Fairweather*'s diving operations consisted of an annual hull inspection, installing two tide gauges in south Kodiak, AK, inspecting the vessel's propellers for damage after they came in contact with a chain, and obtaining least depth information and video footage of an uncharted wreck. When the ship's boiler overboard discharge unexpectedly sprung a leak, divers installed a DC plug and remained in the water in standby mode while a welder cut and patched the pipe. When working in remote locations such as Alaska, having a diving complement becomes invaluable during a situation such as this.

As part of a proficiency dive, the ship's divers performed a reconnaissance dive for the US Coast Guard at the air station in Kodiak, AK. They took video footage of a gangway by the pier to determine if it was in recoverable condition. The gangway ended up being unrecoverable, but they were able to provide its exact location, depth, and condition. Divers also performed many other proficiency dives over the last year to become more familiar with the use of pneumatic tools and line tending techniques, and to volunteer at the Oregon Coast Aquarium.

**NOAA Ship *Henry B. Bigelow***

This year, the diving team aboard the *Bigelow* helped a fellow NOAA ship search for lost equipment. NOAA Ship *Thomas Jefferson* had lost

> "The *Fairweather*'s primary diving mission is to install tide gauges in remote areas for vertical control of hydrographic survey data."

a CTD (an instrument package that includes sensors for measuring the Conductivity, Temperature and Depth of seawater) but, because the ship did not have a diving team, they called upon the *Bigelow* for assistance. At the end, the CTD was not recovered in spite of the great effort expended by the *Bigelow* divers, but this example illustrates why a diving team is important on every ship.

**NOAA Ship *Ronald H. Brown***

The *Ronald Brown* travels great distances on its missions and is usually far removed from a US port, making it vital to have a functioning diving team to perform maintenance and emergency repairs in remote locations. The divers can provide services that would have otherwise required the ship to hire commercial divers, and thus translate into great cost savings. Almost as important is the peace of mind that having the divers at hand provides for the ship's Captain.

This year, the *Ronald Brown*'s diving unit performed its own hull inspections and removed/installed an Acoustic Doppler current Profiler (ADCP) transducer.

A diver from NOAA Ship *Oscar Elton Sette* uses a pneumatic wheel grinder to clean the ship's propellers during a maintenance dive. LT Ryan Wattam, NOAA

OMAO


NDP and NDC personnel joined other NOAA divers on Earth Day to remove trash from Lake Washington. NOAA

### NOAA Diving Program Headquarters (NDP)
**Seattle, WA**

The NOAA Diving Program supports field operations with equipment, personnel and expertise and establishes standards and procedures for NOAA Diving.

This year, The NOAA Ship *Hi'ialakai,* once again, used NOAA Diving Program personnel and equipment to support hyperbaric chamber operations for its remote, arduous, and technical diving operations. Personnel from the NOAA Diving Program also provided technical diving expertise on other Line Office projects, such as the American Samoa Crown-of-Thorns Eradication expedition, the NOAA Ship *Nancy Foster*'s Southeastern Regional Ecosystem Assessment, and the Thunder Bay National Marine Sanctuary's Archeological Assessment.

The Program launched a customer satisfaction survey of all NOAA divers and unit diving supervisors to gauge their level of satisfaction with the field support and training that the NDP and the NOAA Diving Center (NDC) provide. Results indicated that divers were happy with the changes that were made in the Program and at the Center, but also highlighted areas that needed improvement. During 2014, the Program focused its efforts in the areas highlighted by survey respondents, resulting in improvements in the NDC's training approach (to embrace the needs of scientific divers as described in the NDC section below), changes in the diver database to create a more user-friendly interface, and greater communication and sharing of information with the field in the form of a new Facebook page and a newly designed website that will be rolled out in the coming months.

> "The majority of dives conducted by NDC involve instructional training for the NOAA Diver courses."

(Left) Laurie Barber, Financial Specialist, and Acting NDC Manager CAPT Mark Pickett. (Right) Steve Urick, Safety Officer, and NDP Manager Greg McFall. Nick Jeremiah, NOAA

Unfortunately, in January of 2015, the NOAA Diving Program had to say goodbye to Laurie Barber and Steve Urick who together had given 60 years of combined service to the Program. Steve and Laurie were the only remaining plank owners from the Diving Center's move to Seattle in the late 1980's. Anyone who has been a NOAA diver or worked in any way with the Diving Program since that time knows Steve or Laurie and understands how much their contributions will be missed. Thanks to them both for their years of dedication and best wishes to them in their well-earned retirement.

