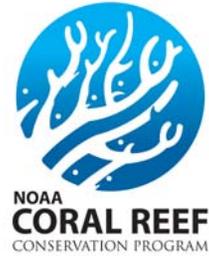


**Coral Reef News**  
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**FROM THE DESK OF THE PROGRAM MANAGER**

On July 19, the President signed an [Executive Order](#) establishing a [National Policy for the Stewardship of our Oceans, Coasts, and Great Lakes](#). This is a historic step forward in ocean policy and I would like to share the highlights.

The policy outlines a new direction and framework for how the federal government will operate differently to improve ocean stewardship in partnership with our many stakeholders. This includes adopting an ecosystem-based approach to management, increasing our knowledge to improve decision-making and enhancing coordination. Specifically, the policy identifies five areas of special emphasis: *climate change and ocean acidification; regional ecosystems; management of water quality on land; changing conditions in the Arctic; and observation, mapping and infrastructure.*

While this policy is national in scope, there is a strong emphasis on regional engagement and implementation. The National Ocean Policy identifies coastal and marine spatial planning (CMSP) as a priority and envisions a regionally-based, collaborative planning process in which key agencies and stakeholders have a role to play in identifying goals and objectives for their regional waters.

As we well know in the coral community, no two regions are alike, but are an interconnected mosaic of diverse ecological, biological, economic, and social components. Each region and its stakeholders will have the opportunity and responsibility to tailor the process, ensuring that all interests and users are adequately represented.

Under the National Ocean Policy, the President established nine Regional Planning Bodies to implement the CMSP Framework. The [Coral Reef Conservation Program](#), our partners, and stakeholders, including the Regional Fishery Management Councils, have an important opportunity to contribute to the work of four of them: South Atlantic, Caribbean, Gulf Coast, and the Pacific Islands. We are well poised to bring our interests to the table and help inform this process through sharing our national goals and objectives and the jurisdiction-specific local management priorities, which map well to the principles and priorities in the National Ocean Policy.

This forward-thinking policy sets the nation on a clear path for the sustainable use of our oceans and coasts. While specific action plans are still in development, I encourage you all to follow this nationally and locally and to engage, where possible, to help ensure a vibrant future for our nations' coral reef ecosystems.

-Kacky

## ANNOUNCEMENTS

**24<sup>th</sup> USCRTF Meeting Registration Opens.** During the week of September 13, the [24<sup>th</sup> meeting](#) of the [US Coral Reef Task Force](#) (USCRTF) will be held in Saipan, Commonwealth of the Northern Mariana Islands (CNMI). Hosted by the jurisdictions of CNMI and Guam, the [US Department of the Interior](#) will serve as co-chair for this meeting. The business meeting is open to the public and will be held Wednesday and Thursday morning; associated side meetings are scheduled Monday and Tuesday in Saipan. Additional meetings will take place in Guam and in Pohnpei, Federated States of Micronesia before and after the Business Meeting, respectively. This meeting provides a unique opportunity to focus on emerging regional issues, including the Micronesia Challenge. Registration is now available at <http://coralreef.gov>.

**Public Comment Opportunity: NOAA Next Generation Strategic Plan.** NOAA is currently developing its [Next Generation Strategic Plan](#) (NGSP), which will help inform the agency's priorities, activities, and how we conduct our science, service and stewardship mission. The objectives identified in this plan are the basis for NOAA's corporate planning, performance management, and stakeholder engagement over the next five years.

Of particular note, the NOAA [Coral Reef Conservation Program](#) (CRCP) will be working in multiple areas within the NGSP including the "[Resilient Coastal Communities and Economies](#)" Goal (Coastal Goal) and the "[Healthy Oceans](#)" Goal (Oceans Goal). Specifically, with the CRCP's realignment to focus on assisting the CRCP's management partners in the US coral jurisdictions, the "[Comprehensive ocean and coastal planning and management](#)" objective is of particular relevance. Also, with increased attention to land-based sources of pollution and its impacts to coral reefs, the CRCP will conduct work under the "[Improved coastal water quality supporting human health and coastal ecosystem services](#)" objective. The CRCP will continue to provide information about the status and trends of US coral reef resources and expects to continue this work which is covered within the following objectives housed under the Oceans Goal: "[Improved understanding of ecosystems to inform resource management decisions](#)," and "[Healthy habitats that sustain resilient and thriving marine resources and communities](#)."

We welcome your comments. The public comment period is open through August 10. Click [here](#) to provide your input.

