

# Coral Reef News

## Volumes 8, No. 4

### January 2011

#### FROM THE DESK OF THE PROGRAM MANAGER

As many of you are aware, Kacky Andrews resigned as the NOAA Coral Program Manager this month. She was a tremendous asset to the agency and this Program, and I wish her the best of luck as she begins a new journey. I feel quite honored that the Program's Senior Management Council has asked that I serve as the Acting Program Manager until the position can be permanently filled. So, you will see messages from me in this and other fora in the coming months.

In the past three years, the CRCP has come a long way. We took the recommendations of the 2007 [External Review Panel](#) and, by this summer, we will have accomplished everything we set out to do in the [NOAA CRCP Roadmap for the Future](#). This has included setting national [Goals and Objectives](#); assisting the states and territories in more clearly articulating their coral reef [priorities](#); establishing new performance measures; improving our budget development and budgeting practices; devising a national coral reef monitoring plan; and developing strategies for our international work, social science work, and education and outreach activities. This has made the Program more directed, strategic and effective. Ultimately, these changes will increase our ability to meet of mission of conserving coral reef ecosystems.



If you are reading this, I do not need to convince you of the importance of reefs to our national economy and the hundreds of millions of people worldwide that rely on them for food security, coastal protection, livelihoods, and recreation. I also do not likely need to convince you of the critical role NOAA's Coral Program plays in understanding coral reef ecosystems and conserving them for continued ecological and economic benefits. However, in the current macroeconomic climate, it is my responsibility to ensure that decision makers are aware of the vital importance of these ecosystems to our nation and the role our program plays. That will be my focus during this interim period.

-Steve

#### CORRECTION

*The following is a correction to an article that appeared in the last issue of this publication.*

**Coral Micrographs Place in International Photo Competitions.** Micrographs of coral by James Nicholson, a volunteer with the Coral Culture and Collaborative Research Facility at the [National Centers for Coastal Ocean Science Center for Coastal Environmental Health and](#)

## UPCOMING EVENTS

### February

13-18: [ASLO 2011](#), San Juan, PR.

22-25: [25<sup>th</sup> US Coral Reef Task Force Meeting](#), Washington, DC.

### March

10-13: [National Science Teachers Association National Conference: Celebrating the Joy of Science](#), San Francisco, CA.

### May

14-18: 2<sup>nd</sup> [International Marine Conservation Congress: Making Marine Science Matter](#), Vancouver, BC, Canada.

### July

17-21: [Coastal Zone 2011](#), Chicago, IL.

[Biomolecular Research](#) in Charleston, S.C.—operated by NOAA—recently placed in international photo competitions for Nikon and Olympus. Mr. Nicholson’s image of a [mushroom coral](#) placed 3<sup>rd</sup> in the Olympus BioScapes Digital Imaging Competition (out of 2000 entries). *Scientific American* featured this image, among others, in the December issue in an [article](#) highlighting the Bioscapes competition. Another entry of an [Acropora species](#) received an honorable mention in the same contest. A different image of a [live mushroom coral](#) placed 13<sup>th</sup> in the Nikon Small World Competition, with an image of a [fluorescing mushroom coral](#) included in the Images of Distinction for the competition. Winners of the Nikon competition were announced on the Today Show in October and 13<sup>th</sup> place image also appears in the Nikon Small World 2011 [Calendar](#) as the image for July. For more information, please contact [Cheryl Woodley](#).

## ANNOUNCEMENTS

**Announcing the 25<sup>th</sup> Meeting of the US Coral Reef Task Force.** The 25<sup>th</sup> bi-annual meeting of the [US Coral Reef Task Force](#) (USCRTF) will be held on Thursday, February 24, 8:00am - 5:00pm in the [US Department of the Interior](#) (DOI) Auditorium in Washington, DC. To register for the meeting or see the meeting agenda, please click [here](#). This meeting has time allotted for public comment. To sign-up for public comment, please email [Liza Johnson](#). Advance public comments can be submitted to the same email address until February 19, 2011. If you have any questions regarding the meeting, please contact Liza.

The USCRTF is comprised of 12 federal agencies and the seven US states and territories that contain coral reefs within their boundaries. The USCRTF is charged with coordinating government efforts to protect these valuable resources. Updates on individual and cross-agency conservation initiatives, as well as decisions for the future direction and actions of this body, are a key part of these meetings and contribute to overall US coral conservation successes. NOAA serves as the co-chair of the USCRTF with DOI.

**Leave Paradise in its Place!** Collection of corals and other marine organisms as souvenirs is a problem in Puerto Rico and U.S. Virgin Islands (USVI). The NOAA Fisheries Caribbean Field Office received NOAA CRCP funds to launch a campaign to *Leave Paradise in its Place!* With the collaboration of the [Caribbean Fisheries Management Council](#) and the [Virgin Islands Network of Environmental Educators](#) (who originated the *Leave Paradise in its Place!* slogan), an advertisement was placed in Continental and American Eagle Latitudes airline magazines, as well as local newspapers in Puerto Rico and USVI and on airport billboards in San Juan. Also, a short educational video and a 30-second PSA were produced in English and Spanish entitled “*Caribbean Marine Etiquette.*” The video and PSA aim to educate tourists and local people of the U.S. Caribbean regarding the importance of coral reef ecosystems, as well as recreational

practices that can damage them. NOAA [National Marine Fisheries Service](#) has begun the distribution of the video and is working to partner with local TV stations, hotels, tourist associations and agencies, and businesses in USVI and Puerto Rico to air the video and PSA. The launch of the video will officially begin in the spring of 2011. Once launched, the video will be available for viewing [here](#). For information about the launch of the video campaign, please contact [Lisa Marie Carrubba](#).