### NOAA Diving Center (NDC)
**Seattle, WA**

The NOAA Diving Center is responsible for training and certifying NOAA divers. The majority of dives conducted by NDC involve instructional training for the NOAA Diver courses. This year, the Center made significant changes to its training courses by introducing a new modular training format. Formerly, the Center offered only a "Working Diver" course taught in a one-size-fits-all format. Now, instead, the Center offers three separate training modules for diving candidates. These modules can accommodate divers with varying needs as well as varying levels of previous diving experience. This year, the Center trained 36 divers and 18 Divemasters using this new approach. Feedback from the students, ships, and science programs has been very positive and the Center plans to continue to develop and improve these new modular courses.

In 2014 the NOAA Diving Center was proud to partner once again with the Undersea and Hyperbaric Medical Society to co-host the Physician's Training in Diving Medicine course. This course has been taught at the Center since the 1970's and is the only course in North America that is credentialed by the Diving Medical Advisory Committee to certify physicians to evaluate and treat commercial divers (Level IId). This year, physicians attended from several university fellowship programs and

NOAA diving students practice line tending.
Greg McFall, NOAA

Diving Medical Officer CMDR Joel Dulaigh with NOAA Science Camp students during a simulated dive in a hyperbaric chamber.
Greg McFall, NOAA

from countries around the globe representing four continents. Courses were taught by nationally recognized Hyperbaric physicians and NOAA representatives past and present, including former NDP managers Dr. Morgan Wells and Dave Dinsmore, Diving Medical Officer CDR Joel Dulaigh, and Center instructors Bill Gordon, Zachary Hileman, and Nick Jeremiah. The Diving Center also hosted a Diving Medical Technician course, increasing the level of initial medical response to NOAA divers in the field.

The NOAA Diving Center participated again this year in the NOAA Science Camp, which is held each summer at the Western Regional Center (WRC) in Seattle, WA. Science Camp strives to take complex scientific concepts and present them in innovative and interesting ways to engage young student campers and demonstrate that science can be fun. This year, the Center hosted about 60 students and engaged them in interactive learning sessions about the diving experience at NOAA. The campers try on diving gear, communicate with divers in the Center's training tank, and conduct simulated dives in the hyperbaric chamber.

The Diving Center celebrated Earth Day this year with a Lake Washington cleanup dive. Seven NOAA divers from the NDC, the Office of Oceanic and Atmospheric Research (OAR), and National Marine Fisheries Services (NMFS) teamed up to remove 75 lbs of trash from the near shore waters around the NOAA Western Regional Center. The underwater cleanup was coordinated with an onshore effort by other NOAA volunteers to improve coastal habitat by removing invasive plant species and replacing them with new native species. The NOAA divers were proud to assist in this effort to improve the NOAA campus and the overall health of the Lake Washington shores.

Anemone. Greg McFall, NOAA

## Office of Oceanic and Atmospheric Research (OAR)

**Miami, FL**

The primary diving mission of the Atlantic Oceanographic and Meteorological Laboratory (AOML) is to support local and international ocean chemistry, ecosystems and physical oceanography research through scientific diving. AOML's collaborations are very extensive; within NOAA these include the Pacific Islands Fisheries Science Center, National Marine Sanctuaries at the Flower Garden Banks, Florida Keys and American Samoa, Southeast Fisheries Science Center, National Centers for Coastal Ocean Science, and the Center for Satellite Applications and Research. Other governmental partners included Florida Fish and Wildlife Commission, US Geological Survey, Department of Environmental Quality (Saipan), and National Park Service. Academic partners included: University of the Virgin Islands, University of Puerto Rico – Mayaguez, Nova Southeastern University, University of Miami (RSMAS), Texas A&M, Florida Technical Institute, University of New Hampshire, Scripps, University of Rhode Island and Columbia University.

Specific projects for this year included site surveys for monitoring equipment installations for the Coral Health and Monitoring Program (CHAMP) / Coral Reef Early Warning System (CREWS), ocean acidification surveys of coral reefs in South Florida, the Caribbean and the Pacific for the Coral Reef Conservation Program (CRCP), deployment of bottom mounted Acoustic Doppler Current Profiler (ADCP) units, assessment and data collection for the Florida Area Coastal Environment (FACE), and instrument deployment, physical oceanographic data collection and instrument maintenance for the Western Boundary Time Series (WBTS). Diving in support of these projects led to six peer-reviewed publications in 2014.