**Funding Opportunity: Pulley Ridge to FL Keys Coral Connectivity Research.** NOAA's [Center for Sponsored Coastal Ocean Research](#) (CSCOR), in partnership with the NOAA [Office of National Marine Sanctuaries](#), [Office of Ocean Exploration and Research](#) (NOAA/OER), [National Marine Fisheries Service Southeast Regional Office](#), and [Gulf of Mexico Regional Collaboration Team](#), is soliciting proposals for a project under the Regional Ecosystem Prediction Program of up to 5 years in duration to conduct research to improve the understanding of population connectivity of key species between the southernmost portion of Pulley Ridge on the West Florida continental shelf and downstream to the coral ecosystems of the Florida Keys. Coral ecosystems upstream of Pulley Ridge can be considered if directly relevant to population connectivity or to provide context to the overall study. This information will be used to improve the ability of Gulf of Mexico resource managers to proactively develop strategies to manage and protect poorly understood mesophotic coral ecosystems, including coastal and marine spatial

## UPCOMING EVENTS

### September

**15-16:** Business Meeting, [24<sup>th</sup> US Coral Reef Task Force Meeting](#), Saipan, CNMI.

### Research Missions

**August 8-29:** Caribbean Coral Reef Ecosystem Monitoring Project bi-annual mission to La Parguera, Puerto Rico, National Park Service small boats.

**September 1-26:** Northwestern Hawaiian Islands Reef Assessment and Monitoring Program Cruise, [NOAA Ship Hi`ialakai](#)

**September 9-13:** Baseline assessment of fish and benthic communities of the Flower Garden Banks, NOAA Ship [R/V Manta](#).

**October 2010:** Main Hawaiian Islands Reef Assessment and Monitoring Cruise, [NOAA Ship Hi`ialakai](#)

planning and the siting of marine protected areas and marine protected area networks for shallow and mesophotic coral ecosystems.

The full funding opportunity and information on how to apply can be found on [grants.gov](#) by clicking on this [link](#) or by searching for CFDA #11.478. Applications are due by October 21.

**Online Tool Allows Users to View Coral Resources in Relation to Gulf Oil Spill.** A new [online mapping tool](#) provides users with near real-time information about the response effort to the Deepwater Horizon spill in the Gulf of Mexico. Developed through a joint partnership between NOAA and the [University of New Hampshire's Coastal Response Research Center](#), the site offers users a 'one-stop shop' for spill response information and hosts data from several government agencies. The site is designed to facilitate communication and coordination among a variety of users—from federal, state and local responders to local community leaders and the public—the site is designed to be fast, user-friendly and constantly updated.

The tool has a series of viewable layers that include the location of natural resources in the region. The location of coral resources are available as a series of layers in the online tool. To view the coral layers, open the mapping tool and expand the following

layers:

- Deep-sea Coral Database and Coral Habitats are found under: Bioresources/Habitat Areas [Coastal Resources/ Benthic Habitat.
- *Acropora* Critical Habitat is found under: Bioresources/Critical Habitat Areas/NOAA NMFS Critical Habitat/*Acropora* Coral.

Hovering over map features will display their coordinates in the bottom of the window. To learn more, read the NOAA [press release](#) or view the [video tutorial](#).

**Interactive Mapping Tool for Vieques, Puerto Rico Provides Rich Immersion into Underwater Habitats.** NOAA's [National Centers for Coastal Ocean Science](#) announces the launch of the Vieques Biogeography Integrated Online Mapper ([BIOMapper](#)). The Vieques BIOMapper provides managers and scientists with improved access to coastal and ocean data and a way to print customized maps of specific areas of interest.

BIOMapper lets users interactively view data, aerial imagery, dive photography, underwater video, and related publications for a project in Puerto Rico, "[Ecological Characterization of the Marine Resources of Vieques, Puerto Rico](#)." The fully interactive tool is an easy way to view the project's benthic habitat data, examine the attributes of the data, and show different thematic representations of the data. In addition, photography and videos taken during dive missions are viewable, linked to the location of the dives. PDF maps can be produced of user-selected areas in a pre-formatted template. BIOMapper uses software that is easily modified to display a

variety of data types for any region. The tool requires a browser with a Flash plugin. While creation of the BIOMapper was not funded by the CRCP, it ties in closely to CRCP-funded work and is a useful tool for both resource managers and scientists working in the region.

## UPDATES FROM THE ATLANTIC/CARIBBEAN REGION

### **Collaborative Monitoring Mission Informs Management and Spears Invasive Lionfish.**

Scientists from NOAA's [National Centers for Coastal Ocean Science](#) (NCCOS) recently returned from their tenth annual research mission in St. John, US Virgin Islands where they continue to evaluate the health of marine resources in and around two National Parks as part of the collaborative [Caribbean Coral Reef Ecosystem Monitoring Project](#). From July 5-16, dive teams surveyed habitats, both inside and outside park boundaries, at the [Virgin Islands Coral Reef National Monument](#) and [Virgin Islands National Park](#) to spatially characterize and monitor the distribution, abundance, and size of coral, reef fishes, and macro-invertebrates.

