



National Centers for
Coastal Ocean Science

ACCOMPLISHMENTS



2005

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MESSAGE FROM THE DIRECTOR

Time flies, as they say. This year's National Centers for Coastal Ocean Science (NCCOS) *Accomplishments Report* not only summarizes what our scientists accomplished in fiscal year 2005 (October 1, 2004 – September 30, 2005) and continue to study, but also illustrates how these accomplishments are helping society now and in the future. One can only conclude that it's been an exceptionally productive year for NCCOS scientists as well as the scientific and management communities that use our science.

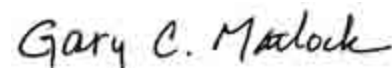
This year's highlights, most of which are discussed in more detail in this *Accomplishments Report*, include:

- Our scientists coordinated and contributed to the government's biennial coral reef report, *The State of Coral Reef Ecosystems in the United States and Pacific Freely Associated States: 2005*, and provided an ecosystem-based approach to determining the health of U.S. estuaries in the U.S. Environmental Protection Agency's *National Coastal Condition Report*.
- We furthered NOAA's priority of integrating earth observations and supported the U.S. Ocean Action Plan by developing a national water quality monitoring network in cooperation with other agencies;
- Our scientists integrated technologies from other NOAA offices and transferred research, observations, and technology to develop the first operational forecast for "red tides" in the Gulf of Mexico;
- We made our scientific information more accessible to the public through presentations around the world, as well as publications, online databases, and web sites;

- Our scientists' coordination and contributions to the two-volume restoration monitoring manual, *Science-based Restoration Monitoring of Coastal Habitats*, received kudos nationally and internationally;
- Our two ecological forecasts this year regarding pink shrimp landings in North Carolina and the size of the Gulf of Mexico's "dead zone" have helped protect public health and local economies;
- We've infused NOAA with the concept of ecosystem-based management as a corporate goal;
- Our staff have adopted disciplined planning processes for setting research priorities to reflect NOAA's business model and fully support NOAA and NOAA's National Ocean Service (NOS) mandates.

These and the other accomplishments highlighted in this report are attributed to the dedicated NCCOS staff. This dedication was reflected in the formal recognition this year of nine NCCOS employees by NOAA and the U.S. Department of Commerce for their distinguished careers; for applying science to management issues; and for health, safety, and environmental compliance successes. This report recognizes these individuals and the entire NCCOS staff for their endeavors and achievements. NCCOS is very proud of its highly competent and diverse workforce, with women and minorities comprising more than 48 percent of our staff.

It's been quite a year for NCCOS, and my colleagues and I urge you to "read all about it" in this year's *Accomplishments Report*. As always, we sincerely welcome your input and reactions. It is, after all, *your* NCCOS.



Gary C. Matlock, Ph.D.

ABOUT NCCOS

The National Oceanic and Atmospheric Administration (NOAA) formed the National Centers for Coastal Ocean Science (NCCOS) in February 1999 as the focal point for NOAA's coastal ocean science efforts. NCCOS' research programs provide coastal managers with the scientific information they need to decide how best to protect environmental resources and public health, preserve valued habitats, and improve the way communities interact with surrounding ecosystems. By improving understanding of the environmental resources and related societal and economic benefits, NCCOS helps decision-makers evaluate and implement resource management strategies.

Core Principles

Society benefits when coastal stewardship decisions reflect sound science. For NCCOS, this vision translates into the following core operating principles:

- ⦿ Deliver high quality science in a timely and consistent manner using productive and strong partnerships;
- ⦿ Develop and maintain relevant research, long-term data collection and analyses, and forecasting capabilities in support of its customers, stakeholders, and partners;
- ⦿ Build capacity in the private, local, state, and tribal sectors by transferring technology, and by providing technical assistance and knowledge to its customers and partners;
- ⦿ Conduct the anticipatory science necessary for managing the potential impacts of multiple stressors on coastal ecosystems; and
- ⦿ Provide the best possible work environment for each employee by treating each individual with fairness, respect, and recognition, and with adequate training in the safest facilities and with the most current equipment possible.





Research Focus

Central to NCCOS research are the four broadly defined categories of ecosystems that NOAA and its partners manage – coral reefs; National Marine Sanctuaries; estuaries, including National Estuarine Research Reserves (NERRs); and coastal oceans. The benefits of these valuable, yet at-risk, ecosystems include great biological diversity, exceptional ecological integrity, unparalleled research potential, valuable recreational opportunities, and a wealth of commercial fish and shellfish as well as spawning grounds and nurseries.

For each of these ecosystems, NCCOS seeks to understand stakeholders' practical needs and the impacts of human and natural "stressors." The five categories of stressors facing coastal ecosystems are climate change, extreme natural events, pollution, invasive species, and land and resource use. Understanding how these stressors affect ecosystems is vital for assessing impacts to coastal communities and managing our Nation's ocean and coastal resources.

Focus on Ecosystems

Coral Reefs

Among the most diverse and productive ecosystems on Earth, coral reefs are rich in biological diversity and cultural heritage. In the U.S. and internationally, these ecosystems are under stress from a combination of human activities and natural causes, including overfishing, disease, pollution, climate change and coral bleaching, and tropical storms.

NCCOS research helps coastal managers decide how best to protect these fragile ecosystems by helping them establish appropriate geographic boundaries for marine protected areas and determine which regulations for fishing, recreational uses, pollutants, and coastal development are most effective. NCCOS also conducts and maintains inventories, develops maps, and monitors coral reef ecosystems using innovative technologies that reduce management costs and improve speed and accuracy. In addition, NCCOS is leading a partnership effort to systematically produce baseline digital benthic habitat maps for all shallow-water U.S. coral reef ecosystems by 2010. NCCOS also sponsors the Hawaii Coral Reef Initiative and National Coral Reef Institute, and is the lead partner in the U.S. Coral Reef Task Force's (USCRTF) Coral Disease and Health Consortium.

National Marine Sanctuaries

National Marine Sanctuaries are areas set aside either administratively or by an act of Congress based on their ecological integrity, biological diversity, and natural and cultural resources. The 13 Sanctuaries are located in the Pacific and Atlantic Oceans, off the coast of American Samoa, and in the Great Lakes, and they include deep-ocean “gardens,” nearshore coral reefs, whale migration corridors, deep sea canyons, and underwater archeological sites. They range in size from one-quarter square mile in Fagatele Bay, American Samoa, to more than 5,300 square miles in Monterey Bay, California, one of the largest marine protected areas in the world.

NCCOS scientists partner with Sanctuary managers to achieve preservation goals by providing comprehensive assessments of current conditions through the mapping of benthic habitats, monitoring of environmental changes and natural events, and researching of contaminant amounts and sources.

Estuaries (including National Estuarine Research Reserves)

Spanning more than 4.5 million acres of U.S. coastline, estuaries are semi-enclosed bodies of water where freshwater and ocean tides connect. Temperatures, water levels, and nutrient concentrations in estuaries differ markedly from those in the open ocean, making estuaries some of the most biologically productive ecosystems on Earth. The National Estuarine Research Reserve System (NERRS) is a network of 26 protected areas established by Congress in 1972 for long-term research, education, and stewardship through partnerships between NOAA and coastal states.

NCCOS scientists examine links between human activities and the increasing number of ecological disturbances that can threaten the productivity of estuaries. They assess habitat health, model the structure and function of estuarine ecosystem components, and evaluate the effects of alternative management strategies. The NCCOS-sponsored National Status and Trends Program, which monitors sediment toxicity in estuaries nationwide, is the longest continuously running monitoring program in the world. The carefully controlled restrictions on uses of the NERRS sites make them valuable reference sites at which NCCOS can conduct comparative studies with other areas.

Coastal Oceans

The coastal oceans that form the U.S. Exclusive Economic Zone extend 200 miles offshore and encompass a broad range of saltwater ecosystems – including estuaries, coral reefs, rocky shores, gravel shores, sandy shores, mud flats, marshes, and mangrove forests. At least two-thirds of the Nation’s commercial fish and shellfish use these ecosystems as spawning grounds and nurseries. Coastal oceans also provide many recreational opportunities that contribute to the economic well-being of local communities.

NCCOS’ research improves the understanding of large-scale processes affecting coastal oceans and helps protect and restore coastal ocean resources through ecosystem-based management.



