



# EPA's Ocean Survey Vessel *Bold*

2006 Annual Report

Monitoring and Assessing  
the Health of Our Oceans and  
Coastal Waters



# Preface



EPA Administrator Johnson (on left) and Assistant Administrator for Water Ben Grumbles in the dry laboratory.



EPA Administrator Johnson (forward right) and Assistant Administrator for Water Ben Grumbles (back center) assist EPA Chief Scientists with the sediment sampler.



EPA Administrator Johnson (on left) and Assistant Administrator for Water Ben Grumbles examine sediment samples.

This first Ocean Survey Vessel *Bold* Annual Report highlights the *Bold*'s scientific survey capabilities, survey accomplishments, and the unique role vessels play in supporting EPA's monitoring and assessment programs. This report will be of particular interest to those working to protect our oceans and coastal resources.

Our previous Ocean Survey Vessel, the OSV *Anderson*, monitored our oceans and coastal waters for 25 years. The *Bold* is continuing to carry on this important mission. The monitoring information gathered with the *Bold* allows EPA to more accurately assess impacts to the marine environment and in turn allows EPA to more effectively protect our marine resources.

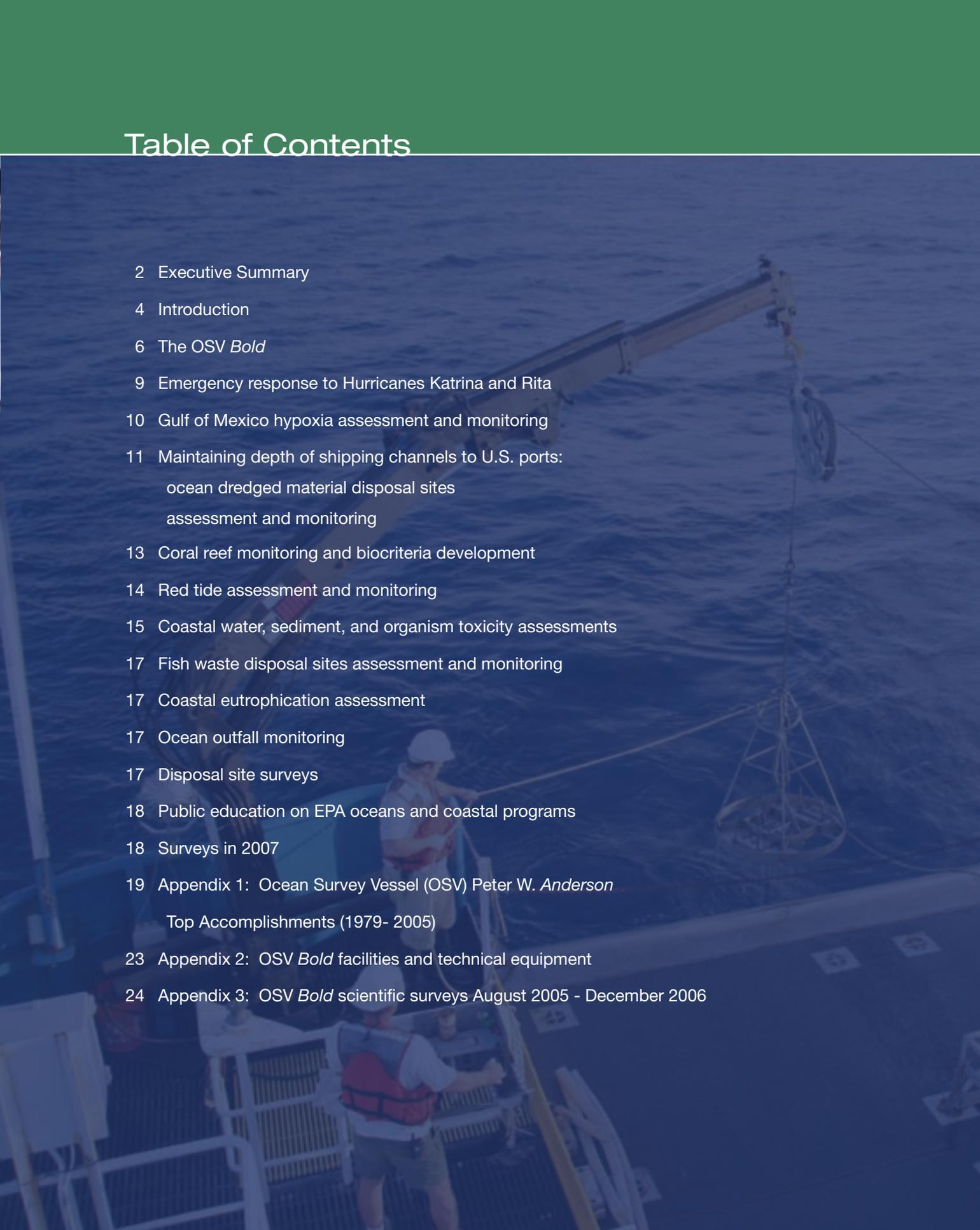
This past year the *Bold* supported scientific surveys ranging in topics from red tide research in New England waters to coral reef health monitoring, assessment of Gulf of Mexico hypoxia, and monitoring of dredged material dumpsites. The *Bold* provided state-of-the-art oceanographic support in the Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea.