This advertisement for the campaign appeared in airline magazines and local newspapers in Puerto Rico and USVI. The ad was created by Janell Conner Design in coordination with the CFO.

## UPDATES FROM THE ATLANTIC/CARIBBEAN REGION

**Grouper Spawning Research in the Dry Tortugas.** [Southeast Fisheries Science Center](#) (SEFSC) investigators conducted a three day research cruise in the Tortugas South Ecological Reserve (TSER) from January 17-19 to study grouper spawning aggregations. The project was a collaboration of scientists from the SEFSC's [Beaufort](#) and [Miami](#) laboratories, the [University of South Florida](#) and the [National Centers for Coastal Ocean Science](#). Scientists retrieved two previously deployed digital spectrum recorders (DSRs), which are passive acoustic listening devices, at sites likely to harbor spawning aggregations of grouper species. The DSRs were downloaded and replaced along with installation of four additional DSRs at new stations. Scientists are hoping to verify and document the location and timing of spawning events by capturing acoustic signals associated with grouper spawning. Point counts and transect counts were made in order to relate acoustic sounds recorded with in situ observations of grouper species present. For the first time in the TSER, a diver observed and reported courtship behavior between two black grouper.

During the mission, scientists noted a significant increase in the presence of invasive lionfish at Riley's Hump. Over 50 lionfish were captured and killed by scientists and staff in the research party, some of which were collected for NCCOS scientists conducting genetic connectivity studies of lionfish in the Southeast-Caribbean region. These observations are a dramatic change from the previous cruise, in April 2010, when three days of diving yielded a single lionfish observation. Lionfish have no natural predators in this region, but divers observed the consumption of speared and cut-up lionfish by both black grouper and moray eels.

**Thriving 'Middle Light' Reefs Found in Puerto Rico.** NOAA-funded scientists have found extensive and biologically diverse [mesophotic](#) coral ecosystems occurring at depths between 100-330 feet within a 12 mile span off the southwestern coast of Puerto Rico. With the overall health of shallow coral reefs and the abundance of reef fish in Puerto Rico in decline, this finding brings hope that deeper fish stocks may help to replenish stocks on shallower reefs. This study was funded by the [National Centers for Coastal Ocean Science](#) and conducted by a team of

scientists and students from the [University of Puerto Rico](#) and the [Caribbean Coral Reef Institute](#), in collaboration with the [University of North Carolina Wilmington](#). It is a companion to a similar mesophotic coral ecosystem research program in Hawai'i. To learn more, please read the NOAA [press release](#) and view the *Associated Press* [video](#).

## UPDATES FROM THE PACIFIC REGION

**Scientists Conduct Fish REA Surveys Around the Island of Oahu.** NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) personnel conducted fish [rapid ecological assessment](#) (REA) surveys around the island of Oahu in November and December, 2010, as a continuation of work done during the October 2010 Main Hawaiian Islands (MHI) Reef Assessment and Monitoring Program [cruise](#).

Scientists and management agencies have repeatedly recommended that a random stratified sampling approach be used for fish surveys in order to increase the statistical rigor of these observations. The CRED fish team has been working to increase the number of surveys around important management areas to meet these requirements. These additional surveys increase the number of observations in the MHI, which will aid CRED's fish team in doing more rigorous statistical analysis of the fish data collected in the MHI over the past five years.

**CRED Maps Important Coral Reef Resources in Kaneohe Bay.** Scientists from the NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) mapping team completed a multibeam sonar survey of Kāne`ohe Bay in October 2010. Surprisingly, although Kāne`ohe Bay is an important and heavily populated management area and the home of the [Hawai'i Institute of Marine Biology, University of Hawai'i](#) (UH), it had not been completely mapped using modern shallow-water survey methods. Some light ranging and detection (LIDAR) data were available in the shallowest areas of the north bay from [Army Corps of Engineers](#) (ACOE) surveys performed in 2001, but turbid conditions in this bay compromised data collected in deeper and southern areas. Kaneohe Bay was one of the last major gaps in the MHI seafloor data synthesis and numerous management issues require accurate and complete maps. Thus, this area was one of the most prominent gaps in seafloor survey data in a [comprehensive data synthesis](#) being compiled jointly by NOAA and UH.

[Multibeam sonar data](#) were collected over a period of three weeks using the NOAA [R/V AHI](#), a 25-ft survey launch. The data are now being processed at the [Pacific Islands Benthic Habitat Mapping Center](#) and will be combined with topographic data and the LIDAR from ACOE. Completion of processing and integration is scheduled for late 2011, when all data will be made publicly available. In addition, at the request of the [Hawai'i Department of Land and Natural Resources](#), CRED also did a re-survey of areas south of the Reef Runway of the Honolulu International Airport in December 2010.

**Monitoring Impacts of Closure of Managed Area in West Maui to Take of Herbivorous Fishes and Sea Urchins.** Based on clear downward trends in coral cover combined with a number of periods of persisting algal overgrowth of the reef in the Kahekili area in the late 1990s and the 2000s, the state of Hawai'i established the [Kahekili Herbivore Fisheries Management Area](#) (KHFMA) in 2009 in a bid to arrest the apparent slide towards a coral-algal phase shift at

that reef. KHFMA was closed to take of sea urchins and herbivorous fishes—such as parrotfishes, surgeonfishes, and chubs—and of sea urchins in late 2009.

The NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) is collaborating with staff of the [Division of Aquatic Resources](#) (DAR) of the [Hawai'i Department of Land and Natural Resources](#) to monitor the impacts of the closure of the KHFMA. In September 2010, CRED and DAR staff completed nearly 100 transects in the KHFMA to assess fish diversity, biomass, and abundance and took benthic photographs for later analysis.

On-going monitoring by CRED and DAR utilizes the survey methods and sampling design approach that was implemented by CRED for baseline surveys in 2008 and early 2009 and, thus, because comparisons of reef conditions can be made over time, gives the ability to comprehensively assess the effectiveness of the KHFMA. Experience from KHFMA has demonstrated that herbivore closure areas can win substantial public support in Hawai'i. Clear and scientifically strong monitoring of the effects of herbivore protection at Kahekili has the potential to lead to wider adoption of this form of marine managed area and to wider protection of herbivores in general.

## INTERNATIONAL UPDATES

**CRW Staff Attend Great Barrier Reef Status Meeting.** On January 13, the [Great Barrier Reef Marine Park Authority](#) (GBRMPA) held a meeting of expert scientists and managers to organize appropriate responses to current levels of environmental stress on the Great Barrier Reef (GBR), Australia. The meeting included representatives from ten agencies, universities, and government departments, including: GBRMPA, the [Reef and Rainforest Research Centre](#), NOAA [Coral Reef Watch](#) (CRW), the [Australian Institute of Marine Science, James Cook University](#), the [Department of Environment and Resource Management](#) (Queensland Government), the [University of Queensland, Bureau of Meteorology, Department of Employment, Economic Development and Innovation](#) (Queensland Government), and the [Commonwealth Scientific and Industrial Research Organisation](#). Two NOAA CRW staff attended.

While significant temperature-related bleaching is not expected for this summer, a major topic addressed at the meeting was the substantial threat to the GBR from freshwater bleaching. On December 24, 2010, a cyclone caused minor flooding throughout much of the North Queensland east coast. A subsequent series of rain events caused unprecedented flooding, resulting in a total flood area larger than Germany and France combined. Much of this freshwater, and accompanying sediment, will eventually end up on the GBR. Efforts to monitor river plumes and analyse reef impacts are ongoing and involve a range of on-water and in-water measurements. Moderate Resolution Imaging Spectroradiometer (MODIS) is also being used to monitor flood plumes, though its use is being hampered by the presence of an active monsoon trough over Queensland.

Meeting participants recognized that an opportunity exists to learn more about freshwater and sediment effects on reefs; therefore, they have agreed to cooperate to collect relevant data from this event. CRW will continue to provide Australian agencies and government departments with

relevant, timely satellite data and products. In turn, NOAA will have access to most of the field data and all of the findings from these collaborative efforts. A follow-up meeting will occur toward the end of February, and NOAA CRW staff will again be in-attendance.

**Census of Marine Life Celebrates a Decade of Discovery.** NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) staff were among the scientists presenting findings of the [Census of Marine Life](#) (CoML)—a 10-year initiative to better understand the abundance, diversity, and distribution of marine life in the world’s oceans—at the “Decade of Discovery” events in London held in October 2010.

For the [Census of Coral Reef Ecosystems](#) (CReefs), a CoML project that began in 2006, CRED has led efforts to deploy more than 600 autonomous reef monitoring structures (ARMS) throughout the world’s oceans and the interest among partners worldwide continues to climb. Now a CoML legacy, ARMS serve as systematic tools for assessment and monitoring of cryptic invertebrates. Other CReefs work—led by CRED, the [Smithsonian](#), [Scripps Institution of Oceanography](#), and the [Australian Institute for Marine Science](#)—included thorough censuses of lesser studied coral reef organisms and advances in genomics that will allow for rapid mass-parallel sequencing of organisms found on ARMS and in dead coral heads to monitor changes caused by ocean warming and ocean acidification.

As a result of the CoML, more than 1200 new species have been described in the world’s oceans, 5,000+ possible new species have been collected and not yet described, 35,000+ species identified with DNA barcodes, 18 million+ microbial DNA sequences catalogued, and 2,600+ peer reviewed scientific publications generated. A global partnership of numerous organizations, including NOAA, CoML consisted of more than 2700 scientists, 80+ countries, 540+ research expeditions, and 9000+ at-sea days. This unprecedented collaboration has given a more complete picture of what exists in the world’s oceans, but even more so, how much we still don’t know. The amount of the as-yet-unknown is extensive—showing a clear need for continued concerted efforts.

## **DIVE DEEPER: DEEP-SEA CORALS**

**NOAA Scientists Go to Extremes to Study Deep-Sea Coral.** A team of scientists aboard the [NOAA Ship Ronald H. Brown](#) returned on November 23 from a 15-day expedition to explore previously uncharted deep-sea coral ecosystems from Pourtales Terrace off the Florida Keys to the Jacksonville Lithoherms. Explorations were conducted using [Woods Hole Oceanographic Institution’s](#) remotely operated vehicle, *Jason II*. The expedition, called [Extreme Corals 2010](#), was sponsored by NOAA’s [Deep Sea Coral Research and Technology Program](#) and was the final field effort in year two of a three-year mission focused on the southeast region of the United States. During the transit to the first Atlantic Ocean site, one ROV dive was made at a recently discovered deep coral site in the Gulf of Mexico off Tampa.

The expedition was developed in consultation with the [South Atlantic Fishery Management Council](#) and concentrated on the new Coral Habitat Areas of Particular Concern established in July. This year’s mission was the first time many of these reefs had been seen by scientists.