Waquoit Bay NERR in Massachusetts
Photo: Alison Robb

Focus on Ecosystem Stressors

Climate Change

There is a scientific consensus that Earth's air and oceans are warming, and that sea level will rise over the coming century. Corals, wetlands, and estuaries are already stressed from the combined effects of these higher temperatures, rising sea levels, increasing atmospheric concentrations of carbon dioxide, and human activities. There is evidence that some marine species have begun to migrate to cooler regions; less mobile species that lack the capacity to adapt or move quickly enough could face extinction.

As there is much uncertainty about the degree of warming and how coastal zones and marine life will respond to these changes, scientists worldwide are striving to improve the understanding of both natural and human causes of climate change. As current conditions offer useful insights into potential longer-term impacts of climate change and climate variability, NCCOS is conducting multidisciplinary research to examine:

- ⦿ Changes in relative sea level and impacts of coastal storms on the sustainability of coastal communities and wetlands;
- ⦿ Changes in precipitation and freshwater flow, resulting changes in nutrient delivery and salinity, and implications for management of coastal eutrophication and coastal resources; and
- ⦿ Changes in ocean temperature, circulation, and carbon dioxide concentration as they might affect the sustainability of coral ecosystems and other sensitive environments, as well as species composition in coastal areas.



Extreme Natural Events

The 2004 and 2005 hurricane seasons brought severe winds, waves, and flooding along the southeast Atlantic and Gulf Coasts, thereby altering freshwater flow in coastal habitats and increasing pollution runoff from populated areas and agricultural fields. Lesser storms, floods, droughts, and phenomena such as harmful algal blooms (HABs) also have profound effects on coastal ecosystems and the people living and working there. HABs in some U.S. coastal areas are recurring events, wreaking havoc on tourism and local economies and threatening human health. HABs occur in waters of nearly every coastal and Great Lakes state, causing an estimated \$1 billion in economic losses – including reductions in tourism and real estate values – over the past few decades. “Harmful algal blooms are a serious human health threat and are economically damaging to communities,” said retired Navy Vice Admiral Conrad C. Lautenbacher, Jr., Ph.D., Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator. “Monitoring efforts assist states in maintaining a safe and plentiful seafood supply by allowing targeted closures.”

NCCOS builds upon NOAA's extensive predictive capabilities to help lessen environmental and social impacts of extreme natural events. It does so through a two-pronged approach emphasizing rapid response to emergencies and long-term planning efforts aimed at mitigating future adverse impacts.



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contaminants in their tissues from water, sediments, and food, and may experience adverse biological effects even from extremely low concentrations. Fish advisories in many parts of the country warn the public of risks from high levels of toxic compounds, such as mercury, in the tissues of certain fish. In recent decades, population growth and related activities have increased nitrogen and other nutrient inputs well beyond levels that occur naturally. Increased nutrient loadings can lead to excessive production of algae, which then decompose and reduce oxygen concentrations in bottom waters. This often leads to hypoxic conditions in which fish and other organisms cannot survive.

NCCOS scientists have compiled extensive historical data on chemical contaminant levels in many U.S. estuaries and are researching how best to address chemical contaminants in coastal watersheds. These efforts have resulted in new methods to assess pesticide concentrations in water and assess risks from pesticides in runoff after large coastal storms. This work has also led to improved methods of analyzing the chemical content of sediments. New predictive models developed by NCCOS and NCCOS-supported scientists are being used to assess risks to marine species from exposures to pollutants such as organochlorines and mercury. NCCOS develops annual forecasts of the Gulf of Mexico hypoxic zone and works to improve its annual forecasts and better understand impacts of hypoxic events on fisheries.





Invasive Species

Exotic plants and animals brought to the U.S. from other countries – or moved to new areas from within the U.S. – can damage native plants and animals, lead to undesirable changes in native community structure, and cost millions of dollars for management and control measures. U.S. marine and coastal environments, already under stress from other factors, are particularly susceptible to risks posed by the introduction of non-native species. The resulting changes in species composition can be dramatic and very difficult to predict.

Through its invasive species research and monitoring activities, NCCOS provides technical assistance and complex data analyses to a growing network of partners who use the information to plan and implement effective local prevention and control strategies.

Land and Resource Use

Increasing domestic and international demands for food, fiber, and space are accelerating changes in land and resource use, resulting in exhausted fisheries, habitat loss, degraded water quality, and increased chemical and sediment runoff. These conditions are found throughout the U.S. and are among the most challenging problems facing coastal managers. Increased understanding of the consequences of human uses of land and resources will allow for better balancing of economic demands with environmental sustainability.

NCCOS conducts and supports research on specific causes and effects of land and resource use on coastal ecosystems. Of particular concern to NCCOS are land and resource issues within those ecosystems managed directly and indirectly by NOAA.

FISCAL YEAR 2005 ACCOMPLISHMENTS

Ecological Forecasts

Ecological forecasts pose “what if?” questions about the ocean and coastal environments. In much the same way that a weather forecast or economic forecast can help society plan for the future, an ecological forecast allows managers to consider future possibilities and challenges in environmental arenas. Some ecological forecasts, like the prediction of hypoxic conditions in the Gulf of Mexico, are yearly events with an established track record. Others are just getting underway – like the ecological forecasting program for climate change impacts which began with a \$500,000 grant to the University of South Carolina Research Foundation. “This project supplements efforts to understand and forecast the effects of climate variability on ocean and coastal systems,” said NOAA Administrator Conrad C. Lautenbacher, Jr. “NOAA recognizes the importance of these nearshore ecosystems and realizes that a first step in the protection and wise use of these environments is to identify vulnerable areas.”

Third Annual Ecological Forecast to Help Managers and Scientists Reduce Hypoxia Impacts in Gulf of Mexico

In mid-July 2005, NCCOS developed its third annual forecast of the Gulf of Mexico hypoxic zone, commonly called the “dead zone,” where seasonal oxygen levels drop too low to support most life in bottom and near-bottom waters. The NCCOS scientists based their forecast on U.S. Geological Survey (USGS) data of nutrient loads from the Mississippi and Atchafalaya Rivers in May and June, and issued the forecast in conjunction with scientists from Louisiana State University and the Louisiana University Marine Consortium (LUMCON).

To confirm the forecast, NCCOS-funded scientists at LUMCON surveyed the extent of the hypoxic zone in the northern Gulf of Mexico and found low oxygen waters covering 11,840 square kilometers. The size of this year’s hypoxic zone, extending from the Mississippi River to the Louisiana/Texas border, was only slightly smaller than the long-term average, despite the influence of a hurricane and tropical storm which recently had passed through the area.

The model used to develop the forecast can also provide coastal managers with information to evaluate various strategies for reducing impacts of hypoxia in the Gulf of Mexico. Such ecological forecasts, say NCCOS scientists, will become an important tool in the future for both decision-makers and the public.

“CSCOR conducted and sponsored research to understand and predict regional ecosystem-level effects of stressors such as hypoxia, HABs, nutrient pollution, climate change, and sea level rise using innovative technologies and models. Doing so with the full involvement of end-users was the key to our successes. Perhaps most satisfying was the payoff from our long-term investment in HAB forecasting in the Gulf of Maine and Gulf of Mexico which addressed public health and economic interests during some of the largest outbreaks of HABs in more than three decades.”

Rob Magnien,
Director, NCCOS Center for
Sponsored Coastal Ocean
Research (CSCOR)



Below Average Pink Shrimp Harvest Forecasted by NCCOS, NOAA Fisheries

Ecological forecasting tools, developed by scientists from NCCOS and NOAA Fisheries, predicted the 2005 spring harvest of pink shrimp in North Carolina. The scientists projected that as a result of colder than usual water temperatures along the North Carolina coast, the pink shrimp harvest would again lag behind average annual harvests over the past four decades of 985,000 pounds. Preliminary estimates for the spring 2005 pink shrimp harvest in North Carolina were the lowest on record at 38,122 pounds, which is even lower than what would have been predicted based on the previous winter's low temperatures.

Pink shrimp account for about one-quarter of the state's total annual shrimp harvest. With unusually cool winter water temperatures, shrimp are unable to adapt to changing salinities, thereby increasing mortality. Pink shrimp in North Carolina are particularly sensitive to temperature variations because they are at the northern limits of their temperature tolerance.