**OAR**

Andrew David
Acting Line Office Diving Officer

"Specific projects for this year included . . . ocean acidification surveys of coral reefs in South Florida, the Caribbean and the Pacific for the Coral Reef Conservation Program (CRCP) . . ."

# Safety Program

Former Diving Safety Officer (DSO) Steve Urick retired from his position on January, 2015. While the Office of Marine and Aviation Operations (OMAO) Safety and Environmental Compliance Division (SECD) hires a new Diving Safety Officer, we are pleased to welcome Roger Mays as the interim Safety Officer.

Roger Mays began his NOAA diving career in 1990 and by 1994 had taken the NDC Working Diver, Divemaster, and Diving Medical Technician classes. Roger served at the Beaufort Lab as Unit Diving Supervisor from 2007 until 2012, when he began assisting the Program with safety inspections, and served as the Acting Safety Officer in 2010 and 2011. Roger was named NOS Employee of the Year in 2009 for "exceptional planning and execution of the small boat and diving program standards and procedures". A licensed mariner, Roger is also a boat operator, a vessel operations coordinator, a small boat program inspector, and a boat program instructor. He completed the National Transportation Safety Board Marine Investigation Training Program in 2014. He is also currently a NOAA Science Diver Instructor.

**Diving Unit Safety Assessment (DUSA) Summary**
Roger Mays, Acting Diving Safety Officer

This year marks the first three-year cycle in the history of the Diving Safety Program, and, as expected, also marks the completion of the first complete cycle of inspections. During this first cycle, 46 units out of a total of 49 diving units in the program conducted operations and were, therefore, eligible for inspection.

Most diving units had low numbers of findings, Many of which were

NOAA Divers practice buddy breathing. Greg McFall, NOAA

administrative and reveal little about how safely units are diving. Results do reveal, however, that:

1. additional training may benefit some units, particularly those with new leadership and/or new divers;
2. communication gaps continue to exist between some unit supervisors and program managers;
3. some UDSs lack sufficient authority to manage their units; and
4. some lockers lack adequate space to properly care for and store gear.

Finally, the findings reveal that some divers, although admittedly very few, simply need to take greater responsibility for their gear and their performance.

**"This year marks the first three-year cycle in the history of the Diving Safety Program, and ... the first complete cycle of inspections."**

NOAA DIVING RESEARCH

# publications

In 2014, the work of NOAA divers contributed directly to the research used in 34 peer-reviewed articles and 17 internal reports or technical memoranda.

## NMFS

### Honolulu, HI


Bruno, J.F., Precht, W.F., Vroom, P.S., & Aronson, R.B. (2014). Coral reef baselines: how much macroalgae is natural? *Marine Pollution Bulletin*. DOI: 10.1016/j.marpolbul.2014.01.010.

Connolly, S.R., MacNeil, M.A., Caley, M.J., Knowlton, N., Cripps, E., Hisano, M., Thibaut, L.M., Bhattacharya, B.D., Benedetti-Cecchi, L., Brainard, R.E., Brandt, A., Bulleri, F., Ellingsen, K.E., Kaiser, S., Kroncke, I., Linse, K., Maggi, E., O'Hara, T.D., Plaisance, L., Poore, G.C.B., Sarkar, S.K., Satpathy, K.K., Schuckel, U., Williams, A., & Wilson, R.S. (2014). Commonness and rarity in the marine biosphere. *Proceedings of the National Academy of Sciences 111:* 8524-8529.

Heenan, A., Ayotte, P., Gray, A., Lino, K., McCoy, K., Zamzow, J., & Williams, I. (2014). Pacific Reef Assessment and Monitoring Program. Data Report: ecological monitoring 2012-2013 - reef fishes and benthic habitats of the main Hawaiian Islands, American Samoa, and Pacific Remote Island Areas. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-003, 112.

Pacific Islands Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. (2014). Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: Pacific Remote Island Areas 2014. Pacific Islands Fisheries Science

Center, PIFSC Data Report, DR-14-007, 2.

Pacific Islands Fisheries Science Center. (2014). Marine debris: removal and assessment at Midway Atoll 2013. Pacific Islands Fisheries Science Center, PIFSC Special Publication, SP-14-001, 6.

Pacific Islands Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. (2014). Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: northern Mariana Archipelago 2014. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-010, 2.

Pacific Islands Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. (2014). Pacific Reef Assessment and Monitoring Program. Fish monitoring brief: southern Mariana Archipelago 2014. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-14-009, 2.