“Deep-sea coral reefs are some of the oldest and most fragile, yet least studied habitats on the planet,” said Andrew David, NOAA research fishery biologist. “Attaining a balance between protection and use of these areas is critical, and this expedition will advance our knowledge of and promote effective management strategies for these important ecosystems.”

Like shallow tropical corals, deep-sea corals provide habitat for fish and other marine life. Recent research has revealed the ecological importance of deep-sea coral communities and the threats they face, such as bottom-tending fishing gear. Sound management of these ecosystems requires scientifically based information.



The *Jason II* preparing for a dive and scientists sorting specimens retrieved during the mission. Images by Art Howard.

“Because these deeper regions are at increased risk of exploitation, their ecological role and value need to be better understood,” said expedition chief scientist Dr. Steve Ross of the [University of North Carolina Wilmington](#). “These ecosystems represent thousands to millions of years of development and once damaged, they may never recover,” said Ross.

Several discoveries were made during the expedition, including the location of a deep coral ecosystem at a depth shallower than previously known in the southeastern US, probably due to a localized and persistent upwelling of cold, nutrient rich bottom waters. This and other findings may, “help federal managers refine the protected areas and include some of the new reefs that were discovered,” Ross added.

Partners in this mission included the [Cooperative Institute for Ocean Exploration, Research and Technology](#), [Marine Conservation Biology Institute](#), the [US Geological Survey](#), and several other government and academic organizations.

**Google Earth Page of West Coast Deep-water Corals and Sponges.** NOAA scientists from the [National Marine Fisheries Service Southwest Fisheries Science Center](#) and the [National Centers for Coastal Ocean Science’s Center for Coastal Environmental Health and Biomolecular Research](#) launched a new interactive [Google Earth](#) page documenting a recent research cruise between San Diego, CA and Seattle, WA. Remotely operated vehicle surveys were conducted from 200-600 meters depth to investigate deep-water sponges and corals in Sur Canyon, south of Monterey Bay; on The Football, a bank north of San Francisco Bay; on Coquille Bank off the Oregon coast, and two sites within the [Olympic Coast National Marine Sanctuary](#). The virtual tours are a ‘first-look’ data product for sharing preliminary cruise results.

## NEW DATA IN CoRIS

Product Name	Description
Integrated Coral Observing Network (ICON) station data for 2009  <a href="#">Sample Link</a>	Instrument arrays to measure the various environmental influences are being deployed at key coral reef areas to gain long-term temporally intensive data coverage, to provide near real-time information products, and to surface-truth NOAA satellite sea surface temperature (SST) products used for coral bleaching predictions ("HotSpot" products). Stations included in this update: Salt River Bay, St. Croix, US Virgin Islands (SRVI2); Media Luna, La Parguera, Puerto Rico (LPPR1); and ICON Reef, Little Cayman, Cayman Islands (LCIY2).
2010 CRED REA Belt Surveys of Coral Population and Disease Assessments in American Samoa and the Pacific Remote Island Areas  <a href="#">Sample Link</a>	As a part of REA surveys, the coral belt surveys were focused on quantifying the diversity, abundance, density, and size-class distribution of the anthozoan and hydrozoan corals as well as the condition and health state of the coral reef populations. The surveys were conducted along two consecutively-placed, 25m transect lines. The belt width was 1-m wide, 0.5-m on each side of the transect line. Within each 25m transect, five 2.5-meter segments were surveyed (beginning at points: 0, 5, 10, 15, and 20 meters), whereby in each segment, all coral colonies whose center fell within 0.5m of either side of the transect line were identified to the lowest taxonomic level possible (genus or species) and two planar size metrics were collected: maximum diameter and diameter perpendicular to the maximum diameter. In addition, the extent of mortality, both recent and old, was estimated for each colony.
Gridded Geomorphology data files for Baker Island, Howland Island, and Johnston Atoll  <a href="#">Sample Link</a>	The geomorphological data layers of slope, rugosity, bathymetric position index (BPI) structures and BPI zones produced at the Pacific Islands Benthic Habitat Mapping Center (PIBHMC) were derived from multibeam bathymetry.
The Coral Reef Temperature Anomaly Database (CoRTAD) Version 3 - Global, 4 km Sea Surface Temperature and Related Thermal Stress Metrics for 1982-2009 (NODC Accession 0068999)  <a href="#">Sample Link</a>	The Coral Reef Temperature Anomaly Database (CoRTAD) Version 3 is a collection of sea surface temperature (SST) and related thermal stress metrics, developed specifically for coral reef ecosystem applications but relevant to other ecosystems as well. The CoRTAD Version 2 contains global, approximately 4 km resolution SST data on a weekly time scale from 1982 through 2009. CoRTAD Version 3 is related to the CoRTAD Version 2 (NODC Accession 0054501), but contains one additional year of data (2009).
2007 Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) Hawaii Lidar: North Coasts of Hawaii (Big Island), Kauai, Maui, Molokai, Oahu  <a href="#">Sample Link</a>	The purpose of the 2007 Hawaii survey, in general, was to collect both bathymetric and topographic lidar along the northern coastline of the Hawaiian Islands. Topographic data were required between the zero and 15 meter contours, nominal, for the northern coastline of the islands of Hawaii (Big Island), Kauai, Maui, Molokai, and Oahu. Bathymetric Lidar data collection was attempted in Kaneohe Bay, Oahu, to fill-in the data gaps between the shoreline and the previously collected SHOALS data. Bathymetric Lidar data were collected on the island of Hawaii from Honolii Stream south along the shoreline to the existing SHOALS data. The data were to be collected from the land water interface seaward to a depth of 40 meters or laser extinction, whichever comes first.