The NOAA scientists note that such forecasts are often difficult to make because economic and environmental factors, such as reduced fishing efforts resulting from depressed market prices and environmental impediments to fishing, can also lead to lower harvests. While such challenges exist, the need for the forecasts is great. "These types of forecasts are invaluable in helping commercial fishermen make better economic decisions about alternative fishing areas or possible alternative fish and shellfish to target," said Jerry Schill, former president of the North Carolina Fisheries Association. "Once fishermen find that the science is credible, they'll accept and use it."

Ecological Forecast Sets Benchmark to Better Understanding of Climate and Land-based Impacts

NCCOS scientists used remote sensing techniques to assess climate and land-based impacts to coastal ecosystems that will prove useful in managing and reducing nutrients, one of the leading causes of coastal water quality impairments. The scientists developed an ecological forecast of the influence of precipitation on chlorophyll in the Southeastern U.S. Using monthly time-series data, they developed modeling capabilities to improve the ability to predict coastal susceptibility to nutrients along the South Atlantic Bight. The response of large coastal ecosystems, including the South Atlantic Bight, to changes in climate-forcing conditions provides scientists with a benchmark for the evaluation of anthropogenic impacts. NCCOS scientists also assessed the El Niño/Southern Oscillation, its effects on long-term regional precipitation and winds, and its associated impacts to chlorophyll levels in the Southeastern U.S.

Results of these assessments are being shared with scientists and coastal managers to help them determine the extent to which nutrient reductions due to management activities will lead to improvements in coastal ecosystem health and sustainability. The results will also allow scientists to address the overall influence of climate variability in driving nutrient exports as part of future assessments of National Marine Sanctuaries and other key coastal ocean areas.

Assessment Reports

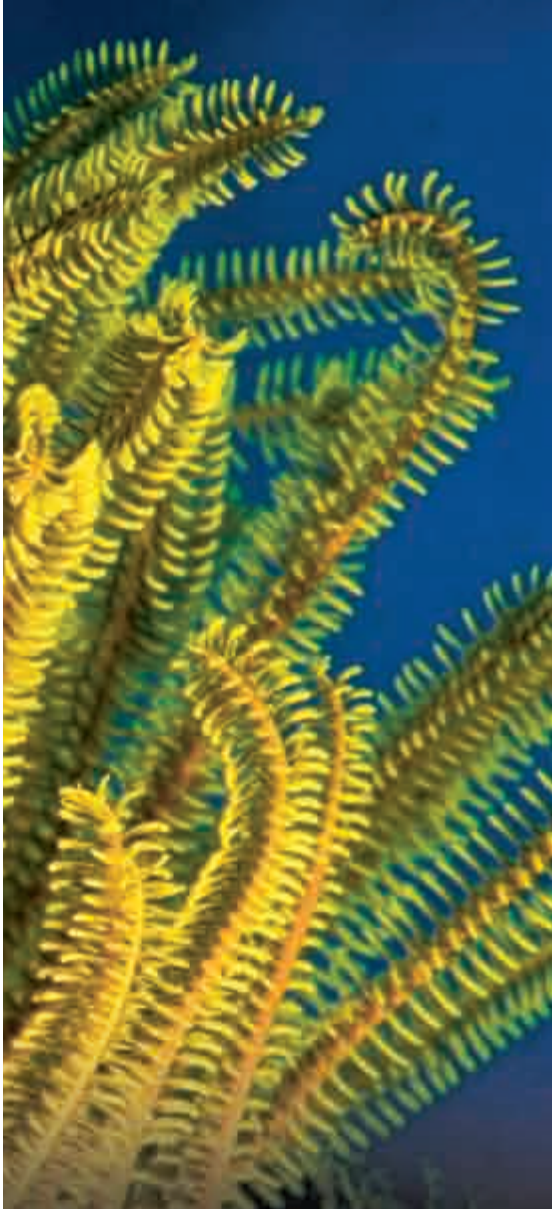
First Quantitative Status Report of U.S. Coral Reef Ecosystems Coordinated, Published by NCCOS

In August 2005, NOAA released a significant new report representing the first attempt to quantitatively assess the conditions of coral reef ecosystems in the U.S. and Pacific Freely Associated States. The 535-page report – *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005* – is based on data collected by Federal, state, territorial, commonwealth, academic, and private sector partners, and reflects input from more than 160 scientists, academicians, and resource managers from 14 U.S. jurisdictions with coral reefs or associated ecosystems. Coordinated, edited, and published by NCCOS staff for NOAA's Coral Reef Conservation Program, the report addresses priorities identified in the USCRTF *National Coral Reef Action Strategy*. Each chapter contains information on conditions of coral reef habitats, current threats to reefs, and management actions underway or needed to reduce threats in each jurisdiction. In addition, the report provides an introduction to the development, character, and spatial extent of U.S. coral reef ecosystems; background information for each of the threats identified by the USCRTF; and a national summary and an executive summary.

The 2005 report is the second in a series of biennial reports describing the condition of U.S. coral reef ecosystems. The first report, published in 2002, was based primarily on qualitative assessments of ecosystem conditions; the 2005 report is based primarily on the most recent quantitative monitoring data available.

The report concludes that the Nation's coral reef ecosystems continue to face numerous stressors from both natural and human sources including overfishing, disease, pollution, climate change and coral bleaching, and tropical storms. The report also indicates that management actions are moving in the right direction, as many jurisdictions have developed local action strategies to focus attention on priority threats, and jurisdictions with marine protected areas have found increased fish biomass and better protected habitats. In addition, significant progress has been made in building an integrated ocean observing system to map, monitor, and assess shallow water coral reef ecosystems.

This and future biennial reports on the state of U.S. coral reef ecosystems will help identify and fill knowledge gaps pertaining to these ecosystems, and provide managers with up-to-date, accurate, and comprehensive scientific information to slow or halt the general decline in coral reefs, their associated habitats, and the organisms that depend on them. Over 12,000 paper copies of the report were requested and more than 7,100 copies were downloaded from the NCCOS web site by October 31, 2005. The 2005 coral report is available at: http://ccma.nos.noaa.gov/ecosystems/coralreef/coral_report_2005/CoralReport2005_C.pdf.



"This year, CCMA produced the most comprehensive assessment ever done documenting the condition of coral reefs."

Russell Callender
Director, NCCOS Center for
Coastal Monitoring and
Assessment (CCMA)



Assessment of Societal Needs in Second National Coastal Condition Report Helps Galveston Coastal Managers with Multiple-use Areas

Scientists from NCCOS and other NOAA offices – along with the U.S. Fish and Wildlife Service, USGS, and coastal states – contributed significantly to a U.S. Environmental Protection Agency (EPA) report on the condition of U.S. coastal waters. The *National Coastal Condition Report II* (NCCR II), released by EPA in January 2005, provides ratings of estuaries based on water quality, coastal habitat loss, sediment quality, benthic community condition, and fish tissue contaminants. More than 50,000 samples were collected at over 1,500 randomly selected coastal sites in the 48 contiguous states (including the Great Lakes) and Puerto Rico to determine that overall conditions of the Nation’s estuaries are fair, on a scale from good to fair to poor.

The final chapter of the report, written by NCCOS scientists, explains how the condition of an estuary can be assessed based on how well it meets human uses, as an alternative assessment method to using ecological indicators. The scientists applied the alternative method to Galveston Bay and showed that, for the most part, the Bay meets some human needs (i.e., marine transportation, coastal habitats, coastal recreation, and commercial and recreational fishing), but is compromised for others (i.e., fish consumption, public oyster harvesting, and public access to the shoreline).

The report, the second in a series which began in 2001, provides benchmarks of coastal conditions so managers can measure the success of their coastal programs over time. In addition, it provides new methods, such as NCCOS’ human needs assessment of Galveston Bay, to help coastal managers make important decisions. The NCCR II is available at: <http://www.epa.gov/owow/oceans/nccr/2005/downloads.html>.

NCCOS-Coordinated Manual Helps Managers, Scientists, and Citizens Restore Coastal Habitats in a Cost-effective, Scientifically-sound Manner

NCCOS scientists coordinated the development of a new book to help scientists, managers, and citizens plan and implement habitat restoration efforts. *Science-Based Restoration Monitoring of Coastal Habitats, Volume Two: Tools for Monitoring Coastal Habitats* is the second in a series that fulfills a legislative mandate under the Estuary Restoration Act to develop monitoring guidance for restoration projects funded under the Act, and help determine if and when the Act's goal for estuary restoration is achieved.

