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Coral Reef News

NOAA coral reef CONSERVATION PROGRAM

Volume 6, No. 10 July 2009

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The Coral Reef Conservation Program (CRCP) is a partnership between the NOAA Line Offices working on coral reef issues, including the National Ocean Service (NOS), the National Marine Fisheries Service (NMFS), the Office of Oceanic and Atmospheric Research (OAR) and the National Environmental Satellites, Data and Information Service(NESDIS). From mapping and monitoring to managing reef resources and removing harmful debris, the CRCP addresses the priorities laid out in both the National Action Plan to Conserve Coral Reefs and the National Coral Reef Action Strategy.

From the Desk of the Program Manager

In light of recent predictions of coral bleaching in the Caribbean this year, which are covered in detail in the Announcements section of this issue, I want to take a moment to discuss NOAA's work to increase resilience in coral reef populations around the U.S. and other parts of the world. Over the past several years, NOAA has held numerous workshops for reef managers on climate change to provide managers the knowledge about what tools are available to understand bleaching, when bleaching events are likely to occur, what actions they can take to protect their reef resources, and what should be included in a bleaching response plan. These workshops have trained over 175 reef experts and managers from over 20 nations who can take the knowledge gained from these workshops and apply it to their local reefs. These workshops help prepare managers for bleaching such as the event that is now predicted to occur in the Caribbean this year.

Anticipated future carbon dioxide levels in the atmosphere will lead to more severe and more common bleaching events, but all is not lost. It has been shown that reducing local stressors can increase the resilience of coral to bleaching events. With rising impacts of climate change, it is now even more important for reef managers to address threats that they have more control of at local levels, such as adverse impacts from fishing and land-based sources of pollution. NOAA's CRCP will continue to partner with coral reef managers and the coral reef community to prepare for climate change, reduce local stressors and conserve coral reefs.

-Kacky

Announcements

Public Comment Opportunity: Regarding Petition to Revise Critical Habitat for *Acropora*. Elkhorn and staghorn corals, both of which are *Acropora* species, are listed as threatened throughout their ranges and have designated critical habitat consisting of substrate of suitable quality and availability to support larval settlement and recruitment and the reattachment and recruitment of asexual fragments. The critical habitat exists in water depths shallower than 30 meters in four areas in Florida, Puerto Rico, and the U.S. Virgin Islands. A petition from Palm Beach County Reef Rescue (FL) seeks to extend the northern boundary of designated critical habitat in the Florida area to the Lake Worth Inlet, approximately 15.5 miles (24.9 km) north of the current boundary at Boynton Beach Inlet. NOAA Fisheries found that the petition presents substantial scientific information that the revision may be warranted and thus is soliciting information and

L: Elkhorn coral *(Acropora palmata)*; R: Staghorn coral *(Acropora cervicornis)*. Courtesy: L: NOAA National Centers for Coastal Ocean Science-Biogeography Branch, and R: Andy Bruckner, NOAA Fisheries

comments pertaining to this request for revision of critical habitat for these species. The current comment period assists NOAA in determining whether the finding that revisions "may be warranted" should lead to a proposed rule for new critical habitat, or not. Written comments and information related to this petition finding, or the petitioned action, must be received by August 26. For more information, or *(continued on page 2)*

UPCOMING EVENTS

August
17-20: Reef Resilience and Climate Change: A Workshop for Coral Reef Managers, Tumon Bay, Guam.

September
21-25: OceanObs'09 Conference: 'Ocean Information for Society: Sustaining the Benefits, Realizing the Potential', Venice, Italy.

November
2: Applications due for both the NOAA Coral Reef Conservation Grant Program: General Coral Reef Conservation Grant and Project s to Improve or Amend Coral Reef Fishery Management Plans.
2-5: 22nd U.S. Coral Reef Task Force Meeting, San Juan, Puerto Rico
9: Pre-applications due for NOAA International Coral Reef Grant Program.
20: Pre-applications due for NOAA Coral Reef Monitoring Grant Program.
30: Pre-applications due for NOAA Coral Reef Management Grant Program.

Announcements continued...

instructions to submit Public Comments, see the *Federal Register Notice (pdf, 45 kb)*. If scientific information and responses to this public comment opportunity support the creation of a new proposed rule for critical habitat, a proposed rule will be drafted and a second comment period will be held on the proposed rule before a final rule is issued.