In addition to successfully completing the two-week monitoring mission, scientists from NCCOS and the CRCP captured the fourth lionfish reported within Park waters. The invasive sub-adult fish was first spotted July 15 and captured the following day within 10 meters of the original sighting.

This research mission was completed in collaboration with the [National Park Service](#), including its [South Florida/Caribbean Network](#), the [US Geological Survey](#), [USVI Department of Planning and Natural Resources](#), and the [University of the Virgin Islands](#), with support from NOAA's CRCP. The monitoring data from this annual mission establishes the knowledge base necessary for enacting management decisions in a spatial setting and has contributed to the Park's efforts for a boundary shift.

### **NPS Update: Invasive Lionfish in Biscayne National Park.**

In June 2009, [Biscayne National Park](#) resource managers followed up on a reported sighting of a lionfish from a shipwreck within the park and were able to successfully remove that adult lionfish. Over the eleven months following that capture, lionfish sightings were sporadic and uncommon. By June 2010; however, it became clear that Biscayne National Park, along with many other parks and areas in south Florida and the Caribbean, is being invaded by the Indo-Pacific lionfish. Over a two-week period in mid-June, resource managers at Biscayne observed (and in most cases removed) over 40 lionfish from locations all over the park. Lionfish are being observed in and collected from

**Lionfish Invasion-A Growing Problem.** Native to the Pacific Ocean, [lionfish](#) are considered an [invasive species](#) along the East coast of the US and in the Caribbean. Since 2000, lionfish have been observed in these waters and populations are on the rise since they have no natural predators in these regions. Lionfish are voracious predators of native fish species, capable of consuming many times their body weight. Large-scale efforts to remove lionfish are not cost-effective, but local jurisdictions are utilizing other means to try to stem the invasion (such as reporting mechanisms, incorporating removal into existing monitoring efforts, fishing contests and recipe contests for lionfish, etc.).



Photo credits: Left: NOAA, Right: Jenny Waddell, NOAA CRCP

shallow water seagrass, small shipwrecks in Biscayne Bay, beneath dock pilings, and from oceanside reef, wreck and hardbottom habitats. As many as 17 lionfish have been removed from a single site in one day. The occurrence of visitor-reported sightings is also increasing in frequency.

All individuals observed and/or captured during these most recent efforts are very small, measuring between six and twelve centimeters. The small size indicates a successful recruitment from upstream spawning and suggests that Biscayne is in the early stages of the invasion. While total eradication of the lionfish is an unlikely outcome, resource managers are hoping to remove as many individuals as possible in order to keep the lionfish population in the park at a manageable size and to prevent these new recruits from becoming voracious reef predators as they grow to adult size....Once introduced, lionfish can rapidly become an established species. The introduced lionfish poses potential problems for both the environment and humans. They are voracious predators that appear to compete for food resources of the already depleted, commercially and ecologically important snapper-grouper fishery. Furthermore, they have few natural predators in the Atlantic Ocean and studies show that Atlantic predators avoid lionfish. Introduced lionfish are not timid and readily approach divers and snorkelers, and their venomous spines can sting park users and can cause intense pain, swelling, headache, nausea, paralysis, and convulsions. *Reprinted with permission from the National Park Service.*



NCCOS researcher Tony Pait collects a sediment sample to get an idea of what chemical contaminants issues might exist in the STEER. Photo credit: NCCOS Center for Coastal Monitoring and Assessment

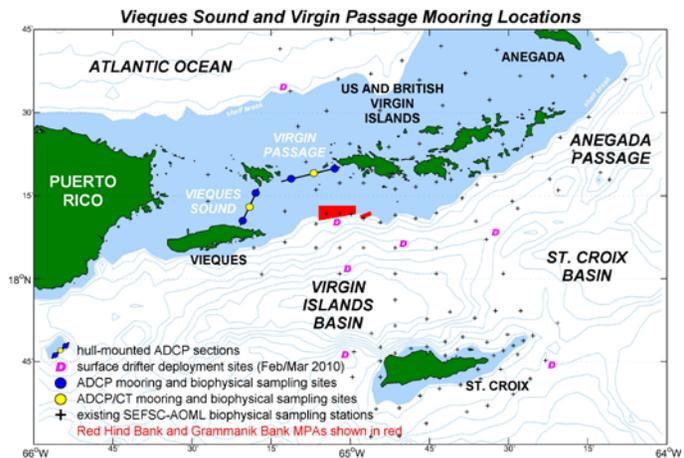
#### **Initial Chemical Contaminant Characterization in St. Thomas.**