The manual covers restoration projects in 13 types of coastal habitats found in the U.S. and its territories, from tropical coral reefs to Arctic rocky shorelines. It is a "one-stop shop" for complex information in a readily understandable format with fiscally and ecologically appropriate monitoring standards, as restoration practitioners may not have access to specialized equipment, technical expertise, and adequate funding.

The two volumes are the collaborative product of scientists from NOAA and the University of Massachusetts at Amherst. NCCOS scientists worked with numerous authors,

contributors, and reviewers from academic, private, non-governmental, and governmental organizations; synthesized a large amount of data; and created a user-friendly document that meets agency and legislative goals. The methods have already been integrated into monitoring efforts by Federal agencies (NOAA, EPA, U.S. Army Corps of Engineers, and U.S. Coast Guard) and Federal/non-Federal partnerships (National Water Quality Monitoring Council, Gulf of Maine Council, and Mississippi-Alabama Sea Grant Consortium), and have been referenced and recommended by more than 30 governmental, non-profit, private, and international organizations. The manual will also be used as a teaching tool in advanced high school science and university courses.

As of the end of the fiscal year, more than 47,000 copies of Volumes One and Two had been downloaded from the NCCOS web site. In addition, 1,300 printed versions of Volume One, and 1,100 printed versions of Volume Two have been distributed, and hundreds of copies with one or both volumes have been distributed on CDs. The two-volume manual is available at: http://coastalscience.noaa.gov/ecosystems/estuaries/restoration_monitoring.html.



Waquoit Bay NERR in Massachusetts
Photo: S. Muller



Technical Assistance/Technology Transfer to International Partners and Customers

Improved Shellfish Poisoning Testing Method May Reduce Trade Barriers for U.S. Products

NCCOS has developed and validated performance criteria for a new method of paralytic shellfish poisoning testing which may replace the regulatory testing method used worldwide and potentially lead to reduced trade barriers for U.S. products.

In collaboration with the U.S. Food and Drug Administration (FDA) and International Atomic Energy Agency, NCCOS will transfer this technology to regulatory laboratories in the U.S. and internationally. NCCOS' results were presented to the European Union's seafood industry and regulatory agencies in April 2005 for potential regulatory applications. NCCOS is now leading the next phase of validating the method through an international collaborative trial.

New NCCOS Technology to Provide Early Warning of Harmful Algal Blooms in Korea

As part of a cooperative effort on coastal and marine management issues between NOAA and the Korean Ministry of Maritime Affairs and Fisheries, NCCOS scientists have developed a rapid diagnostic test for the most problematic Korean HAB species.

This automated, molecular probe-based test was transferred to Korean scientists for use by Korean coastal managers as a HAB early warning tool. It provides an opportunity to implement mitigation techniques and reduce potentially devastating economic impacts approaching \$95 million per year (U.S. Dollars). Scientists from NCCOS and the Korean National Fisheries Research and Development Institute completed the technology transfer over a two-month scientific exchange. The scientists are now doing comparative validation studies and field trials in Korean coastal waters.

Algal Toxin Detection Method to Help Protect Public Health in China and 11 Other Countries

Supported by the International Atomic Energy Agency, NCCOS transferred a new algal toxin detection method to scientists in China, seven Southeast Asian nations, three African nations, and Chile.

The new detection method developed by NCCOS scientists examines pharmacological properties of algal samples rather than the current regulatory practice of using live animals to test the toxicity of samples. An international collaborative study is establishing the accuracy, repeatability, and reproducibility of this microplate receptor binding assay for quantification of paralytic shellfish poisons. The inter-laboratory comparison of the method also will allow for easier international certification, regulatory approval, and implementation of the method for shellfish toxin testing.

NCCOS Expertise Leads to Water Quality Improvements in Portugal

NCCOS has extended NOAA's global leadership in integrated management of the oceans by collaborating with European scientists to improve water quality in Portugal. During the past year, NCCOS has helped the Portuguese government develop its water quality monitoring plan to fulfill the European Commission Water Framework Directive, which has requirements similar to those under the U.S. Clean Water Act. A multinational group of scientists worked with Portugal's Institute of Marine Research and the Portuguese Water Institute to draft a monitoring plan for estuarine and coastal water bodies, including development of a method to determine water body boundaries.

Along with two published reports resulting from its development, the plan will serve as guidance to other European Union countries developing the required monitoring plans. In addition, the method for determining water body boundaries will be used to develop water quality management plans and guide other coastal research in the U.S. as well as other countries.



A new Histological Manual on Shellfish Disease, developed by NCCOS Cooperative Oxford Laboratory, is being widely distributed nationally and internationally.



NCCOS' coastal remote sensing products developed during fiscal year 2005 received international recognition.

Coastal Managers and Citizens in Bermuda Protect Seagrasses using NCCOS Expertise

NCCOS and Florida International University (FIU) trained Bermuda coastal managers on seagrass ecology and management to help them develop a seagrass management plan. At the request of Bermuda's Ministry of Environment, the NCCOS and FIU scientists trained staff from the Bermuda Department of Environmental Protection and Bermuda Biodiversity Project as well as staff and graduate students from the Bermuda Department of Conservation Services. In addition to conducting lectures, field trips, and hands-on training for the coastal managers, the NCCOS and FIU scientists heightened citizen awareness of seagrass conservation efforts through three public lectures. NCCOS continues to assist the Bermuda officials in developing their seagrass management plan.

NCCOS First to Discover Toxic Algae Involved in Namibian Fish and Bird Mortalities

NCCOS scientists used mass spectrometry – a powerful analytical technique that can identify unknown compounds – and a newly-developed biosensor to confirm the involvement of domoic acid, an algal toxin, in an unusual mortality event involving fish and birds along Namibia's coast. The NCCOS results were presented to the Namibian Ministry of Fisheries and Marine Resources to help Namibian officials develop a national monitoring program for algal toxins. The discovery occurred on the eve of the 11th International Conference on Harmful Algae in South Africa, and it became the focus of attention for scientists worldwide, especially in Namibia, Angola, and South Africa where HABs are an increasing concern for both wild and farmed fisheries.

Expanded Forecasting Capabilities to Protect Public Health, Local Economies from Harmful Algal Blooms in Gulf of Mexico

Severe blooms of the harmful algae *Karenia brevis* in 2000, 2001, and 2002 in Mexico and Texas led to NCCOS collaboration with Mexico to understand conditions that initiate and transport blooms in the western Gulf of Mexico. In 2000, all Texas bays were closed to shellfishing as a result of *Karenia brevis* blooms and in December 2001, all Mexican coastal waters were closed to shellfishing. These harmful algae can cause toxic shellfish poisoning, fish kills, marine mammal deaths, and losses to local economies. The events in Texas and Mexico led to cooperative research and a request by the Mexican government to expand geographic coverage of remote bloom monitoring in the Gulf of Mexico.

NEW DIRECTIONS FOR NCCOS SCIENCE

Facilities Construction

New facilities and major upgrades to state-of-the-art technologies are giving NCCOS centers added capacity and support for a broad range of pioneering new research.

Updated Seawater System Improves Research Capabilities at NCCOS Center

A new high-tech seawater system at the NCCOS Center for Coastal Fisheries and Habitat Research (CCFHR) in Beaufort, N.C. replaced a 30-year old gravity flow system to provide high quality seawater for CCFHR research on invasive species, aquaculture, and altered habitats in experimental fish-raising labs and outdoor tanks. The new system increases husbandry capacity, seawater flow rate, and reliability, and does so at lower costs and within a safer operating environment.