**Miami, FL**

Ault, J.S., Smith, S.G., Browder, J., Nuttle, W., Franklin, E.C., Luo, J., DiNardo, G.T., & Bohnsack, J.A. (2014). Indicators for assessing the ecological dynamics and sustainability of southern Florida's coral reef and coastal fisheries. *Ecological Indicators 109*: 25-41. http://dx.doi.org/10.1016/j.ecolind.2014.04.013

Bright, A.J., Cameron, C., Miller, M.W. (in review). Prey condition and host-origin affect prey-choice behavior in an important corallivore. *J Exp Mar Biol Ecol*.

Huntington, B.E. and Miller, M.W. (2014) Location-specific metrics for rapidly estimating the abundance and condition of the endangered coral, *Acropora cervicornis*. *Restoration Ecology 22*:299-309.

Javech, J. & Blondeau, J. (2014). Investigator's Annual Report: reef fish visual census in Biscayne National Park FY 2013. Unpublished report PRBD-2014-04, 2.

Johnston, L. & Miller, M.W. (2014). Negative indirect effects of neighbors on imperiled scleractinian corals. *Coral Reefs*. DOI: 10.1007/s00338-014-1176-8.

Koch, M.S., Coronado, C., Miller, M.W., Rudnick, D., Halley, R., Smith, T., & Stabenau, E. (in revision). Climate change effects on coastal foundation communities of the Greater Everglades Ecosystem using a 2060 scenario. *Env. Manag.*

Miller, M.W. (2014). Post-settlement survival in two Caribbean broadcasting corals. *Coral Reefs.* DOI: 10.1007/s00338-014-1177-7.

NOAA Diver collecting data with a video camera.
Greg McFall, NOAA

Squid. Greg McFall, NOAA

# publications


Miller, M.W. (accepted, in press). Coral disturbance and recovery in a changing world. In Birkeland C (Ed.) Coral Reefs in the Anthropocene. Springer.

Miller, M.W., Lohr, K.E., Cameron, C.M., Williams, D.E., Peters, & E.C. (2014). Disease dynamics and potential mitigation among restored and wild staghorn coral, *Acropora cervicornis*. *PeerJ 2*:e541. DOI.org/10.7717/peerj.541.

Miller, M.W., Marmet, C., Cameron, C.M., & Williams, D.E. (in press, 2014 accepted Aug 18). Prevalence, consequences, and mitigation of fireworm predation on endangered staghorn coral. *Mar Ecol Prog Ser*: 000.

SEFSC Coral Reef Program: FY 2013 Project Accomplishments Report. Compiled by Jennifer Schull. NOAA Technical Memorandum NMFS-SEFSC-663, 34.

Smith, S.G., Ault, J.S., Bohnsack, J.A., Blondeau, J., Acosta, A., Renchen, J., Feeley, M.W., & Ziegler, T.A. (2014). Fisheries-independent data for hogfish (*Lachnolaimus maximus*) from reef-fish visual surveys in the Florida Keys and Dry Tortugas, 1994-2012. FWC SEDAR Data Working Paper. Protected Resources and Biodiversity Division, unpublished document, PRBD-2014-02.

Southeast Fisheries Science Center. (2014). Population trends for Yellowtail damselfish (*Microspathodon chrysurus*) from forereef, high relief spur and groove coral reef habitats in the Florida Keys 1980-2012. Report to NMFS Southeast Regional Office, PRBD-2014-03, 5.

Weijerman, M., Birkeland, C., Piniak, G.A., Miller, M.W., Eakin, C.M., McElhany, P., Dunlap, M., & Brainard, R. (2014). Endangered Species Act listing: Three case studies of data deficiencies and consequences of ESA listing on research output Current Opinion. *Environmental Sustainability 7*:15–21.

Williams, D.E., Miller, M.W., & Baums, I.B. (2014). Cryptic changes in the genetic structure of a highly clonal coral population and the relationship with ecological performance. *Coral Reefs 33*:595-606. DOI: 10.1007/s00338-014-1157-y.

Williams, D.E., Miller, M.W., Bright, A.J., & Cameron, C.M. (in review). Removal of corallivorous snails as a proactive conservation tool. *Peer J.*


Gorgonian. Greg McFall, NOAA

## OAR

### Miami, FL

Enochs, I.C., Manzella, D.P., Carlton, R., Schopmeyer, S., van Hooidonk, R., & Linman, D. (2014). Effects of light and elevated pC02 on the growth and photochemical efficiency of Acropora cervicomis. *Coral Reefs 33*(2):477-485. DOI: 10 1007/s00338-014-1132-7.