The St. Thomas East End Reserve (STEER) in the US Virgin Islands (USVI) is a collection of marine reserves and wildlife sanctuaries located on the eastern end of the island. Within the STEER, there are a variety of land use and maritime activities that have the potential to impact the natural ecosystem and its inhabitants. Recently, scientists from the [National Centers for Coastal Ocean Science](#) (NCCOS), in cooperation with local partners, collected sediments as part of a preliminary effort to characterize contaminant-related issues that may exist in the STEER. In addition, a passive water sampler was installed in Turpentine Gut to concentrate water soluble contaminants entering the STEER. During the trip, a presentation was also made before the STEER Core Planning Group which is developing a management plan for this valuable reserve. The presentation and subsequent discussions focused on characterization and management needs related to land-based sources of pollution, and how these issues could be addressed through collaborative work being planned. NOAA was supported in these efforts by the [USVI Department of Planning and Natural Resources](#) (Coastal Zone Management and Divisions of Fish and Wildlife and Environmental Enforcement), the [University of the Virgin Islands](#), and [Virgin Islands Ecotours](#).

**Moored Acoustic Array Deployed between Puerto Rico and St. Thomas.** In March, scientists successfully deployed an array of acoustic Doppler current profilers in the waters of Puerto Rico (PR) and the US Virgin Islands (USVI) from the [NOAA Ship Nancy Foster](#).

Instruments were positioned across the eastern end of Vieques Sound, between Vieques and Culebra, and across Virgin Passage, between Culebra and St. Thomas. The six-mooring array is designed to quantify mass transport across the region for a year by measuring water current velocities over a range of depths. This deployment is a component of CRCP's *Vieques Sound and Virgin Passage Transport Study*. Project partners will utilize data recovered from the moored array quarterly to construct a detided velocity section and mass transport time-series for each passage. These results will be combined with the multi-year biophysical dataset collected during regional CRCP cruises for the *USVI Larval Reef Fish Distribution and Supply Study* to determine ichthyoplankton flux in these passages.

Previously collected current velocity data, surface drifter trajectories, and model simulations suggest connectivity between Marine Protected Areas south of St. Thomas (such as Red Hind and Grammanik Banks), coastal areas east of PR (within Vieques Sound) and north of St. Thomas, St. John, and the British Virgin Islands. However, larval transport of economically important reef fish across the PR/USVI shelf is poorly understood. This collaborative project, seeks to gain a better understanding of the physical and biological linkages between these coastal ecosystems and to provide



Map courtesy: Atlantic Oceanographic and Meteorological Laboratory

scientists and managers with broader insight into the connected nature of the catch found in the region. Partners for the March deployment included scientists from NOAA's [Atlantic Oceanographic and Meteorological Laboratory Physical Oceanography Division](#), NOAA's [Southeast Fisheries Science Center Early Life History Laboratory](#), and the [University of the Virgin Islands Center for Marine and Environmental Studies](#).

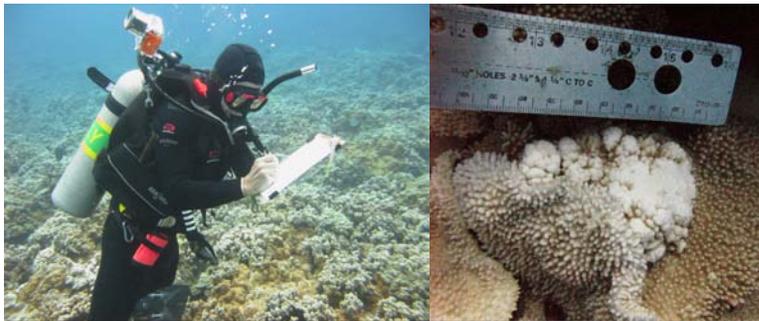
## UPDATES FROM THE PACIFIC REGION

**Cruise Studies Mesophotic Reefs of 'Au'au Channel.** On July 7<sup>th</sup>, scientists from the NOAA [Pacific Island Fisheries Science Center](#), the [University of Hawai'i](#), and the [Bishop Museum](#) departed Pearl Harbor for an 11-day [cruise](#) aboard the [NOAA ship Oscar Elton Sette](#). The mission of the cruise was to study a series of coral reefs in the 'Au'au Channel between the islands of Maui and [Lāna'i](#) in the main Hawaiian Islands. The reefs feature luxuriant expanses of stony corals as well as macroalgae, reef fish, and other coral reef organisms. Most reefs in Hawai'i are found at depths of about 100 ft or shallower, and are most prolific at depths of around 40 ft. The reefs being studied on this cruise are unique in that they are most prolific at a depth of approximately 280 ft, and have been found to flourish even below 400 ft.