NOAA Models Show Coral Bleaching Likely in Caribbean. High thermal stress, or continued high temperatures and UV exposure, can cause coral bleaching and infectious disease outbreaks. Scientists from NOAA Coral Reef Watch (CRW) say conditions are favorable for significant coral bleaching and infectious coral disease outbreaks in the Caribbean, especially in the Lesser Antilles. The forecast is based on the July NOAA CRW outlook, which expects continued high water temperatures through October 2009. The system suggests that other areas of concern in 2009 are the central Pacific region, including the equatorial Line Islands and Kiribati. Some thermal stress may also develop between the Northern Marianas Islands and Japan. The thermal stress outlooks are available online. "Just like any climate forecast, local conditions and weather events can influence actual temperatures. However, we are quite concerned that high temperatures may threaten the health of coral reefs in the Caribbean this year," says C. Mark Eakin, Ph.D., coordinator of CRW.

A severe bleaching event occurred in the Caribbean in 2005, causing mass coral disease and mortality in parts of the region. CRW has input the data from 2005 to create a 'hind cast' with the bleaching outlook system, and the current model output for 2009 looks much like what the model would have predicted for 2005. This means that if there is not a change in underlying conditions as the worst bleaching months approach, or if local weather patterns and local conditions do not relieve some of the thermal stress in the region, the Caribbean could experience bleaching as severe as the 2005 event.

For more information, visit CRW's Website and read the NOAA Press Release, which has already generated over 25 stories in news outlets around the world.

NOAA Coral Grants Available for FY10. The CRCP is pleased to announce that Fiscal Year 2010 (FY10) Federal Funding Opportunities (FFO) for five of the CRCP's six grant programs were published in the Federal Register on July 16, 2009. Federal Register notices are the official mechanism for announcing funding opportunities within the Federal government and can be accessed online or through Grants.gov.

The FFOs published on July 16 describe the CRCP's FY10 priorities for State and Territorial Management and Monitoring grant programs, the International grant program, the General Coral Reef Conservation grant program, and the grant program that supports the efforts of relevant Fishery Management Councils to improve or amend coral reef fishery management plans. Applications and/or pre-proposals submitted under these five grant programs are due in November 2009; please see the individual FFO announcements to learn about the application process, specific due dates, and contacts from whom more information can be obtained. The portions of the FFO pertaining to these five grant programs have been excerpted and posted online for your convenience.

(continued on page 3)

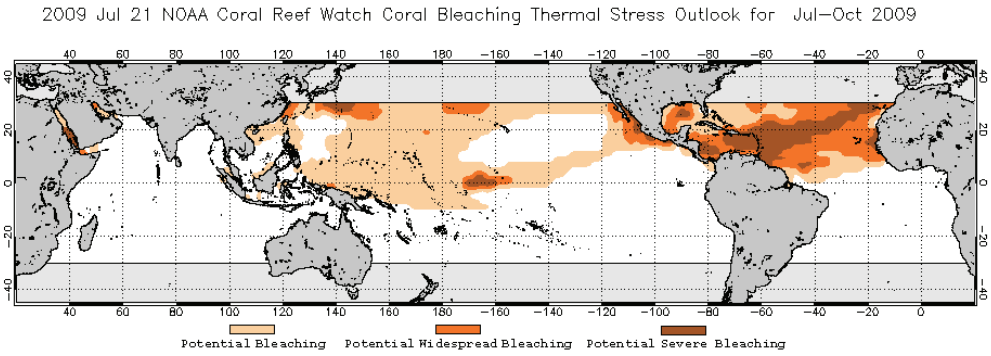


Image of the NOAA Coral Reef Watch Coral Bleaching Thermal Stress Outlook for July through October 2009, indicating the potential for significant bleaching in the Caribbean. Courtesy: NOAA Coral Reef Watch

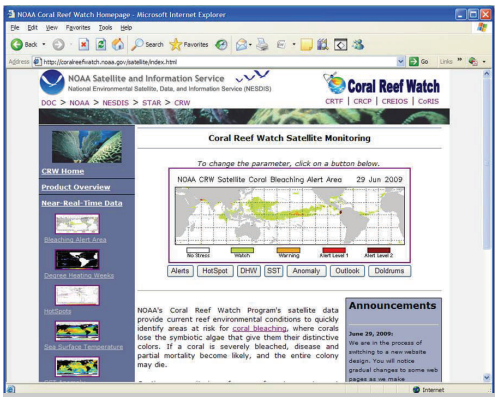
Announcements continued...