Manzella, D.P. (in revision). Carbonate budgets of eastern Pacific reefs with global warming and ocean acidification. In Glynn, P.W., Manzella, D.P., and Enochs, I.C. (eds.) Coral Reefs of the eastern Tropical Pacific, Coral Reefs of the Wand Book Series. Springer Verlag, Heidelberg.

Manzella, D.P., Enochs, I.C., Bruckner, A., Renaud, P., Kolodziej, G., Budd, D., Canton, R., & Glynn, P. (in review September 2014). Galapagos Coral Reef Persistence after ENSO Warming Across an Acidification Gradient. *Geophysical Research Letters*.

Enochs, I.C., Manzella, D., Carlton, R., Graham, D., Ruzicka, R., & Collela, M. (preparing for resubmission) Ocean acidification enhances the bioerosion of a common coral reef sponge: implications for the persistence of the Florida Reef Tract, *Bulletin of Marine Science*.

Manzella, D.P., Enochs, I.C., Kolodziej, G., & Carlton, R. (in re-review August 2014). Recent decade of growth and calcificaon of Orbicella faveolata tracks reef resilience patterns in the Florida Keys. *Marine Ecology Progress Series*.

Sutton, A., Manzella, D., & Gintert, B. (in review). Coupled chemical and biological monitoring to understand the impact of ocean acidification on coral reef ecosystems. *Oceanography.*

## NOS

### NCCOS

### Headquarters, Silver Spring MD

Apeti, D.A., Mason, A.L., Hartwell, S.I., Pait, A.S., Bauer, L.J., Jeffrey, C.F.G., Hoffman, A.M., Galdo, F.R., & Pittman, S.J. (2014) An assessment of contaminant body burdens in the coral (Porites astreoides) and Queen conch (Strombus gigas) from the St. Thomas East End Reserves. NOAA Technical Memorandum NOS NCCOS, 177.

Clark, R., Taylor, J.C., Buckel, C.A., & Kracker, L.M. (eds.) (2014). Fish and Benthic Communities of the Flower Garden Banks National Marine Sanctuary: Science to Support Sanctuary Management. NOAA

NOAA Diver Randy Clark, conducting a Line Point Intercept habitat survey for the National Coral Reef Monitoring Project.
Lee Richter, NOAA

Acoustic receivers deployed by NOAA Diver Marissa Nuttall at East Flower Garden Bank, FGBNMS.
Emma Hickerson, NOAA

# publications

NOAA Diver John Embesi installs a placozoan collection rack on top of a long-term monitoring photo station rod, Flower Gardens NMS. Marissa Nuttall, NOAA


Technical Memorandum NOS NCCOS 179, 317.

Costa, B., Taylor, C., Kracker, L., Battista, T., & Pittman, S. (2014) Mapping reef fish and the seascape: combining acoustics and spatial modeling to guide coastal management. *PLos ONE*. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0085555

Pittman, S.J., Monaco, M.E., Friedlander, A.M., Legare, B., Nemeth, R.S., et al. (2014) Fish with chips: tracking reef fish movements to evaluate size and connectivity of Caribbean Marine Protected Areas. *PLoS ONE* 9(5): e96028. DOI:10.1371/journal.pone.0096028

Renchen, G. F., Pittman, S. J., Clark, R., Caldow, C., Gall, S., Olsen, D., & Hill, R. L. (2014). Impact of derelict fish traps in Caribbean waters: an experimental approach. *Bulletin of Marine Science*, 90(2), 551-563.

**Beaufort, NC**

Bauer, L.J., Vander Pluym, J., Jeffrey, C.F.G., Caldow, C., Hoffman, A.M., & Uhrin, A.V. (2014). Characterization of fish communities and associated benthic habitats in the St. Thomas East End Reserves (STEER). NOAA Technical Memorandum 185, 67.

Clark, R., Taylor, J.C., Buckel, C.A., & Kracker, L.M. (eds) (2014). Fish and benthic communities of the Flower Garden Banks National Marine Sanctuary: Science to support sanctuary management. NOAA Technical Memorandum NOS NCCOS 179, 317.