Through this floating laboratory, EPA is helping to chart a healthier course for our oceans, ensuring that the beauty and health of our oceans will be enjoyed for years to come by future generations.

A handwritten signature in white ink that reads "Ben Grumbles". The signature is fluid and cursive.

Benjamin H. Grumbles,  
Assistant Administrator for Water  
United States Environmental Protection Agency

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- The background of the page is a photograph of a research vessel's deck. A large crane arm extends from the upper right towards the center. A person wearing a white hard hat and a red life vest is visible in the lower center, looking towards the right. The deck is blue with white railings and various pieces of equipment. The overall scene is set against a backdrop of a blue ocean under a clear sky.
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## Executive Summary



The *Bold* at sea

This report highlights oceanographic surveys from the initiation of the *Bold* as EPA's oceans and coastal monitoring vessel in August 2005 through December of 2006. Over this year and a half, the *Bold* completed a total of 32 oceanographic surveys involving hundreds of sampling locations, spending over 250 days at sea in U.S. waters.

Scientific surveys completed by the *Bold*:

- Assisted in the aftermath of *Hurricanes Katrina and Rita*.
- Gathered data in three *Gulf of Mexico hypoxia* surveys in 2006 (April, June, September).
- Conducted monitoring regarding 14 *ocean dredged material disposal sites* managed by EPA.
- Surveyed *coral reef environments* in the Caribbean and in Florida waters.
- Investigated whether shellfish beds in the Gulf of Maine exposed to *red tide* could be reopened to harvesting.
- Evaluated *contaminant levels* in organisms that inhabit artificial reefs created from vessels scuttled off the coast of Florida.
- Monitored *shellfish waste disposal* impacts to the marine environment off the coast of Virginia.
- Assessed *coastal eutrophication* in the Mid-Atlantic Bight (New York to North Carolina).
- Monitored an *ocean discharge outfall* for effects on the marine environment in St. Croix, U.S. Virgin Islands, and assessed possible bacterial contamination at an outfall in Virginia.

Various survey partners have made the *Bold*'s first full year of operation successful, including: U.S. Army Corps of Engineers, U.S. Navy, U.S. Virgin Islands Department of Planning and Natural Re-



Photo by John H. McShane

**OSV *Bold* ship manager Ken Potts explains how scientists use the water sampler.**

sources, Woods Hole Oceanographic Institution, the National Estuary Program, and National Oceanic and Atmospheric Administration.

In addition to supporting numerous and diverse scientific surveys, there have been more than 10 public education events held aboard the *Bold*. Participants in events involving the ship in 2006 include EPA Administrator Stephen Johnson and Assistant Administrator for Water Ben Grumbles, and Regional Administrators Jimmy Palmer, Donald Welsh, Alan Steinberg, and Robert Varney.

# Introduction



The *Bold* docked at South Street Seaport,  
New York City, New York.

The future health of our ocean and coastal resources depends on our actions today. To restore and safeguard these resources, EPA undertakes many efforts to identify and control problems that threaten the health of our oceans and coastal waters.



EPA Gulf Ecology Division scientists, Anthony Digirolamo (on left) and Alex Almario, deploy the water sampler.

Gathering information and analyzing data to support management decisions are essential parts of marine resource protection. The *Bold* collects data in the ocean and coastal environments. The *Bold* surveys our oceans and coasts to protect human health, to support economic and recreational activities, and to influence actions that safeguard healthy habitat for fish, plants, and wildlife.

Our oceans and coasts are unique resources that support a wide diversity of life. We depend on those complex ecosystems to provide us with places to live, play, relax, and work. Our national economy is linked in a number of ways to the productivity of our oceans and coasts. For instance, in 2000, the ocean economy contributed more than \$117 billion to American prosperity, and supported in excess of two million jobs (U.S. Commission on Ocean Policy, 2004). Of no less importance are the values of marine resources that are

difficult to measure in economic terms. Values include the beauty of our oceans and coasts, their cultural significance, and the vital ecosystem functions they provide that sustain life on earth.