Scientists recovered oceanographic instruments that had been previously placed at the study site to record information about currents, ocean temperatures and the passage of tagged fish. A

number of SCUBA dives using mixed gas were conducted to collect high-definition video of segments of the seafloor to measure the size and species of corals. Other divers identified, counted and measured sizes of fish associated with the reefs. An underwater camera sled was deployed during the night to better characterize the distribution of [mesophotic](#) reefs, and acoustic surveying was used to look for communities of small fish, squid, and other organisms which live offshore, but that may be contributing nutrients to the ‘Au‘au’s mesophotic reefs.

**Maui Sites Surveyed for Development of Tool to Predict Coral Bleaching and Disease Risks in the Hawaiian Islands.** The [Coral Reef Ecosystem Division](#) of the NOAA [Pacific Island Fisheries Science Center](#), in partnership with the [Hawai‘i Division of Aquatic Resources](#), conducted a series of coral disease surveys April 19–25 along the West Maui shoreline at Molokini crater, Keawakapu, Kahekili, and Honolua Bay. These surveys were funded as part of the CRCP project “Environmental Monitoring of Coral Bleaching and Disease in the Hawaiian Islands.” This project is working to develop an experimental, predictive tool that uses satellite-derived sea-surface-temperature metrics to assess the risk of bleaching and disease in this region.



Left: NOAA diver and coral disease principal investigator, Bernardo Vargas-Ángel, conducts coral bleaching and disease assessments at Molokini crater. Photo credit: Darla White, Hawai‘i DAR Right: Anomalous and discolored growth protuberances on the rice coral *Montipora capitata*. Photo credit: Bernardo Vargas-Ángel, NOAA PIFSC CRED

Results from the surveys conducted in April are expected to provide a better understanding of the intra-annual patterns of coral bleaching and disease prevalence at selected sites across the state of Hawai‘i. Comparable surveys are planned for areas around the islands of Hawai‘i and O‘ahu. An enhanced understanding of coral disease events and their likelihood of occurring will allow managers to make better-informed decisions pertaining to the use of the reef ecosystems that they administer.

## INTERNATIONAL UPDATES

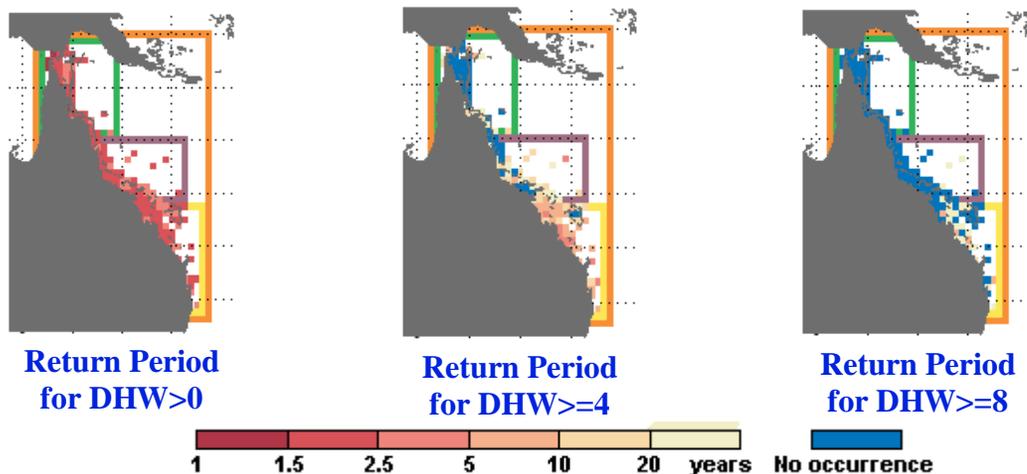
**ARMS deployment in Coral Triangle.** Two researchers from NOAA’s [Pacific Island Fisheries Science Center Coral Reef Ecosystem Division](#) are participating in a [cruise](#) aboard the Indonesian research vessel *Baruna Jaya IV* to deploy Autonomous Reef Monitoring Structures (ARMS). ARMS are long-term collecting devices developed to mimic the structural complexity of



Left: A portion of the ARMS deployment team, including CRED Staff Molly Timmers and Russell Reardon (individuals on left). Photo courtesy: NOAA Okeanos Explorer Program Right: An ARM deployed during the mission. Photo courtesy: NOAA Okeanos Explorer Program

coral reef habitats and to attract colonizing invertebrates and algae. They were developed as a standard and systematic method to investigate and monitor the diversity of the lesser known reef organisms. The diving mission on this cruise is to install ARMS in the Sangihe – Talaud region. To date, six ARMS have been installed along the coast of Sangihe Island. Other activities during the cruise include conductivity temperature depth deployments, a plankton tow, a deep or shallow water trawl, Acoustic Doppler Current Profile measurements, and bathymetric surveys. The *Baruna Jaya IV* is working in conjunction with the [NOAA Ship Okeanos Explorer](#), which is mapping and examining the undersea environment with a focus on the deeper waters of the Sangihe Talaud region as part of the joint Indonesia-USA Deep-Sea Exploration of the Sangihe Talaud Region ([INDEX 2010](#)) project.