<p>SEAKEYS - Meteorological and Oceanographic Historical Observations 2009</p> <p><a href="#">Sample Link</a></p>	<p>The Florida Institute of Oceanography's (FIO) SEAKEYS (Sustained Ecological Research Related to Management of the Florida Keys Seascape) program began in 1989 and has continued until the present. This program implements a framework for long-term monitoring and research along the 220 mile Florida coral reef tract and in Florida Bay at a geographical scale encompassing the Florida Keys National Marine Sanctuary (FKNMS). The network consists of six instrument-enhanced Coastal-Marine Automated Network (C-MAN) stations, cooperatively managed with NOAA's National Data Buoy Center, plus a proposed new one in northwest Florida Bay. These stations measure the usual C-MAN meteorological parameters, such as wind speed, gusts and barometric pressure, but are enhanced with oceanographic instruments measuring salinity, sea temperature, fluorometry and turbidity.</p>
<p>Reef Fish Surveys for Fagatele Bay, American Samoa, 2007 (NODC Accession 0068717)</p> <p><a href="#">Sample Link</a></p>	<p>Fish surveys were conducted in November 2007 using visual census techniques at Fagatele Bay. This data set was collected at Transect 2, Fagatele Bay, in collaboration with surveys of NODC Accession 0066319, which is composed of coral and benthic surveys.</p>
<p>CRED Marine Debris Survey and Removal Efforts within the Northwestern Hawaiian Islands during 1999-2009</p> <p><a href="#">Sample Link</a></p>	<p>The Papahānaumokuākea Marine National Monument includes the 1200 nautical mile chain of atolls and islets known as the Northwestern Hawaiian Islands (NWHI) that are geographically positioned as a repository for marine debris such as derelict fishing gear (DFG). Supported by NOAA's Coral Reef Conservation Program (CRCP) and Marine Debris Program (MDP), the marine debris team of Coral Reef Ecosystem Division (CRED) at the Pacific Islands Fisheries Science Center (PIFSC) conducts cruises to the NWHI for the purpose of surveying and removing DFG.</p>
<p>NOS/NCCOS Seafloor Characterization of the U. S. Caribbean 2010 Multibeam Bathymetry, Rugosity and Slope products</p> <p><a href="#">Sample Link</a></p>	<p>These multibeam data were collected as IOCM (Integrated Ocean and Coastal Mapping) project NF-10-03 during the seventh year of an ongoing NOAA scientific research mission in the US Caribbean to characterize nearshore to deep water coral reef habitats at depths down to 1,000 meters. The mission purpose is to better understand the resources within the surveyed reef habitats, and ultimately develop species utilization models linking physical habitats with biological information. The multibeam backscatter, multibeam bathymetry, and ground truth video footage collected during the 2004-2010 missions will be used internally to characterize sea floor topography and to create benthic habitat maps, helping NOAA meet its mapping commitment to the US Coral Reef Task Force. The resulting publicly-distributed data is also a contribution to the greater scientific community interested in the USVI seafloor.</p>
<p>40 m and 10m Gridded bathymetry of Swains Island, American Samoa</p> <p><a href="#">Sample Link</a></p>	<p>Gridded bathymetry of the slope environment of Swains Island, American Samoa, South Pacific. Almost complete bottom coverage was achieved in depths between 7 and 4800 meters (the 10 m gridded product includes data to 300 m). The multibeam data are from the Simrad EM300 system aboard the NOAA Ship Hi'ialakai, and the Reson 8101ER system aboard the R/V AHI and were collected from 10th - 13th February 2006.</p>

<p>2010 CRED REA Invertebrate Quantitative Assessments in American Samoa and the Pacific Remote Island Areas</p> <p><a href="#">Sample Link</a></p>	<p>Invertebrate surveys were focused on quantifying key non-coral invertebrate species common to the reef habitats, and were conducted using a belt-transect survey method. In belt-transect surveys, quantitative counts of key invertebrates were recorded along two consecutively-placed 25m long and 2m wide belt transects (total area = 100 m<sup>2</sup>). For any species that cannot be identified in the field, a photograph and a representative specimen, if possible, is collected for later identification. Based on data from previous REA surveys, a group of target invertebrate species was chosen for quantitative counts at selected locations. The species in the list were chosen because they have been shown to be common components of the reef habitats and they are species that are generally visible (i.e.; non-cryptic) and easily enumerated during the course of a single 50-60 minute SCUBA survey.</p>
<p>2004 to 2010 ground validation sampling locations associated with the NOS/NCCOS Seafloor Characterization of the U. S. Caribbean project</p> <p><a href="#">Sample Link</a></p>	<p>The objective of this ground validation (GV) effort was to acquire spatially-explicit information about the geomorphological structure, biological cover and live coral cover of the seafloor in the U.S. Caribbean. Extensive field work is needed to create high-quality benthic habitat maps because it enhances the accuracy of habitat attribution and (to a lesser degree) habitat delineation.</p>
<p>2005 Era C-CAP Land Cover Data, Niihau and Kauai</p> <p><a href="#">Sample Link</a></p>	<p>These data sets consist of land derived from high resolution imagery and were analyzed according to the Coastal Change Analysis Program (C-CAP) protocol to determine land cover. One full Quickbird multispectral scene was processed to detect C-CAP land cover features on the island of Niihau. The Kauai data set utilized 43 full Quickbird multispectral scenes which were processed to detect C-CAP land cover features on the island.</p>
<p>Preliminary hard and soft bottom seafloor substrate map derived from an unsupervised classification of gridded backscatter and bathymetry derivatives at Ofu and Olosega Islands, and Ta'u Island</p> <p><a href="#">Sample Link</a></p>	<p>Preliminary hard and soft seafloor substrate maps derived from an unsupervised classification of multibeam backscatter and bathymetry derivatives. These datasets were derived using Reson 8101 backscatter data, bathymetric variance and bathymetric rugosity.</p>
<p>Preliminary hard and soft bottom seafloor substrate map derived from gridded sidescan and bathymetry derivatives at Apra Harbor, Guam U.S. Territory.</p> <p><a href="#">Sample Link</a></p>	<p>Preliminary hard and soft seafloor substrate map classified from sidescan data and bathymetric derivatives at Apra Harbor, Guam U.S. Territory. The dataset was created using Bathymetric Position Index (bpi) zones derived from Reson SeaBat 8125 multibeam data at a 1 m grid cell size, and Klein 3000 sidescan sonar data. The sonar frequency is 455 kHz for the Reson Seabat 8125 multibeam echosounder. Additional information on multibeam and sidescan datasets can be found in the Data Acquisition and Processing Report (DAPR) that can be accessed at: <a href="http://www.soest.hawaii.edu/pibhmc">www.soest.hawaii.edu/pibhmc</a>. Classification of the bathymetry and sidescan data into hard and soft seafloor substrates were validated using groundtruth data collected for the US Navy in Appendix J of the Final EIS Statement: Guam and CNMI Military Relocation. Although hard and soft classes from the substrate map are highly correlated with those from the optical validation data, the substrate map should be used with caution as groundtruth data were mostly collected at areas of known hard bottom in less than 60 ft of water depth.</p>