Uhrin, Amy, Matthews, T., & Lewis C. (2014). Lobster trap debris in the Florida Keys National Marine Sanctuary: distribution, abundance, density, and patterns of accumulation, marine and coastal fisheries. *Dynamics, Management, and Ecosystem Science, 6*:1, 20-32. http://dx.doi.org/10.1080/19425120.2013.852638

Whitfield, P.E., Muñoz, R.C., Buckel, C.A., Degan, B.P., Freshwater, D.W., & Hare, J.A. (2014). Native fish community structure and Indo-Pacific lionfish Pterois volitans densities along a depth-temperature gradient in Onslow Bay, North Carolina, USA. *Mar Ecol Prog Ser, 509*:241-254. http://www.int-res.com/articles/meps_oa/m509p241.pdf


**ONMS**

**Channel Islands NMS**


Caselle, J. E. (in press). Marine Protected Areas Encyclopedia of Natural Resources.

Lobster trap (above) and Stone crab trap, used by the NOS Beaufort unit, Florida Keys NMS. NOAA


**Flower Garden Banks NMS**

Precht, W.F., Deslarzes, K.J.P., Hickerson, E.L., Schmahl, G.P., Nuttall, M.F., & Aronson, R.B. (2014). Back to the future: the history of Acroporid corals at the Flower Garden Banks, Gulf of Mexico, USA. *Marine Geology 349*, 152-161.

**Gray's Reef NMS**

Mathies, N.H., Ogburn, M.B., McFall, G., & Fangman, S. (2014). Environmental interference factors affecting detection range in acoustic telemetry studies using fixed receiver arrays. *Marine Ecology Progress Series* 495: 27-38.

**Pacific Islands Region**

Van Tilburg, H.K. (2014) The Local Pacific Inventory: maritime heritage resources in the Main Hawaiian Islands, in Van Tilburg et al. (eds.) Proceedings of the 2nd Asia-Pacific Regional Conference on Underwater Cultural Heritage, vol. 1. Honolulu: Electric Pencil.

**Papahānaumokuākea MNM**

Kane, C., Kosaki, R., & Wagner, D. (2014). High levels of mesophotic reef fish endemism in the Northwestern Hawaiian Islands. *Bulletin of Marine Science 90*(2):693-703.

Kahng, S.E., Copus, J., & Wagner, D. (2014). Recent advances in the ecology of mesophotic coral ecosystems (MCEs). *Current Opinion in Environmental Sustainability 7*: 72-81.

Kelley,C., Smith, J.C., Tree, J., Miller, J., Boston, B., Garcia, M., Ito, G., Taylor, J., Lichowski, F., Wagner, D., Leonard, J.,Dechnik, B., & Luers, D. (in review). New R/V Falkor multibeam surveys are rewriting the geologic history of the Hawaiian Archipelago. *Earth and Space Science*.

Papastamatiou, Y., Meyer, C., Kosaki, R., Wallsgrove, R. N., & Popp, B. (in review). Movement and foraging of predators associated with mesophotic reefs and their potential for linking ecological habitats. *Marine Ecology Progress Series*.

Parrish, F.A., Wagner, D., Jewardene, D., Kelley, C.D., DeMello, J., & Breuer, E. (2014). NOAA deep-sea coral and sponge research and management priorities workshop for the Pacific Islands Region. NOAA Pacific Islands Fisheries Science Center Administrative Report H-14-03, 16.

Roche, R.C., Pratchett, M.S., Carr, P., Turner, T.R., Wagner, D., Head, C., & Sheppard, C.R.C. (in review). The occurrence and impact of Acanthaster planci outbreaks in the Chagos Archipelago. *Marine Biology.*

# publications

Wagner, D., Kosaki, R., Spalding, H., Pyle, R., Whitton, Sherwood, A., & Calcinai, B. (2014). Mesophotic surveys of the flora and fauna at Johnston Atoll, Central Pacific Ocean. *Marine Biodiversity Records 7* (e68). DOI: 10.1017/S175526721400078.

Wagner, D., Opresko, D.M., Montgomery, A.D., & Parrish F.A. (in press). An update on recent research and management activities of Hawaiian Black corals. In: Etnoyer, P.J., Cairns, S.D., & Hourigan, T. (eds.) State of Deep-Coral and Sponge Ecosystems of the United States. Silver Spring, MD.

Wilson, J., Williams, G., Aeby, G, Bourne, D., Conklin, E., Furby, K., Harvell, D., Kosaki, R., Salm, R., Vargas-Angel, B., Willis, B., & Yusuf, S. (in review). Increasing the resilience of Indo-Pacific reefs through informed management of coral diseases. *Ecology and Society*.

Anemone. Greg McFall, NOAA

http://www.ndc.noaa.gov

https://www.facebook.com/NOAADivingProgram

# NOAA
# DIVING PROGRAM

Diving for Science and Technology