Expanded Greenhouse at NCCOS Center Increases Research Capabilities

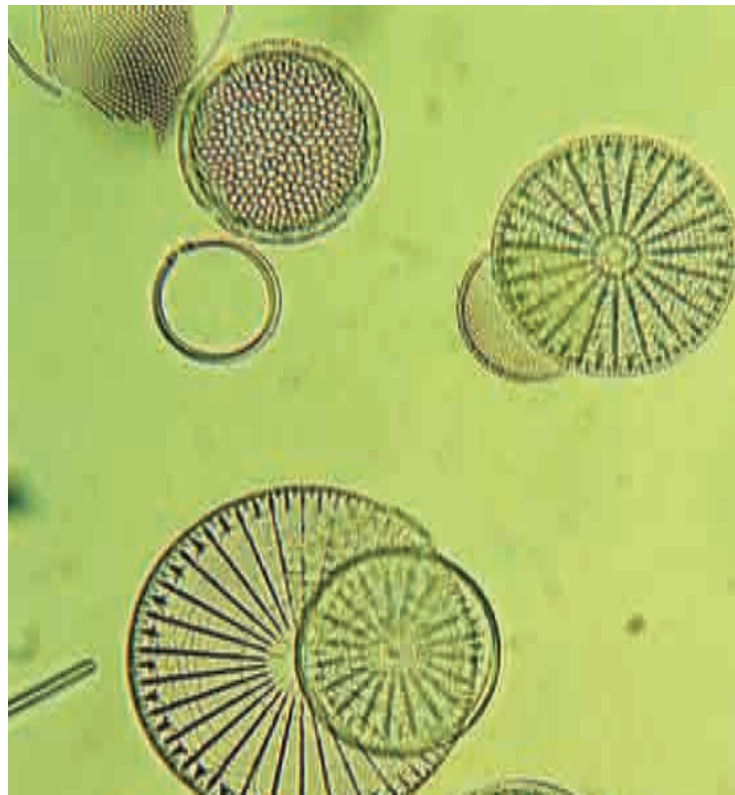
The NCCOS Center for Coastal Environmental Health and Biomolecular Research expanded its greenhouse mesocosm from 644 to 1,400 square feet and added an evaporative cooling system to help during summertime temperature extremes. The facility, which previously contained twelve modular tidally controlled estuarine mesocosms, now has the capacity to support 36 functioning systems. This increased capacity will support additional functions and allow for more complex experiments with increased replication.

Nuclear Magnetic Resonance Instruments Advance Molecular Scale Research at Hollings Marine Laboratory

Two new high-resolution nuclear magnetic resonance (NMR) instruments at the Hollings Marine Laboratory (HML) in Charleston, S.C. are offering scientists a powerful new cross-disciplinary tool for research relating molecular scale information to complex human and ecosystem health issues for the first time. According to a HML scientist working most closely with the NMR technology, "the exciting thing about NMR-based research is that the technology and tools of NMR continue to evolve at an exciting pace that we could not have envisioned when the first commercial NMR instruments were introduced in the early 1960s. To successfully manage human interactions with the environment, we must cover the scale of atoms to ecosystems, and NMR is a tool that can do that right now." The NMR instruments have been optimized to address structural biology, metabolomics, and natural products research, three disciplines of prime interest to HML. Scientists, for example, will be able to investigate climate change and its effects as organisms adapt at the structural and functional level (i.e., monitoring the metabolic response of organisms to subtle environmental changes).

New NCCOS Center Building to Provide Teaching Lab, Increased Research and Outreach Opportunities

NCCOS' Center for Coastal Fisheries and Habitat Research is one step closer to having its first new building in 40 years as the building plans passed the "95% architectural review" this year. The building will house staff offices as well as an auditorium, broadcast facilities, teaching laboratory, and library. Through the Intergovernmental Cooperation Act Agreement, the new building will also serve as the main office of the North Carolina NERR/North Carolina Coastal Reserve Program. This new partnership will improve research and outreach collaborations among NCCOS, the NERR, and the North Carolina Department of Environment and Natural Resources. Building construction is scheduled to be completed in June 2006.



The redevelopment of four NCCOS laboratories is providing scientists and partners state-of-the-art research facilities, and the redevelopment of the Kasitsna Bay Lab in Alaska was finished early and under budget. These updates maintain NCCOS' commitment to a safe working environment for its 300-plus workers.



New Partnerships

“Bricks and mortar” are necessary for the conduct of coastal ocean science, but the human dimension is also imperative for our achievements to come to fruition. In this context, NCCOS constantly builds on its extensive network of partners, and seeks out new partnerships with academia, government, non-profit organizations, and the private sector. Following is a sampling of exciting new partnerships launched during the past fiscal year:

New Research Center to Help Conserve Protected Marine Animals

NOS and NOAA Fisheries established the new Cooperative Center for Marine Animal Health to serve as the agency’s focal point for a wide spectrum of marine animal health issues. Through cooperative efforts by NCCOS and NOAA Fisheries scientists, the center will support and coordinate NOAA’s research on the health of marine animals – such as sea turtles, corals, and anadromous fish – as well as responses to unusual marine mortality events through data collection, forensic investigation, and integrated analyses. The scientists will use geographic information systems (GIS) and other modern techniques to study the health of marine mammals – especially vulnerable species – in order to better understand the relationship of their health with biological, physical, and chemical parameters within the environment. The findings will help shape fisheries management decisions and be used to evaluate human health risks from impaired marine ecosystems.

Alaska Tribal Training Partnership Bridges Miles and Cultures

Tribal officials bring to the table a wealth of understanding about natural resources and the environment, but according to Tatitlek Village Chief Gary Kompkoff, the fundamental challenge that tribes face “is that western science in many

ways doesn't fully respect and understand the traditional knowledge that tribes and fishers have." Through the Alaska Tribal Training Program, NCCOS scientists are teaming with tribal governments and the University of Alaska-Fairbanks to improve access to that knowledge and increase employment opportunities for tribal members. The goal of the program is to combine traditional ecological knowledge and practices with the kinds of rigorous science practiced throughout the U.S. so that the tribes can become more meaningfully involved in fish and wildlife management, research, and monitoring. The tribes have developed a number of promising programs to address environmental and natural resource issues and are eager to strengthen collaborative partnerships with resource agencies and researchers. A variety of Federal and state projects and grants offer research and management opportunities to the tribes and their members, including projects at NCCOS' Kasitsna Bay Laboratory in Alaska which employs rural Alaskans and gives them opportunities to pursue education and training objectives. Rural Alaskans can earn college level credit in marine, coastal, and fisheries sciences for their practical experience at the Lab. Credits are transferable to the University of Alaska-Fairbanks, where students can earn a bachelors degree. A pilot program will enable approximately ten students to receive a certificate or associates degree and then seek employment in the region or continue their education for a more advanced degree.

Managers and Scientists Receive Timely, Relevant Research from New Caribbean Coral Reef Institute

NCCOS and the University of Puerto Rico have established the Caribbean Coral Reef Institute (CCRI) at the University of Puerto Rico's Department of Marine Sciences Magueyes Island Research Laboratory. This congressionally-directed program serves as a major hub for applied coral reef research in the Caribbean and, along with the Caribbean Marine Research Center in Florida, provides a competitive extramural process extending to the broader science community. The

main objective of the CCRI is to aid in the management and conservation of Puerto Rico's coral reefs by providing timely, relevant information to the Puerto Rico Department of Natural and Environmental Resources and scientific community-at-large.

Human Dimensions

This year NCCOS increased the emphasis on the human dimensions – the social, economic, and political aspects – of its work, beginning with the hiring of a human dimensions coordinator, establishment of Memoranda of Understanding with two university programs, and funding of two graduate research assistantships in human dimensions research. This research strives to better understand human contributions to ecosystem stress, consequences of ecosystem stress and management for societal goals, governance of large marine ecosystems, and the vulnerability and recovery of communities to coastal hazards. Working with its new partners, NCCOS is developing a human dimensions strategic plan and providing the results of human dimensions research to improve coastal restoration monitoring, HAB mitigation, fisheries management, and coral reef ecosystem management. During fiscal year 2005, NCCOS:

- ⦿ Assisted in the development of the human dimension-related components of the *Science-Based Restoration Monitoring of Coastal Habitats* manual;
- ⦿ Convened a workshop for social and biophysical scientists from academic, private, state, Federal, and regional organizations to identify the social science necessary to achieve the goals of the National Plan for Algal Research and Response. A work group is developing a human dimensions research strategy to help implement the Plan as well as the Harmful Algal Bloom and Hypoxia Research and Control Act;



“Focusing on human health impacts brings the assessment cycle full-circle. This is a big deal, as we have traditionally focused on how humans affect the marine environment.”