Human actions have the potential to adversely affect our coastal and ocean waters. Pollution of sediments might significantly alter aquatic ecosystems. Wastewater discharged from shore or vessels in violation of permit requirements might become a threat to public health and marine life. Toxic chemical and pathogen contamination negatively affects the entire food web, including humans, who need the nutrition that fish can provide, but who should not be exposed to unsafe contaminants. If not managed properly, ocean and coastal resources can be damaged by habitat modification, dredging, construction, and other human activities.

## The OSV *Bold*



The *Bold* at dock in the Caribbean.

Photo by Richard Klain

The *Bold* replaced EPA's previous ocean survey vessel, the *Anderson*. The *Anderson* served as the Agency's oceans and coastal monitoring vessel from 1979 until it was retired in 2005.



EPA Chief Scientists on the bow of the OSV *Bold*.

In 25 years of monitoring and assessing our oceans and coasts, the *Anderson* performed many physical, chemical, and biological investigations that supported numerous EPA and state coastal and ocean programs initiatives. Highlights of the *Anderson's* accomplishments can be found in Appendix 1.

The size, stability, and equipment capacity of the *Bold* offer many advantages over the *Anderson* for expanded scientific monitoring activities. The *Bold* can withstand more severe weather and higher seas, can accommodate a larger scientific crew, and has more space for work areas and scientific equipment.

The *Bold* was constructed by the Tacoma Boat Building Company of Tacoma, Washington, and was first commissioned on October 16, 1989, as the United States Naval Ship (USNS) *Vigorous*, a Tactical Auxiliary General Ocean Survey (T-AGOS) class

vessel. The vessel was later renamed the USNS *Bold* and served on many surveillance missions in the North Pacific Ocean. The Navy decommissioned the USNS *Bold* in 2004. EPA acquired the ex-USNS *Bold* on March 31, 2004, to replace the *Anderson*. EPA began scientific surveys with the *Bold* on August 8, 2005.

The *Bold* underwent dramatic changes in its transformation from a military surveillance vessel to an oceans and coastal monitoring vessel. EPA improved the deck system, and added wet and dry laboratories, including a data acquisition laboratory. Information is transmitted from sampling equipment to computers in the data acquisition laboratory, where the data are analyzed. The *Bold* is specially equipped to support EPA's environmental monitoring and assessment needs. Sampling equipment includes a

## Quick Facts



**Overall Length: 224 feet**  
**Width: 43 feet**  
**Draft: 15 feet**  
**Water Displacement: 2300 tons**  
**Operating Speed: 11 knots**  
**Ship Operating Crew: 19**  
**Scientific Berths: 20**

side scan sonar that produces digital acoustic images of the ocean floor and a Conductivity, Temperature, Depth (CTD) water profiler which measures physical water characteristics *in situ* in real-time throughout the water column. For a detailed list of scientific facilities and technical equipment on the *Bold*, see Appendix 2.

Scientific surveys conducted onboard the *Bold* address requirements of federal statutes such as the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act. The surveys provide scientific information and data to support EPA's mission to protect and enhance oceans and coastal waters through a variety of programs including part-