**CRW Launches Experimental Bleaching Return Period Product.** NOAA [Coral Reef Watch](#) (CRW) has launched an exciting new bleaching product that will help coral reef managers and other stakeholders understand the frequency of bleaching-level thermal stress events. The new “[Bleaching Thermal Stress Return Period](#)” product calculates the return period of thermal stress events that are likely to cause mass coral bleaching. This product is based on the CRW [Degree Heating Week](#) product and is derived from AVHRR Pathfinder SST data from from 1985–2009. Maps, such as those displayed below, demonstrate the average period of time between repeat occurrences of each level of thermal stress.



The experimental Bleaching Thermal Stress Return Period product is currently being developed for the Great Barrier Reef region. Once it has been evaluated, it will be expanded to include all coral reef regions of the world. This product will help resource managers and scientists understand regional effects of climate change and will assist them in evaluating their particular areas of study in terms of a regional and/or global context. This information is valuable when planning management actions such as the placement of Marine Protected Areas.

**NOAA/TNC Sponsor First Reef Resilience and Climate Change Training of Trainers Workshop.** NOAA [Coral Reef Watch](#) (CRW) staff attended a *Reef Resilience and Climate Change Training of Trainers Workshop* in Key Largo, Florida from June 21-24. Led by [The Nature Conservancy](#) (TNC), the workshop was sponsored in partnership with NOAA as part of a new NOAA CRCP-TNC Cooperative Agreement. The Training of Trainers workshop was based on the *Reef Resilience and Climate Change* curriculum that NOAA CRCP and CRW have been



Participants in the training workshop.  
Photo credit: Tyler Christensen, NOAA  
CRW

offering to coral reef managers since 2007. The workshop was attended by 28 reef managers from 18 countries around the Caribbean.

Participants had to apply to the program and accepted participants then participated in an 11-week online mentored course based on TNC's [Reef Resilience Toolkit](#) and [A Reef Manager's Guide to Coral Bleaching](#) prior to this workshop. As part of the online course, information about the impacts of climate change on coral reefs was integrated with materials about reef resilience, responding to and communicating about bleaching events, and incorporating resilience concepts into marine protected

area design and management. Participants also chose to draft either a bleaching response plan or a communications plan.

At the four-day workshop, attendees received instruction on how to deliver the training modules to audiences in their home countries, as well as information on facilitation, adult learning modalities, and presentation skills. Participants then drafted a training plan to deliver a workshop or training event in their home country. Assistance for the workshops/trainings will be provided by TNC. This workshop was the first time that the *Reef Resilience and Climate Change* curriculum was presented for trainers, and response from participants was quite positive. The next Training of Trainers Workshop is scheduled to be held in the Pacific in 2011.

**CRCP Responds to Coral Bleaching in the Coral Triangle.** Coral bleaching events can cause coral mortality, reducing ecosystem function and resulting in social and economic impacts to vulnerable populations. Staff from NOAA's CRCP, including [Coral Reef Watch](#), and the [National Marine Fisheries Service Office of Science and Technology](#), are working with partners in the Greater Coral Triangle region to undertake a rapid response assessment of the [current coral bleaching event](#). Project activities include an ecological assessment, diver surveys, and a socioeconomic impact study to determine the economic, social, and ecological impacts of the coral bleaching event. Survey tools are presently being tested in a pilot study to refine and improve for the full study. A kick-off project meeting was held in Phuket, Thailand on June 25-26, and data collection began June 27.

In addition to NOAA, the international team of partners includes the Southeast Asian Bleaching Project Team; the Australian [Commonwealth Scientific and Industrial Research Organisation](#); the [Australian Department of Environment, Water, Heritage and the Arts](#); [The Nature Conservancy](#); [Reef Check Indonesia](#); Prince of Songkla University (Thailand); [Macquarie University](#) (Australia); and [James Cook University](#) (Australia).

**NOAA Trains Cayman Islands Coral Outbreak Response Team.** An international training workshop was held in Little Cayman at the [Central Caribbean Marine Institute](#) from June 1-5 on behalf of the CRCP's [Coral Disease and Health Consortium](#). This workshop was held to assist in establishing a local coral disease outbreak response team. It was very well received by the local [Department of Environment](#), where participants included the Deputy Director for the agency. In

addition, three representatives from the local veterinary college, [St Matthews University](#), a local diver operator, and four others participated. These participants received instructions both in a classroom setting and in-water to recognize the local predominant coral species, distinguish lesions (whether disease or other source), conduct surveys, and take samples. Workshop leaders cite the event as the best yet in a series of similar trainings.