Fred Holland
Director, Hollings Marine
Laboratory

- ⦿ Produced socioeconomic profiles of fishing communities in western Puerto Rico through an ongoing study by NCCOS and NOAA Fisheries; and
- ⦿ Connected societal goals and ecosystem health through a fisheries case study in Galveston Bay, Texas, and presented the results at the Annual Meeting of the Eastern Sociological Society. The NCCOS scientist found that chemical exposures through fish consumption are highest for subsistence fishers in urban areas and that fish consumption advisories across the U.S. are increasing as states adopt progressively lower risk thresholds for issuing advisories.

Ocean and Human Health Connections Better Understood by NCCOS and Partners at NOAA Center of Excellence

With its designation as one of three NOAA Centers of Excellence in Oceans and Human Health and \$2 million in initial funding, the HML is beginning to address fundamental questions about the quality and safety of coastal waters and the seafood they contain, including:

- What are the cumulative impacts of coastal development on marine life?
- Are the fish and shellfish safe to eat?
- Is it safe for people to swim in the oceans?
- What are the best strategies to reduce risks facing our marine ecosystems?

HML scientists – from NCCOS, the Medical University of South Carolina, National Institute of Science and Technology, University of Charleston, and South Carolina Department of Natural Resources – are examining how marine organisms respond to multiple environmental stressors, and how best

to identify and characterize chemical and microbial threats to marine ecosystems and human health. For example, HML scientists are evaluating molecular-level responses of oysters to multiple environmental stressors, and seeking to understand how this exposure affects the degree to which oysters serve as vectors for human pathogens. Through a field program in shallow tidal creeks and estuaries, HML scientists are determining the reliability of new monitoring and assessment tools for regional and national application.

HML recently launched the Pathogen Source Tracking Program aimed at rapidly detecting and tracking microbial threats and improving public health risk assessments. To complement their research activities, HML scientists are reaching out to students, teachers, and the public to train the next generation of scientists interested in the oceans and human health.



REGIONAL HIGHLIGHTS

Northeast

New England Communities Plagued by Harmful Algal Bloom Benefit from NCCOS Funding and Expertise

In response to the most severe algal bloom of *Alexandrium fundyense* since 1972 which extended along the coasts of Maine and Massachusetts in spring 2005, NCCOS provided more than \$30,000 in emergency funds for new and expanded sampling and monitoring of the bloom in Massachusetts Bay. While such blooms occur periodically in the Gulf of Maine, the 2005 bloom spread into Massachusetts waters for the first time since 1993. The bloom resulted in extensive commercial and recreational shellfish harvesting closures along the New England coast to protect humans from paralytic shellfish poisoning, as consumption of toxin-contaminated shellfish can result in severe illness and death. NCCOS research in the Gulf of Maine – amounting to \$11 million from 1998 through 2007 – has enhanced response capabilities in the region. New molecular methods for rapidly detecting and mapping *Alexandrium* and models in the Gulf of Maine helped predict the bloom and understand factors leading to the unusual event. In addition, NOAA awarded \$540,000 to Woods Hole Oceanographic Institution to sustain monitoring throughout the bloom period and support post-bloom

NCCOS First to Identify Algal Biotoxins in Endangered Whale Species

NCCOS scientists were first to identify algal biotoxins in North Atlantic right whales, an endangered species of about 300 individuals, many of which feed in Canada's Bay of Fundy. Canadian and U.S. scientists are collaborating to provide data to coastal managers on right whale exposure to these toxins and their potential threats to right whale reproduction. While effects of these neurotoxins on right whales are uncertain, laboratory research suggests they may interfere with reproductive functions, may be highly toxic to newborn calves, and may cause increased susceptibility to disease and possibly ship strikes. The potential impacts of prolonged, sub-lethal biotoxin exposure on reproduction and population recovery are important areas for future research.

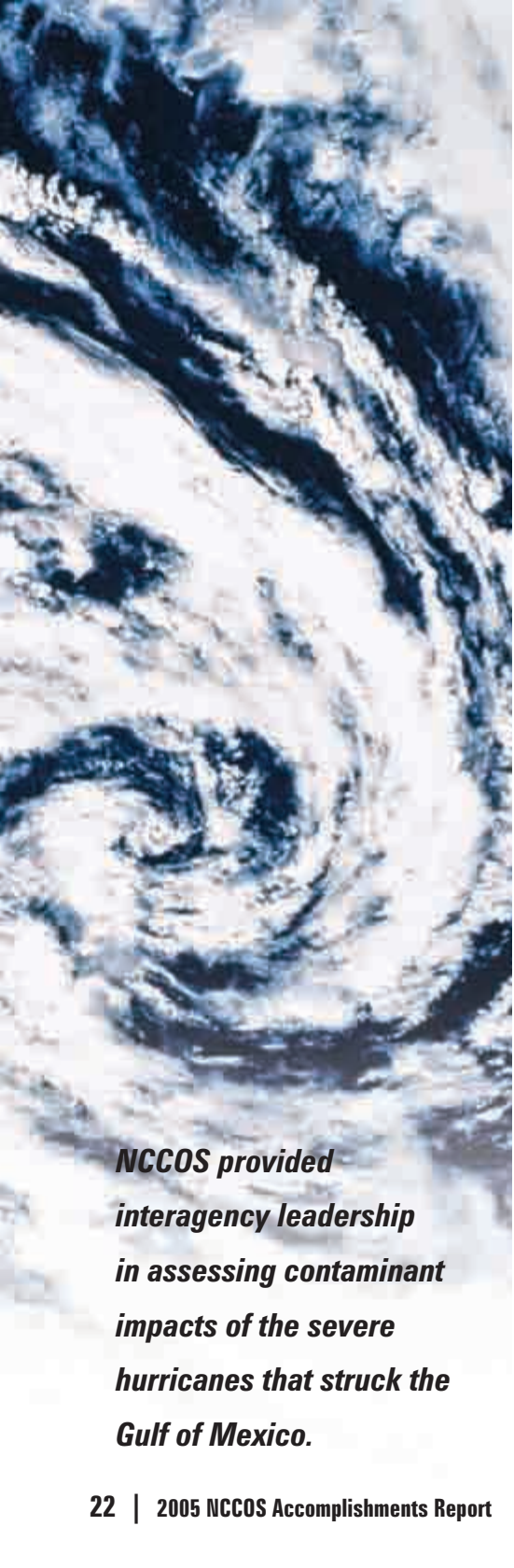
Southeast

Invasive Lionfish Found Abundant and Widely Distributed in North Carolina Waters

In 2005, NCCOS surveyed 27 locations across 90 miles of the North Carolina shelf to quantify the invasion of the Indo-Pacific lionfish and observed them at 95 percent of surveyed locations, suggesting widespread distribution. In addition, the density of lionfish was similar to that of many native grouper species. Results from other sources suggest that both the density and distribution of the poisonous tropical invaders, which were first reported off the North Carolina coast in August 2000, are increasing. Furthermore, the results suggest the likelihood of future impacts from lionfish in Atlantic coastal ecosystems.

“Significant advances in research on biotoxins, pathogens, and emerging contaminants are leading to improved seafood safety and marine animal health.”

Geoff Scott
Director, NCCOS Center for
Coastal Environmental Health
and Biomolecular Research



NCCOS provided interagency leadership in assessing contaminant impacts of the severe hurricanes that struck the Gulf of Mexico.

Damage Assessment and Restoration Efforts in Florida Keys Made Easier with New Models

Working with NOS' National Marine Sanctuary Program and the U.S. National Park Service (NPS), NCCOS calibrated a coral injury recovery model for the Florida Keys National Marine Sanctuary to develop recovery estimates for natural resource damage assessments, restoration plans, and Federal court cases regarding coral reef injuries. The scientists located historical boat groundings on coral reefs within the Sanctuary to assess the natural recovery process. NCCOS and NOS' Office of Response and Restoration are adapting existing seagrass and marsh recovery models to other ecosystems, such as corals and rocky intertidal habitat to provide accurate information to parties responsible for the damages, restoration planners, and the public.