FY09 International Coral Grants Awarded. The CRCP is pleased to announce nine Fiscal Year 2009 grants that were recently awarded in various categories for a total of $436,752. One project will promote watershed management in St. Lucia through the measurement of land-use and sedimentation impacts on St. Lucia's coral reefs. Two projects will implement socio-economic monitoring in Papua New Guinea and the South Pacific region. One project will support implementation of the national protected areas initiative of the Vanuatu Village-Based Resource Managed Areas. Five projects will implement management effectiveness evaluations and management plan revisions in marine protected areas of Southeast Asia, the South Pacific, the Bahamas, and the Western Caribbean.

Through these grants, NOAA continues to exercise global leadership in the international arena in shaping and developing environmentally sound and comprehensive coral reef policy, strengthen international conventions, and foster strategic partnerships with other countries, international organizations and institutions, the public and private sectors, and non-governmental organizations to address international threats to coral reef ecosystems.

Monitoring Report Available to Partners for Review. NOAA Fisheries' Coral Reef Ecosystem Division (CRED) has made major portions of the draft *Coral Reef Ecosystem Monitoring Report for the Mariana Archipelago, 2003-2007* available for read-only review by partners via a Microsoft SharePoint interface. While not all sections of the report are currently complete, providing continuous access to the most recent version of the document for review will both increase the transparency of the report production process and help to produce a document that better meets management needs. Notices have been sent out to management partners in the Commonwealth of the Northern Mariana Islands and Guam to advise them of this opportunity for input. The majority of the data sections for all chapters are complete and currently in various stages of internal review and editing; Guam, Saipan, and Tinian are the chapters that are most advanced in the editorial process. CRED scientists are now concentrating on Archipelagic and island-specific integration sections. The draft report is scheduled to be made available in late September. If you wish to be granted access to the review site, please contact Joyce Miller.

CRW Launches Redesigned Website. NOAA Coral Reef Watch (CRW) is pleased to announce that its Website has been completely reorganized and redesigned. The new pages make it easier for new users to discover and understand CRW's data products, and new sections highlight research projects and partnerships. The URLs for existing pages remain the same, so regular users will not have to update links or bookmarks.



Screen capture of the newly redesigned Coral Reef Watch Website. Courtesy: NOAA Coral Reef Watch

TOO PRECIOUS TO WEAR
Creating a Demand for Coral Conservation

As part of SeaWeb's Too Precious to Wear Campaign, top New York and Los Angeles designers created an ocean-inspired jewelry collection that celebrates the ocean without harming it. This collection launched in NYC in February.

Updates from Headquarters

CRCP Holds 'Train the Trainer' Sessions at NMEA. The National Marine Educators Association (NMEA) held its annual conference June 29-July 3 in Monterey, California. CRCP staff gave two 'train the trainer' presentations; one on coral bleaching and a second presentation on ocean acidification and its effect on coral reef ecosystems. These presentations had a combined attendance of over 60 educators, which included about an equal mix of formal K-12 and informal educators, as well as a handful of university-level professors. Both presentations were well-received by the audience and included demonstrations and hands-on activities, as well as classroom-ready resources. The 60 educators that participated in the "train the trainer" efforts will be able to bring the information and lessons back to their respective institutions, further spreading the word about coral issues.

CORALS ARE ALREADY A GIFT · DON'T GIVE THEM AS PRESENTS

Be a Reef-Hugger

Corals are already a gift. Don't give them as presents.

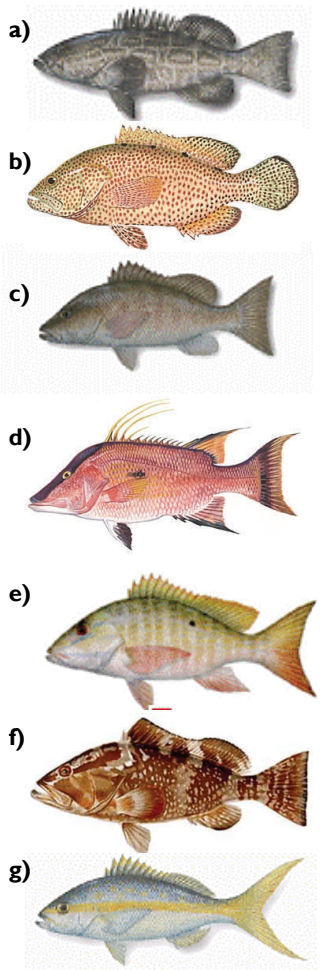
Even if you don't live near a reef, you can help protect coral reefs in the U.S.A. and around the world