<p>Gridded multibeam bathymetry of Apra Harbor, Guam U.S. Territory</p> <p><a href="#">Sample Link</a></p>	<p>Gridded bathymetry from Apra Harbor, Guam U.S. Territory. The netCDF and Arc ASCII grids include multibeam bathymetry from the Reson SeaBat 8125 multibeam sonar collected in 2008 by the NOAA Office of Coast Survey and the United States Navy Fleet Survey Team. The sonar frequency is 455 kHz and the data are gridded at 1 m resolution. The data served here were extracted from a Caris project provided by OCS and converted to netCDF and Arc ASCII grids by the NOAA Coral Reef Ecosystem Division.</p>
<p>Reson 8101ER Multibeam Sonar Data from Cruise SE1002 Commonwealth of the Northern Mariana Islands and Guam</p> <p><a href="#">Sample Link</a></p>	<p>Reson 8101ER multibeam Data were collected in February 11 - March 14, 2010 aboard NOAA Ship Oscar Elton Sette in the Commonwealth of the Northern Mariana Islands and Guam on cruise SE1002. These multibeam data were collected using SAIC ISS-2000 v 4.0.0.3.0 software in the Generic Sensor Format and processed using SABER editing software. Sound velocity corrections from a Seabird SBE19 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time and observed tides were applied during post-processing.</p>
<p>Benthic data for corals, macroalgae, invertebrates, and non-living bottom types from 12 sites in American Samoa, 2005-2009. (NODC Accession 0068364)</p> <p><a href="#">Sample Link</a></p>	<p>Benthic transects were repeated at 12 sites around Tutuila at various depths on the reef slopes and flats. Benthic coverage categories include coral species, invertebrates, and non-living substrate type. Annual surveys took place during 2005-2009. The most detailed data are from 2008.</p>
<p>Delta-15 Nitrogen from All Shores of Maui and Benthic, Algae, and Urchin Data from Kahekili, West Maui, 2007-2009 (NODC Accession 0068665)</p> <p><a href="#">Sample Link</a></p>	<p>The Hawaii Division of Aquatic Resources (DAR) established an Herbivore Fisheries Management Area (HFMA) in front of Kahekili Beach Park in West Maui that was effective on July 25th 2009. Benthic transects were performed to assess the diversity and coverage of algal and urchin species in the Kahekili area in 2008-2009. To address the sources of the algal blooms in the region, a seep sampling device for water chemistry analysis and a macroalgae bio-indicators were used to monitor the nutrient conditions. Fine-scale surveys were made in the Kahekili HFMA and in Kihei in 2008 and 2009. Detection of delta-15 nitrogen levels were made all around Maui in the summer of 2007, every mile in built-up areas and every five miles in remote areas, for a total of 116 sites. Data are provided as spreadsheets. A complimentary data set is found in NODC Accession 0065597, which contains fish and benthic surveys for 2008 in the Kahekili HFMA.</p>
<p>Gridded Geomorphology data files for Ni'ihau</p> <p><a href="#">Sample Link</a></p>	<p>The geomorphological data layers of slope, rugosity, bathymetric position index (BPI) structures and BPI zones produced at the Pacific Islands Benthic Habitat Mapping Center (PIBHMC) were derived from multibeam bathymetry.</p>
<p>CRED Optical Validation Data in the Auau Channel</p> <p><a href="#">Sample Link</a></p>	<p>Optical validation data were collected using either a ROV or a Tethered Optical Assessment Device (TOAD).</p>
<p>Map of percent scleractinian coral cover along camera sled and ROV tracks in the Auau Channel, Hawaii</p> <p><a href="#">Sample Link</a></p>	<p>This map displays optical validation observation locations and percent coverage of scleractinian coral overlaid on bathymetry and landsat imagery. Optical data were collected by CRED TOAD camera sled aboard NOAA ship Oscar Elton Sette cruise SE0807, and aboard NOAA ship Hi'ialakai cruise HA0905. Data were also collected with Hawaii Undersea Research Laboratory's (HURL) RCV-150 remotely operated vehicle (ROV) on HURL R/V Ka'imikai-o-Kanaloa cruise's KOK0409, KOK0209, and KOK1207.</p>