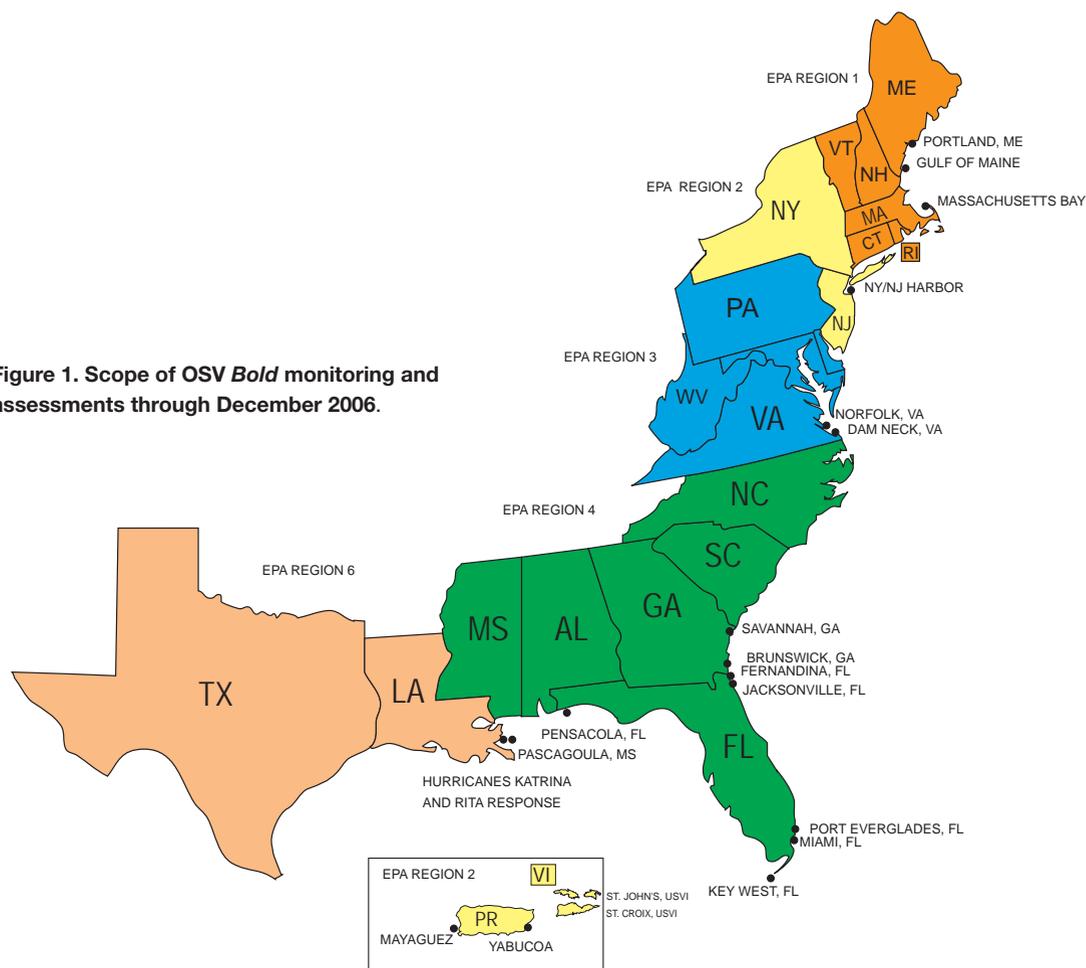
nerships and regulatory actions, and response to emergencies. Surveys are conducted by scientists from various EPA offices, including Regional offices, Headquarters, and the Office of Research and Development, from states and territories, academic institutions, and other partners. All surveys are conducted under the leadership of EPA-Certified Chief Scientists, who must complete a rigorous certification program before being allowed to serve in that capacity.

The *Bold* is managed by the EPA's Oceans and Coastal Protection Division, in the Office of Water. EPA Ship Manager Kennard Potts and vessel contractor Seaward Services, Inc. provide direction to, and operational handling of, the ship.

The *Bold* provides EPA and its partners a platform to gather the scientific data needed to assess effects to the marine environment and to make informed decisions to protect these resources and human health. EPA's partners include: the U.S. Army Corps of Engineers, U.S. Navy, National Oceanic and Atmospheric Administration, Woods Hole Oceanographic Institution, and the National Estuary Program. Since its initial scientific survey in August 2005, the *Bold* has supported surveys along the Atlantic Coast, in the Gulf of Mexico, and in the Caribbean Sea.

Scientific surveys fall into the categories listed below and are described in detail in the subsequent sections of this Report.

**Figure 1. Scope of OSV *Bold* monitoring and assessments through December 2006.**



- *Emergency response to Hurricanes Katrina and Rita*
- *Gulf of Mexico hypoxia assessment and monitoring*
- *Maintaining depth of shipping channels to U.S. ports: ocean dredged material disposal sites assessment and monitoring*
- *Coral reef monitoring and biocriteria development*
- *Red tide assessment and monitoring*
- *Coastal water, sediment, and organism toxicity assessments*
- *Fish waste disposal site assessment and monitoring*

- *Coastal eutrophication assessment*
- *Ocean outfall monitoring*
- *Disposal site surveys*

### **Emergency response to Hurricanes Katrina and Rita**

One of the *Bold's* first scientific surveys was in response to the damage caused by Hurricanes Katrina and Rita. EPA, the National Oceanic and Atmospheric Administration (NOAA), the Food and Drug Administration (FDA), and the U.S. Geological Survey coordinated an environmental impact assessment in coastal waters throughout the affected region. Response activities conducted aboard numerous

vessels, including the *Bold*, NOAA's Research Vessel *Nancy Foster*, FDA's small boat teams, and other field activities in the shallow near shore and wetland environments, enabled the scientific crews to characterize the magnitude and extent of coastal contamination as well as ecological effects resulting from the devastating storms. EPA monitored twenty areas at the mouth of the Mississippi River, Mississippi Sound, and Lake Ponchartrain to determine whether raw sewage from flooded communities had spread into local waters. Test results from Gulf of Mexico sampling indicated that the waters in these areas met the standards for all primary contact recreation, which includes swimming.