Updates from the Atlantic/Caribbean Region

Southeast Regional Deep-sea Coral Research Workshop. A workshop to develop priorities for NOAA's deep-sea coral research and exploration activities in the southeast U.S., from Cape Hatteras to south Florida, was held at the University of North Carolina's Marine Laboratory in Wilmington, July 7th-8th. The workshop, funded by NOAA's Deep-sea Coral Research and Technology Program, brought together leading researchers working in the region and managers from NOAA and the South Atlantic Fishery Management Council (SAFMC) so that they could collectively identify priorities for work in the region over the coming five years. The workshop built upon the *DRAFT NOAA Deep-Sea Coral and Sponge Research and Management Strategic Plan (pdf, 331 kb)* and the SAFMC's *Deepwater Coral Research and Monitoring Plan (pdf, 253 kb)*. The top priorities identified were to map the location of coral habitats and study their importance for associated fauna, with a geographic focus on the SAFMC's proposed Deepwater Coral Habitat Areas of Particular Concern. These priorities validated the direction of the research begun in the region this year by the Deep-Sea Coral Research and Technology Program.

Marine Reserves Spur Changes in Coral Reef Fish Density in the FKNMS. The Florida Keys National Marine Sanctuary (FKNMS) established 23 small no-take marine reserves from Key Largo to Key West in 1997. In the years since the marine reserves were established, NOAA scientists monitoring reef fish populations within the protection of the FKNMS have noted significant increases in reef fish populations. During a ten-year study from 1997-2007, reef fish densities were visually monitored annually inside and outside of no-take zones and compared to a four-year baseline period before the zones were established. As predicted by marine reserve theory, within the protection of the reserves, the seven reef fish species examined that are affected by fishing pressures showed statistically significant increases in population densities of size classes appropriate for fishing. In contrast, population densities of two reference parrotfish species that are not targeted by fishing remained essentially unchanged in reserves and fished areas over the study period. This shows that the reserves have been successful in regaining a population of large adult fish as compared to outside the no-take areas.

The study also found that hurricanes and other severe storm disturbances significantly impacted population densities within reserves. Mean density of adult fish that exceed the minimum size approved in fishing regulations declined significantly in marine reserves in 2005 and 2006, years following two 2004 storms and four storms in 2005. Hurricanes appear to mix fish populations by displacing resident reef fishes. The result is a 'pulsed spillover' in which net movement of fish is away from small, high density sites in the reserves to larger surrounding fished areas with lower densities. To learn more, request a copy of the draft report on this ten-year study.



Reef fish species examined in FKNMS study: a) black grouper, b) graysby, c) gray snapper, d) hogfish, e) mutton snapper, f) red grouper, and g) yellowtail snapper. Courtesy: NOAA Southeast Fisheries Science Center

NOAA-Funded Management Plan Approved for Puerto Rico Reserve. The Puerto Rico Planning Board recently approved the Management Plan for the Luis Peña Channel Natural Reserve, a no-take reserve located in Culebra, Puerto Rico. This is the second Natural Reserve plan approved by the Planning Board and it was funded by NOAA through the National Fish and Wildlife Foundation. The funds were granted to the Authority for the Conservation and Development of Culebra (ACDEC), a Commonwealth of Puerto Rico agency under the administration of the Culebra Mayor's office, to support the implementation of a collaborative process in conjunction with the Department of Natural and Environmental Resources (DNER) and the local community to write a management plan for the Luis Peña Channel Natural Reserve.

In 1990, the Asociación de Pescadores de la Isla de Culebra, a fisher's association of Culebra Island, proposed the establishment of small no-take fishery reserves as a tool for recovery of depleted fisheries stocks. After a site selection process and negotiations led by the community, the Puerto Rico Planning Board designated the Luis Peña Channel Natural Reserve in July 1999. Through an administrative order, the DNER Secretary further designated it as a no-take fishery reserve in September 30, 1999 prohibiting the extraction of marine resources within the Natural Reserve's boundaries.