<p>Slope grid derived from gridded bathymetry of Apra Harbor, Guam U.S. Territory</p> <p><a href="#">Sample Link</a></p>	<p>Slope is derived from gridded (1 m cell size) multibeam bathymetry, collected aboard the Survey Vessel Swamp Fox. Cell values reflect the maximum rate of change (in degrees) in elevation between neighboring cells derived with the ArcGIS Spatial Analyst extension.</p>
<p>Rugosity grid derived from gridded bathymetry of Apra Harbor, Guam U.S. Territory</p> <p><a href="#">Sample Link</a></p>	<p>Rugosity is derived from gridded (1 m cell size) multibeam bathymetry, collected aboard the Survey Vessel Swamp Fox using the Terrain Modeler with rugosity methods by Jeff Jenness (2003). Cell values reflect the surface area/planimetric area ratio for the area contained within that cell's boundaries. They provide indices of topographic roughness &amp; convolutedness.</p>
<p>Side-scan imagery of Apra Harbor, Guam U.S. Territory</p> <p><a href="#">Sample Link</a></p>	<p>Gridded side-scan imagery collected in Apra Harbor, Guam U.S. Territory, USA. The GeoTIFF and Arc ASCII file includes data that were collected using a Klein 3000 high-resolution side-scan sonar system with dual operating frequencies of 100 and 500 kHz. The data were collected in 2008 by the NOAA Office of Coast Survey and the United States Navy Fleet Survey Team and were preliminarily processed by NOAA OCS using the Caris software. Additional processing and mosaicking was performed by the NOAA Coral Reef Ecosystem Division.</p>
<p>2010 CRED Rapid Ecological Assessment Reef Fish Surveys in American Samoa and the PRIAs</p> <p><a href="#">Sample Link</a></p>	<p>Reef fish assessment surveys were conducted, as a part of Rapid Ecological Assessments (REA) in the region. At each REA site, fish biologists entered the water and conducted a fine-scale (~700 m<sup>2</sup>) and high degree of taxonomic resolution REA survey to assess and monitor species diversity, size distribution, and abundance of fish in shallow-water hard-bottom (less than 30 m) habitats. Reef fish assessment surveys were focused on cataloging the diversity (species richness), abundance (numeric density) and biomass (fish mass per unit area) of diurnally active reef fish assemblages. The stationary point count (SPC) method was used to quantify reef fish species.</p>
<p>2010 CRED Towed-Diver Fish Biomass and Benthic Characterization Surveys in American Samoa and the PRIAs</p> <p><a href="#">Sample Link</a></p>	<p>Towboard surveys are a good method for obtaining a general description of large reef areas, assessing the status of low-density populations of large-bodied reef fish, large-scale disturbances (e.g., bleaching), general distribution and abundance patterns of macro-invertebrates (e.g., crown of thorns sea stars, giant clams), and for assessing trends in these populations and metrics. A pair of scuba divers (1 fish diver and 1 benthic diver) are towed 60 m behind a small survey launch at a speed of 1-2 knots and a depth of approximately 15 m. Each survey is 50 min long, covers about 2 km of habitat, and is divided into ten 5-minute survey segments. The fish diver records, to the lowest possible taxon, all large-bodied reef fishes (greater than 50 cm total length) seen within 5 m either side and 10 m in front of the towboard. Length of each individual is estimated to the nearest cm. The benthic diver records percent cover of coral and macroalgae, estimates benthic habitat type and complexity, and censuses a suite of benthic macroinvertebrates including crown of thorns sea stars and sea urchins.</p>

## PUBLICATIONS

**CRCP Technical Memorandum Explores Coral Disease.** Colonies of the scleractinian coral *Acropora palmata*, listed as threatened under the US Endangered Species Act in 2006, have been monitored in Hawksnest Bay, within [Virgin Islands National Park](#), St. John, from 2004 through 2010 by scientists with the [US Geological Survey](#), [National Park Service](#), and the [University of the Virgin Islands](#). The focus has been on documenting the prevalence of disease, including

white band, white pox (also called patchy necrosis and white patches), and unidentified diseases. In an effort to learn more about the pathologies that might be involved with the diseases that were observed, samples were collected from apparently healthy and diseased colonies in July 2009 for analysis. The methods are non-invasive, an advantage which eliminates the need to remove coral sections for study, thus preserving coral reef sanctuaries. The resulting paper reports the methodologies used to evaluate the microbial community associated with coral mucus, and the changes those communities may undergo in response to disease. The CRCP Technical Memorandum; [Microbial Community Analysis of Acropora palmata Mucus Swabs, Water and Sediment Samples from Hawksnest Bay, St. John, U.S. Virgin Islands](#) can be accessed and downloaded from the CoRIS [Key Documents](#) page. This publication is a product of the NOAA [National Centers for Coastal Ocean Science](#).