Establishing local response teams is key to enabling rapid response capabilities in the event of a coral disease outbreak or other unusual mortality event. These teams are trained in an incident command structure and can be mobilized on short notice to carry out a formal investigation and inform other response activities to alleviate or mitigate the outbreak/unusual event.

**NOAA Conducts Reef Resilience and Climate Change Workshop for Caribbean Coral Reef Managers.** From May 10-14, the US Virgin Islands was the location of the most recent *Reef Resilience and Climate Change: A Workshop for Coral Reef Managers* workshop. NOAA's [Coral Reef Watch](#) (CRW) has organized and conducted this training workshop for over 200 reef managers around the globe since 2007. Participants included more than 25 coral reef managers and researchers from the US Virgin Islands, Puerto Rico, and the British Virgin Islands. The curriculum included modules on impacts of climate change in the Caribbean, how to respond to mass coral bleaching events, the principles of resilience and incorporating resilience into management and Marine Protected Area (MPA) design, NOAA early warning systems available to managers to predict when bleaching may occur, and how to communicate effectively about the threats posed to coral reefs. There was also a focus

on the human element of the issues surrounding climate change and mass bleaching with information on the socioeconomic impacts of these events, how to monitor these impacts, and the concepts of social-ecological resilience.



Workshop participants are briefed by Tyler Smith (UVI) prior to a field activity where managers assessed an area for coral reef resilience. Photo credit: M. Mehling

The main goal beyond communicating the latest climate change science and management strategies is for participants to strengthen partnerships with their fellow managers and share strategies, local management actions and lessons learned. An additional goal was to strengthen the connections amongst MPA's in the region and work towards developing a conservation network. Tangible outcomes will include draft bleaching response plans and MPA designs that emphasize resilience to climate change. With completion of this workshop, NOAA has provided this training for managers and scientists in all seven of the US coral reef jurisdictions. The workshop was sponsored by the NOAA CRCP and [The Nature Conservancy](#) with support from the [University of the Virgin Islands](#).

## DIVE DEEPER: DEEP-SEA CORALS

**NOAA Researchers Embark on Deep-Sea Coral Exploration Along US West Coast.** NOAA completed a month-long [expedition](#) to conduct research on deep-sea coral communities off the US West Coast in and around four national marine sanctuaries. The first of three such expeditions planned for 2010, this mission was conducted from June 9 through July 2. Two additional research cruises are scheduled for Fall to survey an extensive glass sponge community off the coast of Washington and to study a ‘hot spot’ of black corals off Southern California.



Left: Small Christmas tree black coral with brittle stars in 300 meters of water on top of Piggy Bank near Anacapa Island, southern California. Photo credit: NOAA NMFS Right: Two-foot tall vase sponge with anemone, brittlestars, and thornyhead rockfish on rocky bank inside the CINMS. Photo credit: NOAA NMFS

This west coast program is a coordinated three-year field research effort to better understand the location, distribution, health, and role of deep-sea coral and sponge ecosystems. This research will contribute to conservation and

management actions and assist NOAA in meeting the requirements of the [Magnuson-Steven Fishery Conservation and Management](#)

[Reauthorization Act of 2006.](#)

“Deep-sea coral provides habitat for fish and other marine life,” said Kacky Andrews, program manager for NOAA’s CRCP. “Research helps determine the extent and ecological importance of deep-sea coral communities and the threats they face. Sound management of these ecosystems requires scientifically based information on their condition.”

Potential threats to the health of deep-sea coral include human-induced and natural physical disturbance, invasive species, climate change, and ocean acidification.

The first leg of this expedition took place within [Olympic Coast National Marine Sanctuary](#) off the Washington coast June 9 through June 17. During the second leg coral communities were surveyed 19-25 June on the upper steep slope of the continental shelf in and around [Cordell Bank National Marine Sanctuary](#). In the third and final leg of this cruise, a diverse and abundant assemblage of black corals, sea fans, and sponges in a myriad of types, colors, and sizes were assessed on a rocky bank in [Channel Islands National Marine Sanctuary](#) (CINMS) June 26 through July 2.

NOAA scientists and partners conducted round-the-clock operations onboard the 224-foot [NOAA Ship McArthur II](#). Underwater surveys of corals, sponges, and associated habitats, invertebrates, and fishes were conducted in deep rocky areas at depths 400-3,000 feet (120-900 meters) using non-extractive direct observations from the remotely operated vehicle, *Kraken II*, and a Seabed autonomous underwater vehicle, *Lucille*. About 65 hrs of continuous high-definition video and thousands of still images were collected along navigated track lines. Data

also were collected on environmental conditions, including depth, temperature, substratum types, topography, and carbonate saturation state to help understand habitat factors that influence settlement and distribution of the corals. Thirty-four specimens of corals, sponges, and associated organisms were collected for identification confirmation, genetics, and reproductive analyses. This was a cooperative expedition, with investigators from NOAA Fisheries, Sanctuaries, academia, private research institutes, native American tribes, and U.S. Geological Survey.