The approved management plan was developed through a multi-stakeholder process and with extensive public participation. NOAA CRCP staff provided training and facilitated several workshops that led to the formation of stakeholder working groups and the development of this plan. It addresses issues affecting the Reserve and includes goals and objectives for target areas such as enforcement, public awareness and education, habitat protection and restoration, and research needs, among others chosen by a multidisciplinary working *(continued on page 5)*

Atlantic/Caribbean continued...

group. It is a positive step towards more effective conservation of reefs and associated habitats within the Reserve.

NOAA and Partners Investigate Condition of St. John Coral Reef Ecosystems. Scientists with NOAA's National Centers for Coastal Ocean Science and partners recently completed a two-week mission in St. John, U.S. Virgin Islands. From July 6-17, the group surveyed the waters in and around the island's national parks and monuments to study and characterize the corals, fish and other organisms living on the reefs. Ultimately, the biological data collected will help reef managers evaluate the effectiveness of existing protected areas and make management decisions to best balance human needs and the need to protect these ecosystems for future generations.

Emergency Coral Restoration Completed at Site of Ship Grounding. On April 19, NOAA was notified by U.S Coast Guard Sector San Juan that the 42' pleasure craft *M/V Atlantique* had grounded north of the island of Vieques off the east coast of Puerto Rico. Initial site visits by NOAA personnel confirmed the vessel was hard aground on the reef crest of the small coral cay "Arrecife Corona," located between Cayo Mosquito and Caballo Blanco off the north coast of Vieques. After about 40 hours of salvage operations, the vessel was finally removed from the reef on April 23rd. In a collaborative effort between personnel from the Puerto Rico Department of Natural and Environmental Resources, NOAA's Restoration Center, and the local dive operation, Sea Ventures, additional surveys and coral triage were conducted over the following weeks. During these trips, approximately 150 corals ranging from 10-60 cm in size were cached in the back reef and an additional 100 were left near the impact site to be addressed during emergency restoration. A minimum of 250 stony coral colonies were damaged as a result of the *M/V Atlantique* grounding, including three colonies of *Acropora palmata* that are currently listed as Threatened under the Endangered Species Act.

L: The *M/V Atlantique* grounded on Arrecife Corona off of Puerto Rico. R: Propeller damage to this brain coral is one of the negative impacts of the grounding. Courtesy: Sean Griffin, NOAA Restoration Center

The restoration team mobilized again in late June for emergency restoration. Over the course of a week, approximately 250 coral colonies, from 10 cm to one meter in diameter, were reattached. This included the 150 corals that had already been cached during the first two trips in May and an additional 100 fragments and colonies that were collected from the impact site. A number of larger coral colonies that were greater than 60 cm diameter were removed from the reef crest with lift bags, transported to the back reef, and reattached. Reattachment enhances the recovery and survival of these injured colonies by preventing future mobilization. There was also a large amount of rubble generated from the impact that may cause additional damage to the reef in the future as storms and swells mobilize these pieces and cause them to abrade or smother additional coral colonies. Emergency restoration, such as this, is critical to the affected reef to reduce the amount of mobile rubble and because very large colonies were impacted; restoration of these large colonies represents a direct opportunity to preserve corals that are hundreds of years old and a key part of the coral reef reproductive strategy. Fifty of the restored colonies have been tagged for monitoring to track their recovery and survival rate and assist in the continual modification and refinement of restoration techniques. This emergency restoration effort was supported with resources from NOAA's Assessment and Restoration Division, Fisheries Southeast Regional Office, the CRCP, and Restoration Center. Click here to watch a video of this restoration effort.

This year has been an unprecedented year for groundings, with over 30 reported in the U.S. Caribbean in July alone. Most groundings warrant varying levels of restoration, but the NOAA Restoration Center currently only has the capacity to complete a fraction of the restoration needs that exist.

Research Mission Completed on Three Cooperative Projects in Puerto Rico. photos From June 11-23, NOAA CRCP scientists and research assistants from the University of Puerto Rico (UPR) and Texas A&M University at Galveston (TAMUG) completed a cooperative research mission by leveraging and sharing resources to accomplish multiple research objectives effectively and *(continued on page 6)*

DID YOU KNOW...