**Artificial Reef Guidelines for Southeast Florida.** Hundreds of deployments of natural and manmade structures have occurred in southeast Florida coastal waters over the last 30 years. Construction practices, design features, and usage patterns associated with artificial reef-building all have the potential to adversely affect coral ecosystems. *Guidelines and Management Practices for Artificial Reef Siting, Usage, Construction, and Anchoring in Southeast Florida* describes artificial reef technology and synthesizes the science behind it, as a means of assisting practitioners with varied backgrounds, skills and experience in achieving responsible and sustainable artificial reef development. The document presents best and acceptable guidelines and management practices for artificial reef planning, siting, construction, anchoring and monitoring in southeast Florida, in addition to essential information and guidance to resource users, managers and planners on the most effective methods for protecting natural reefs and other natural resources during the establishment of artificial reefs. This document was jointly developed by the State of Florida's [Department of Environmental Protection](#) and [Fish and Wildlife Conservation Commission](#), NOAA [National Marine Fisheries Service Southeast Regional Office](#), [Jacksonville District Army Corps of Engineers](#), and County Artificial Reef Coordinators from the [Southeast Florida Coral Reef Initiative](#) area. Funding for this publication was provided by a CRCP grant.



**Pamphlet Aims to Reduce Illegal Grouper Fishing in Puerto Rico.**

In 2007, NOAA [National Marine Fisheries Service](#) Caribbean Field Office (CFO) compiled a list of restaurants purchasing locally caught seafood in Puerto Rico and USVI as part of a multi-year grouper conservation project funded by the NOAA CRCP. Of the 218 seafood restaurants surveyed, 81 (37.2 %) served grouper purchased from local fishermen. While the species of grouper served was not specified by the restaurants, the demand for these fish, as well as the lack of knowledge on the part of businesses and consumers regarding which grouper species are protected, leads to targeted fishing of grouper by local fishermen. For this reason, CFO has created and distributed an educational pamphlet entitled "Caring for Grouper Nursery Areas/ Cuidando los Criaderos Para el." The pamphlet is bilingual and targets restaurant and fish market owners, as well as consumers, to reduce the illegal fishing of protected grouper species. To request hard copies of the pamphlet, please contact [Lisamarie Carrubba](#).

**CRCP Publishes First Technical Report.** NOAA [Coral Reef Watch](#) (CRW) staff co-edited a NOAA Technical Report entitled “[Satellite Monitoring of Reef Vulnerability in a Changing Climate](#).” The report documents the biological, technical, and managerial presentations and discussions held during the January 2010 workshop of the same name in Lamington, Australia. It is designed to provide readers with a record of the event and document new ideas and prospects for remote sensing of coral reefs. The technical report discusses the prominent threats coral reefs face and actions that scientists, managers, and other stakeholders can take to monitor them. It also identifies potential satellite products that would be of use to coral reef researchers and resource managers. It is the first document produced under the new CRCP Technical Report series.

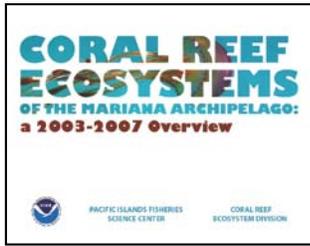
This work was supported by the NOAA CRCP; the Lamington workshop was co-hosted by NOAA CRW and the [University of Queensland](#). Workshop attendees and technical report contributors and reviewers included CRW staff and partners from within NOAA and multiple Australian institutions, such as the [Great Barrier Reef Marine Park Authority](#), [Australian Institute of Marine Science](#), [Bureau of Meteorology](#), and the [Commonwealth Scientific and Industrial Research Organisation](#).

**Pacific-wide Synthesis of CRED Fish Data Published.** On-going Pacific Reef Assessment and Monitoring cruises in the Pacific have collected fish assemblage data across the Pacific since 2000. Use of the random stratified stationary-point-count survey data allows analysis of these data across gradients of population and location.

NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) scientists published an article, entitled “[Differences in reef fish assemblages between populated and remote reefs spanning multiple archipelagos across the Central and Western Pacific](#)” in a 2011 special issue of the *Journal of Marine Biology*, themed “Ecosystem-Based Management of Pacific Islands.” This work, covering 39 atolls and islands around the Pacific, utilizes the most recent CRED random stratified stationary-point-count surveys to assess differences between remote and populated areas in the Pacific. Total reef fish biomass varied by more than an order of magnitude, and remote reefs averaged four times the total biomass and fifteen times the piscivore biomass of reefs near human populations. The ability to detect differences in fish and piscivore biomass and correlate these differences with gradients in human population is an important and statistically significant finding.

**Summary Booklet on the Coral Reef Ecosystems of the Mariana Archipelago Released at USCRTF Meeting.** NOAA [National Marine Fisheries Service Coral Reef Ecosystem Division](#) (CRED) distributed a new booklet, titled [Coral Reef Ecosystems of the Mariana Archipelago: a 2003–2007 Overview](#), at the U.S. Coral Reef Task Force (USCRTF) meeting on Sept. 15, 2010, in Saipan, Commonwealth of the Northern Mariana Islands (CNMI). Produced in response to specific requests in 2009 from management agencies in Guam and CNMI, this succinct publication summarizes coral reef conditions in the Mariana Archipelago, as observed during Pacific Reef Assessment and Monitoring Program surveys conducted in 2003, 2005, and 2007. This 38-page booklet was derived from a more extensive document, scheduled for publication in early 2011, which provides the most comprehensive integrated ecosystem assessment ever

completed of the benthic habitats and biological and oceanographic conditions around 14 islands and remote and offshore banks in the Mariana Archipelago.



This booklet provides a comparison of conditions around the northern, active volcanic islands and the older, southern, carbonate islands and illustrates distinct differences in benthic conditions and fish populations across the Mariana Archipelago. This publication also presents an integrated overview of benthic and fish compositions and various natural and human factors influencing coral reefs around Guam and Saipan. It is designed to be understandable and visually

compelling for ecosystem managers, students, and the general public and is available as a PDF file online. At request of management agencies in Guam and CNMI, an additional 1000 copies were recently printed and are available upon request.

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