NOAA's [Deep Sea Coral Research and Technology Program](#) is conducted under the auspices of the CRCP and coordinates deep-sea coral activities across offices and programs within NOAA for a multidisciplinary approach to manage and understand deep-sea coral ecosystems. NOAA works with the Regional Fishery Management Councils, other federal and state agencies, tribal governments and resource protection managers, academia and other partners to enhance protection of these ecosystems.

**Deep-Sea Coral Information Management Workshop.** On July 20<sup>th</sup> & 21<sup>st</sup>, NOAA's [Deep Sea Coral Research and Technology Program](#) held an Information Management Workshop in Silver Spring, MD focused on collecting information from deep-sea environments. This workshop addressed key challenges for integrating, managing, and disseminating data on the location and status of deep-sea corals. The workshop also addressed regional database compilation, and the development of information products to support both management and research needs. Workshop participants assisted in the development of site characterization methods and refinement of field survey protocol. Participants also identified sources of existing information on the locations of deep-sea corals and sponges and worked towards the development of a standard format for recording information from deep-sea expeditions. Researchers worked to identify best practices for video analysis from remotely operated vehicles, autonomous underwater vehicles, and manned submersibles. Management approaches for deep-sea coral were presented by a representative from the [South Atlantic Fishery Management Council](#). In addition to a focus on the development of deep-sea coral ecosystem information to support management activities, workshop participants also discussed and identified products, processes, and strategies for the advancement of the Deep Sea Coral Research and Technology Program and the field of deep-sea research as a whole.

## PUBLICATIONS

**Report and Benthic Habitat Maps Shed Light on the Mesophotic Ecosystems of Abrir La Sierra, Puerto Rico.** A recent report submitted to the [Caribbean Fisheries Management Council](#) (CFMC) highlights how mapping efforts supported by the CRCP helped scientists and managers gain a better understanding of the [mesophotic coral](#) habitats at Abrir La Sierra. Prepared by the [University of Puerto Rico](#) researcher Jorge García-Sais, *Mesophotic Benthic Habitats and Associated Marine Communities and Abrir La Sierra, Puerto Rico*, offers a comprehensive characterization of the area's mesophotic zone (30-50 m). The multibeam bathymetry data collected by the [National Centers for Coastal Ocean Science](#) made it possible for García-Sais and his team to identify biologically significant areas and explore them in more detail with dive teams. "The multibeam bathymetry and benthic habitat map provided by NOAA have been

essential for our biological characterization of mesophotic habitats at Bajo de Sico, Abrir la Sierra and most recently at El Seco, Vieques,” García-Sais said. “The bathymetry footprint provides a lead to where the most important benthic habitats are distributed.” The report and related mapping products will ultimately help managers in Puerto Rico make informed ecosystem-based management decisions.

**NOAA Finds Condition of the Marine Ecosystems of Vieques, Puerto Rico to be Similar to Other Areas of the U.S. Caribbean.** Researchers from the [National Centers for Coastal Ocean Science](#) found that the marine environment of Vieques, Puerto Rico appears to be less impacted by human activities than might have been expected. Contamination of coastal sediments and corals was generally low, and fish populations and coral reefs are in a condition similar to those seen elsewhere in the region, despite the historical use of much of the island by the [US Navy](#) to conduct military activities, including live bombing exercises. This study was a collaboration between the Center for Coastal Monitoring and Assessment, the Center for Fisheries and Habitat Research, the Office of Response and Restoration and the CRCP. The results of this study appear in a technical memorandum titled [An Ecological Characterization of Vieques, Puerto Rico Part II: Field Studies of Habitats, Nutrients, Contaminants, Fish, and Benthic Communities](#). Understanding the baseline condition of an ecosystem is fundamental to managing how best to manage resources. The study will serve as a baseline to compare with future studies as land-use practices and resource conditions change around Vieques.

**Regulated Species Guide Published for US Caribbean.** The new [Regulated and Protected Species in US Caribbean Waters Guide](#) is now available. It contains information and pictures of the species that are regulated in US Caribbean waters. This guide is meant to serve as a quick reference for all those working in law enforcement, conservation, and management of marine resources in Puerto Rico and the US Virgin Islands. It provides general descriptions of species that are either managed due to their importance in local fisheries, or protected under the Federal Endangered Species Act of 1973. The guide briefly summarizes pertinent Federal, Territorial, or Commonwealth regulations for each species and provides photos of the animals. All text is provided in both Spanish and English.

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