Proposals for project funding via the CRCP Grants Programs are being accepted through various dates in November 2009.

Learn more by reading the Federal Funding Opportunity.

Be a Reef-Hugger

As the Summer boating and diving season begins, please make a point to ALWAYS use a mooring buoy or anchor away from reefs and sea grass beds.

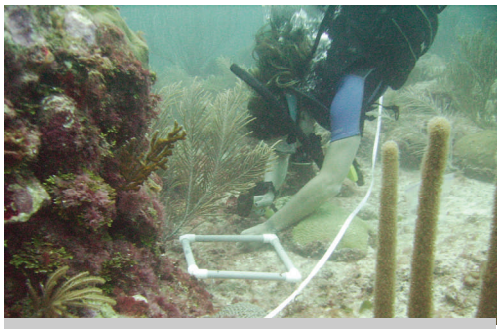
Atlantic/Caribbean continued...

Every Act Counts

Don't drag the reef into this.

Use reef mooring buoys when available. Or, anchor in sandy areas away from coral and sea grasses so that anchor and chain do not drag on nearby corals or tear-up sea grass beds. Once broken, corals can take decades or longer to re-develop, and a damaged reef is less able to provide food, habitat and shoreline protection.

Whether you live one mile or one thousand miles from a coral reef, your actions affect the reefs' future – and the reefs' future affects yours. As the natural guardians of our shores, reefs play a vital role in our global ecosystem. With climate change, pollution, and overfishing contributing to coral reef degradation, we can all play a role in protecting our land, sea and sky. And all it takes is a few simple changes to your daily routine.



Jennifer Atchison, a research technician at SEFSC-Galveston and Masters student at TAMUG, sets up coral recruitment quadrats at Mona Island. Courtesy: Ron Hill, NOAA Southeast Fisheries Science Center

efficiently. The mission involved work on three coral reef projects, coral health and disease; productivity of staghorn (*Acropora cervicornis*); and grunt (*Haemulid*) recruitment, in western and southwestern Puerto Rico. Researchers compared coral health and disease metrics across a gradient of human population densities at Desecheo Island, Mona Island and La Parguera. This ongoing research has demonstrated that over the last decade, coral diseases have continued to drastically change coral reef ecosystems at all three sites, despite human population differences. Recovery has been sparse, and researchers are now paying special attention to new coral recruitment to signal future recovery at these sites. The staghorn colonies surveyed at La Parguera and Mona Island appeared to be in good shape, with signs of new growth and little disease, though they showed some evidence of predation by fire worms and corallivorous snails. Fish utilization of these habitats was explored, and colonies affected by disease or predation were tagged for additional monitoring. The research team was able to collect data for a CRCP-grant funded researcher from the University of Houston, whose transplant sites overlapped with two transects at Mona Island. Researchers also downloaded continuous temperature loggers from each site. The science team also opportunistically collected post settlement grunts from La Parguera to support the Masters project of a TAMUG grad student assistant who is working with NOAA scientists from the NOAA Fisheries Southeast Fisheries Science Center's Galveston Lab. This project, which involves genetically identifying grunt species, will provide greater insight into the habitat needs for successful settlement and recruitment of key reef fish species.

Fish Telemetry Data Improves GRNMS Conservation Management. On June 7-15, a scientist from the National Centers for Coastal Ocean Science surgically implanted acoustic transmitters into red grouper, gag, scamp, and red snapper to study the movement patterns of the fish. Fish locations are continuously monitored within GRNMS by an array of hydrophones. This study will help managers at Gray's Reef National Marine Sanctuary (GRNMS) improve conservation planning. This marks the second year of this study; results from last year showed that most grouper stay at a "home ledge" for several months but then travel more widely. This study was a partnership with GRNMS and Georgia's Department of Natural Resources. For more information, click here.

Marine Debris Monitoring and Removal in GRNMS. Scientists from the National Centers for Coastal Ocean Science (NCCOS) and Gray's Reef National Marine Sanctuary (GRNMS), along with local volunteer divers, surveyed nine long-term monitoring sites from June 7-14 to determine the rate of accumulation of marine debris in the sanctuary. In general, most marine debris was found on tall, well-colonized ledges which not only support more fish, but also snag fishing gear more readily. Any debris found within the survey site was identified and removed, and scientists recorded their observations of entanglement of marine creatures, negative impacts on biota, and degree of fouling. In addition, NCCOS scientists trained the local divers in survey protocol so that they can conduct future monitoring in the Sanctuary. For more information, click here.