Protection of Bottlenose Dolphins through Increased Regulation of Blue Crab Fishery Supported by NCCOS Research

A NCCOS model using marine mammal strandings data and information from blue crab fishers supported a recent management decision to heighten regulation of the Atlantic blue crab fishery to help protect bottlenose dolphins. Regulation of the fishery under the Marine Mammal Protection Act (MMPA) was heightened based on suspected increases in fishery-related mortalities of bottlenose dolphins in mid- and south-Atlantic coastal states. The Atlantic blue crab fishery – one of South Carolina's largest commercial fisheries by volume and value – was found to be the most significant anthropogenic source of mortality to bottlenose dolphins in the state. The model developed by NCCOS scientists, which was published in late 2004 in the *Journal of Cetacean Research and Management*, provided the best available data for future fisheries management decisions. The model may also be applicable to other marine

mammal-fisheries interactions, thereby helping Federal and state fisheries managers meet the MMPA goals of reducing incidental mortality and serious injuries of marine mammals resulting from fishing practices.

Fisheries Data Linked with Global Climate Change Using Long-term NCCOS Data Set

Data collected by NCCOS and NOAA Fisheries scientists over the past 20 years on larval fish entry into Beaufort Inlet, N.C. – the longest continuous time series of larval fish entry on the U.S. east coast – was used to identify decadal correlation with climate level events, specifically variation in the El Niño/Southern Oscillation of the Pacific Ocean and North Atlantic Oscillation. NCCOS monitors larval fish entry into the inlet to also assess adult population abundance and environmental conditions. Scientists from Rutgers University Marine Field Station used the Beaufort Inlet data to identify correlations between larval fish entry and climate events.

Gulf of Mexico

Environmental Impacts of Hurricanes Katrina and Rita Assessed by NOAA and Other Federal Agencies

NCCOS played a key role in planning and coordinating the efforts of the EPA, FDA, USGS, and NOAA in conducting an environmental impact assessment of Hurricanes Katrina and Rita in coastal waters and wetlands throughout the affected areas of Louisiana, Mississippi, and Alabama. This multi-agency response includes six projects to assess coastal ecosystems, including biological conditions, fisheries, water quality, and sediment quality; seafood safety; and human health risks. The results will be used to support environmental and public health recovery and restoration efforts.

NCCOS Data Used to Help Protect Humans and Coastal Resources from Hurricane Contamination

NCCOS scientists assisted in addressing environmental and health impacts in Louisiana, Mississippi, and Alabama from Hurricanes Katrina and Rita by monitoring and assessing chemical contaminant concentrations in oysters, coastal waters, and sediments at 20 coastal Mussel Watch Project sites. The sediment and water samples were also analyzed for bacterial and viral indicators of human or animal fecal contamination, and the oyster samples are being assessed by the FDA for chemical and microbial indicators of seafood safety. With 20 years of data from over 300 sites nationwide, the Mussel Watch Project is serving as a baseline to compare data collected after the hurricanes. The results will support environmental and public health recovery and restoration efforts. More information on NCCOS' response to Hurricanes Katrina and Rita is available at: <http://ccma.nos.noaa.gov/data/katrina/welcome.html>.

Caribbean

Online Database Improves Coral Reef Research and Management in Caribbean

Online access to information on fish and habitats is improving research and management by NCCOS' partner agencies in the Caribbean region, including the NPS and University of Puerto Rico. The Coral Reef Ecosystem Assessment and Management Database developed and managed by NCCOS provides data gathered over the last four years from field studies in La Parguera, Puerto Rico and the U.S. Virgin Islands. Researchers, coastal managers, and the public can download data sets or query the database for reports on species biomass, richness, abundance, and diversity. The database is available at: http://www8.nos.noaa.gov/biogeopublic/query_main.aspx.

New Computer Software Helps Managers and Scientists Monitor Coral Reefs

The NCCOS-sponsored National Coral Reef Institute developed a Windows-based computer program to rapidly determine coral cover and diversity using underwater photographs. The Coral Point Count with Excel Extensions (CPCe) software automates data collection and processing, and helps resource managers and scientists monitor the health of coral ecosystems. The software makes it easy to add, manipulate, and view coral data; provides new spreadsheet, orientation, and statistical features; and allows for aerial analysis of benthic features. CPCe is available free of charge for non-commercial use by managers and scientific institutions at: <http://www.nova.edu/ocean/cpce/>.

Documented Decadal Changes at Salt River Bay National Historic Park and Ecological Preserve Inform Research and Monitoring Activities

NCCOS, the NPS, and the U.S. Virgin Islands Department of Planning and Natural Resources provided managers of the Salt River Bay National Historic Park and Ecological Preserve with information and tools to successfully manage research and monitoring activities. They developed a comprehensive ecological characterization of the Park, consisting of a report, digital habitat maps from the 1970s through 2000, and a collection of orthorectified historical aerial photographs, all of which are available on a DVD. The products summarize years of NOAA/NPS studies at the site, document massive changes since the 1970s in the extent of seagrass and mangrove habitats within the Park, and integrate data from several monitoring programs.



“Among our key accomplishments over the past year were transitioning our research to application for the protection of specific species, and focusing on the management of non-indigenous species that potentially could become invasive. Characterizing the population growth of the introduced marine finfish lionfish and studying the proposed introduction of the Asian Oyster were particular highlights.”

David Johnson
Director, NCCOS Center for Coastal Fisheries and Habitat Research



Great Lakes

Harmful Algal Bloom Forecasting System to Help Protect Public Health in Great Lakes

NOAA scientists are developing methods to identify and monitor blooms of microcystis, a harmful blue-green alga, with satellites. These methods and microcystis data collected by NCCOS and NOAA's Great Lakes Environmental Research Laboratory during an August 2005 cruise in Saginaw Bay, MI support the development of a HAB detection and forecasting system to help Great Lakes state and local officials protect public health. Microcystis can produce a toxin which in high concentrations poses health risks to swimmers and may contaminate drinking water. Project results, including data from the cruise, support NOAA's Oceans and Human Health Initiative.

Northwest

NCCOS Helps Alaskan Village Council, Fish Hatchery Improve Pink Salmon Release

NCCOS scientists collaborated with the Village Council and fish hatchery staff in Port Graham, Alaska to improve the release of 25 million pink salmon. Past hatchery releases of pink salmon fry (less than one year old) suffered heavy predation as a result of their lack of predator-avoidance behavior. NCCOS helped local managers decide to release the fish at night at the mouth of the bay in strong ebb tidal currents, thereby reducing risks from visual predators. The fish will also be trained in anti-predator behavior by copying the behavior of other prey-avoiding fishes.

New HAB Management Program in Oregon to Help Protect Coastal Resources and Public Health

NCCOS is helping the State of Oregon develop a program to predict, monitor, and manage HABs, which have caused beach and shellfishery closures there. Oregon's program is being developed similar to the successful Olympic Region Harmful Algal Bloom (ORHAB) Program in Washington State, a partnership among NCCOS and four other Federal agencies which sponsors research and development of a HAB early warning system. Phytoplankton cell counts and rapid toxin tests provide early warnings regarding potential toxin-related concerns, so coastal resource and public health managers can allocate sampling and monitoring resources more effectively and efficiently, thereby reducing costs and risks to its citizens.



Southwest

NCCOS Instruments Broaden Scale, Location, and Efficiency of Ocean Observations in Hawaii

NCCOS researchers have compiled a “Get Wet” toolbox of off-the-shelf instruments for broader, more cost-effective ocean observations. NCCOS and its partners in Hawaii deploy the underwater instruments from small boats, making observations at scales, locations, and efficiencies not possible using historical field approaches or large research vessels, airborne, or satellite observation platforms. The instruments map and assess coral reefs, seagrass beds, illegal dump sites, injured natural resources, and water column habitats from the Caribbean to the Pacific Northwest.

New Digital Maps of Pacific Islands Help Managers Monitor Corals and Delineate, Evaluate Marine Protected Areas

NCCOS published the first comprehensive digital maps depicting the location and distribution of shallow-water seafloor habitats in American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. The maps, which are available online and on CD, help resource managers, scientists, and researchers delineate and evaluate potential marine protected areas ecosystem monitoring strategies. Thirty-four types of benthic habitats in eleven unique ecological zones were mapped in a GIS using visual interpretation of

Understanding and Management of National Marine Sanctuaries in California Improved using Long-term Data Set Integrated by NCCOS

NCCOS scientists developed and published an integrated characterization of physical conditions for three National Marine Sanctuaries offshore of Central California. They processed and formatted satellite imagery to make it useful for Sanctuary managers; developed techniques to conduct analysis of wind conditions, particularly for ongoing studies of seabirds; and developed the geographic and climatologic context of changing oceanographic conditions. The project included analysis of 20 years of satellite sea surface temperature data, seven years of satellite chlorophyll and turbidity data, and time series data of precipitation and winds, as well as the comparison of patterns discovered through the analysis of data from stations that have been recording temperatures for decades.