PSA on Proper Disposal of Trash Created for Puerto Rico. As part of a campaign to promote the conservation of beaches and near-shore marine habitats and reduce the quantify of trash impacting these habitats, the NOAA Fisheries Caribbean Field Office has completed a 30-second public service announcement (PSA) that encourages people to dispose of trash properly when they visit the beach. The PSA, which was funded through the CRCP, is now airing on local and cable television stations in Puerto Rico will also air on the radio. The PSA was produced by the founder of Turismo en Borinquen, and will also air during this local tourism program on cable stations around Puerto Rico.

Updates from the Pacific Region

Enviro-Discoveries Camp in American Samoa. Le Tausagi, an educational group composed of both local and federal government resource agencies in American Samoa, hosted an Enviro-Discoveries Camp this summer targeting students from ages eight to 13. Enviro-Discoveries Camp is an annual event put together by Le Tausagi to educate the young people of American Samoa on the importance of conservation and management of its resources, while fostering and promoting their stewardship and interest. More than 40 children participated in this camp where they learned about corals, fish, turtles, pollution, piggeries, watershed, wetlands, and forestry through hands-on activities, songs, and skits. The students were engaged in activities that connects them to their environment from land to sea. One of the activities, sponsored by NOAA Fisheries' Pacific Islands Regional Office, was the Environmental Wish Banner. Each student, volunteer, and Le Tausagi member were asked to write their own environmental wish explaining how they would like to envision their environment or American Samoa. The Wish banner will be displayed at various public areas to promote environmental stewardship in the Territory.

Campers write messages on the Environmental Wish Banner. Courtesy: Alyssa Edwards, NOAA Coral Reef Management Fellow

Marine Debris Removal in the NWHI. Two NOAA Fisheries' Coral Reef Ecosystem Division (CRED) scientists worked with the U.S. Coast Guard (USCG) and the U.S. Army's 7th Engineer Dive Team aboard the USCG Vessel *Walnut*, a 225-ft buoy tender, in removal of marine debris from the northernmost of the Northwestern Hawaiian Islands (NWHI) in the Papahānaumokuākea Marine National Monument (Monument). The marine debris crew departed June 21 for a 2,900-mile multi-mission trip to Maro Reef, Kure and Midway Atoll. During the three- week voyage, an estimated 32 tons of derelict fishing nets were removed from the waters and beaches of the Monument. CRED's staff provided technical support using geographical information systems to survey, locate, and provide expertise on removing marine debris. Previous CRED marine debris studies provide estimates that approximately 52 metric tons of debris accumulate in the NWHI each year. In addition to the marine debris removal, the Coast Guard vessel was engaged in a two-week law enforcement patrol of the Monument. The ship returned to port on July 12th. To learn more, read the USCG news story.

New Data in CoRIS

Product Name	Description
Deep Profiles of Temperature, Salinity, Oxygen Saturation, and Flourescence Data from 12 Select R/V Oscar Elton Sette Cruises in the Northwest Hawaiian Islands 2003-2007 (NODC Accession 0036670) *Sample link to metadata for this product*	The Pacific Islands Fisheries Science Center conducted cruises in the Northwest Hawaiian Islands on the R/V Oscar Elton Sette during 2003-2007. 12 select cruises are included in this batch. Finalized data include the profiles of temperature, salinity, oxygen saturation, and fluorescence.
Deep Profiles of Temperature, Salinity, Oxygen Saturation, and Flourescence Data from 14 Select R/V Hi'ialakai, Townsend Cromwell,and Oscar Elton Sette Cruises in the Northwest Hawaiian Islands and Guam 1999-2006 (NODC Accession 0038588) *Sample link to metadata for this product*	The Pacific Islands Fisheries Science Center conducted cruises in the Northwest Hawaiian Islands and Guam on the R/V Hi'ialakai, Townsend Cromwell, and Oscar Elton Sette during 1999-2006. 14 select cruises are included in this batch. Finalized data include the profiles of temperature, salinity, oxygen saturation, and fluorescence.

We value your feedback. Feel free to email us comments .

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The CRCP supports effective management and sound science to preserve, sustain and restore valuable coral reef ecosystems.