New Tool Developed by NCCOS and NOAA Fisheries to Help Protect Marine Turtle Health

A joint study between NCCOS and the NOAA Fisheries laboratory in Honolulu has demonstrated the utility of lipid content and fatty acid composition as indicators of feeding ecology and animal health for two groups of endangered Hawaiian green turtles. The study, published in *Comparative Biochemistry and Physiology Part B* in February 2005, is one of a very few publications on this subject for this species. Information about the lipid content and composition can provide an indication of nutritional status and, when considered along with other health indicators, can enhance the capability to assess marine turtle health.



CONTACTING NCCOS

NCCOS Headquarters is located along with its parent organization, NOAA's National Ocean Service. Headquarters operations include professional, financial, and administrative management and coordination of the activities conducted at the NCCOS centers and laboratories.

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NCCOS Center for Coastal Monitoring and Assessment

(CCMA) monitors, surveys, and assesses coastal environmental quality, habitats, and resource distribution. CCMA manages the National Status and Trends Program, which performs long-term contaminant monitoring at over 350 estuarine and coastal sites. CCMA's monitoring and assessment studies determine how contaminant exposure and changes in coastal habitats affect the distribution and abundance of living marine resources. In addition, CCMA uses remote-sensing technology to evaluate estuarine and coastal environmental problems, track harmful algal blooms, and determine coastal habitat changes over time.

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NCCOS Center for Sponsored Coastal Ocean Research

(CSCOR) administers a Federal-academic partnership to develop predictive capabilities for managing coastal ecosystems. These partnerships support long-term multidisciplinary projects to evaluate ecological effects of multiple stressors; develop forecasting tools; respond to the combined public health, economic, and ecosystem threats

from harmful algal blooms; and transition successful research into NOAA operations. CSCOR research addresses coastal fisheries ecosystems, cumulative coastal impacts, and harmful algal blooms/eutrophication.

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NCCOS Center for Coastal Fisheries and Habitat

Research (CCFHR) provides coastal resource managers with information to enhance recreational and commercial fishing and essential fish habitat. CCFHR conducts laboratory and field research on estuarine processes, biological productivity of nearshore and ocean ecosystems, dynamics of coastal and reef fishery resources, and effects of human influences on resource productivity. The CCFHR-affiliated Kasitsna Bay Laboratory, located on a small bay in the Kachemak Bay system in Alaska, focuses on the impacts of land and resource use on relatively pristine coastal ecosystems.

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NCCOS Center for Coastal Environmental Health and Biomolecular Research

(CCEHBR) conducts interdisciplinary research on issues related to coastal ecosystem health, environmental quality, and related public health impacts. CCEHBR conducts chemical, biomolecular, microbiological, and histological research pertaining to human influences on marine and estuarine habitats. The CCEHBR-affiliated Cooperative Oxford Laboratory located in Oxford, Maryland specializes in the pathology of marine organisms and habitat restoration research.

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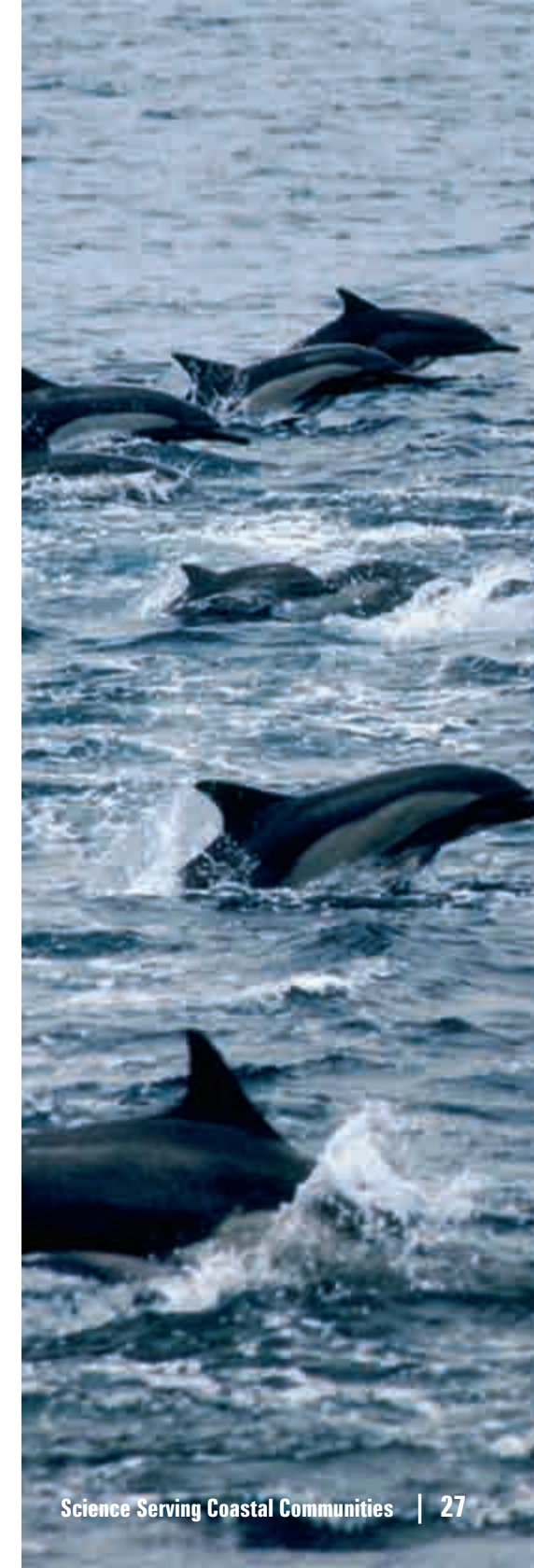
Cooperative Oxford Laboratory
904 South Morris Street
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<http://www.chbr.noaa.gov/default.aspx?category=oxford&pageName=Oxford%20home%20page>

The **Hollings Marine Laboratory** (HML), a NOAA facility on state-owned land in Charleston, South Carolina, will house a new NCCOS center. The multi-institutional, multi-disciplinary laboratory, named after former U.S. Senator Ernest F. Hollings of South Carolina, focuses on the relationship between the coastal ocean ecosystem and human health. It represents an innovative way of developing scientific advancements by integrating medical and marine expertise through a diverse partnership among Federal, state, and academic organizations: NCCOS, the Medical University of South Carolina, National Institute of Science and Technology, University of Charleston, and South Carolina Department of Natural Resources. As a newly designated NOAA Center of Excellence in Oceans and Human Health, the HML facility uses state-of-the-art technologies to conduct pioneering new research examining relationships between coastal environmental health and human health.

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ACRONYM DEFINITIONS

CCEHBR – NCCOS’ Center for Coastal Environmental Health and Biomolecular Research
CCFHR – NCCOS’ Center for Coastal Fisheries and Habitat Research
CCMA – NCCOS’ Center for Coastal Monitoring and Assessment
CCRI – Caribbean Coral Reef Institute
CPCe – Coral Point Count with Excel extensions
CSCOR – NCCOS’ Center for Sponsored Coastal Ocean Research
EPA – U.S. Environmental Protection Agency
FDA – U.S. Food and Drug Administration
FIU – Florida International University
GIS – geographic information system
HAB – harmful algal bloom
HML – Hollings Marine Laboratory
LUMCON – Louisiana University Marine Consortium
MMPA – Marine Mammal Protection Act
NCCOS – NOS’ National Centers for Coastal Ocean Science
NCCR II – National Coastal Condition Report II
NERR – National Estuarine Research Reserve
NERRS – National Estuarine Research Reserve System
NMR – nuclear magnetic resonance
NOAA – National Oceanic and Atmospheric Administration
NOS – NOAA’s National Ocean Service
NPS – U.S. National Park Service
ORHAB – Olympic Region Harmful Algal Bloom
USCRTF – U.S. Coral Reef Task Force
USGS – U.S. Geological Survey





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