For additional information, see <http://www.epa.gov/katrina/index.html>.

### **Gulf of Mexico hypoxia assessment and monitoring**

The *Bold* supported assessment and monitoring of hypoxia in the Gulf of Mexico. Investigations into the Gulf's inner shelf along coastal Louisiana and Texas have documented the development of oxygen-depleted or hypoxic bottom waters and the increasing extent of the hypoxic zone over the past several decades. Surveys were conducted in April, June, and September 2006.

Hypoxia is dissolved oxygen concentrations in water that are less than two milligrams per liter. This

level is generally accepted as the minimum concentration required for most marine life to survive and reproduce. The magnitude of the Gulf of Mexico hypoxic zone varies from year-to-year, but appears to be the largest hypoxic zone in the waters of the United States. The area of hypoxic waters reached in excess of 20,000 square kilometers during the summers of 2001 and 2002, an area that exceeded the size of Massachusetts. Current evidence indicates that the development, extent, and persistence of hypoxia in the Gulf of Mexico are caused by anthropogenic nutrient loading from the Mississippi-Atchafalaya River Basin.

Hypoxia monitoring and assessment by the *Bold* supports the Hypoxia Action Plan. The Hypoxia Action Plan, prepared by a federal and state agency working group, was established in response to the Harmful Algal Bloom and Hypoxia Control Act in October 2000. The plan calls for expanded long-term monitoring programs, enhanced research and modeling efforts, and increased stakeholder education and national awareness programs. Increasing the scale and frequency of monitoring activities will better define the spatial and temporal extent and dynamics of the hypoxic zone, and the conditions of waters throughout the Mississippi- Atchafalaya River Basin. The surveys directly support the reassessment of nutrient load reductions achieved and

the response of the hypoxic zone since the Action Plan was released in January 2001. A revised Action Plan is scheduled for release in late 2007. The *Bold* supports the research and modeling efforts that are needed to reduce the scientific uncertainties of the effects of hypoxia, to find the sources of contributing factors, and to understand the biochemical processes that underlie the causes and effects of hypoxia. The surveys also support investigations into the social and economic impacts of various management strategies, as well as the success of nutrient reduction strategies.

The objective of the three *Bold* hypoxia surveys conducted in 2006 was to characterize the magnitude of, and variability in, physical, chemical, and biological properties and processes in the water column and sediments along coastal Louisiana throughout the year. Seasonal data and information collected include the distribution and variability in dissolved inorganic nutrient concentrations, particulate nutrients, total suspended solids, phytoplankton species biomass and pigments, temperature, salinity, dissolved oxygen, and light extinction. The data and information was used to refine a predictive model that will provide useful insight into Gulf of Mexico hypoxia. Additional studies to fill data and information gaps related to the water column and sediment processes were also performed during these *Bold* surveys.

### **Maintaining depth of shipping channels to U.S. ports: ocean dredged material disposal sites assessment and monitoring**

Our ports, harbors, and navigable waterways are vital to the U.S. economy and national security. Dredging maintains access to those areas, and has become increasingly important as ships increase in size. Dredged material disposal must be conducted in a safe and environmentally acceptable manner under the Marine Protection, Research, and Sanctuaries Act (MPRSA) or the Clean Water Act (jurisdiction is determined by the location of the disposal site). An important mission of the *Bold* is the collection of environmental data that are used in the designation of new sites and in the required periodic monitoring of existing designated ocean disposal sites. Under the MPRSA, EPA is responsible for designating sites, and for reviewing and concurring in dredged material ocean disposal permits. The MPRSA also requires that a site monitoring and management plan be prepared for each site before it may be used for dredged material disposal. An essential component of the site monitoring and management plan is a characterization of baseline conditions before any disposal activity is conducted at the site, so that any qualitative changes in benthic habitat resulting from disposal activities can be identified during future surveys.

Appropriate reference areas need to be identified for each disposal site, so that characteristics similar to those of potential dredging projects can be used as a source of reference sediments. There were two reference evaluation studies conducted in 2006: the Gulf of Mexico Reference Evaluation and the South Atlantic Bight Reference Evaluation.

EPA regional scientists use the *Bold* for monitoring ocean dredged material disposal sites to confirm that the dredged material is disposed of properly, that the dumping does not unreasonably degrade or endanger human health or the marine environment, and that the site is performing as it was designed. For example, surveys conducted in 2006 off the coast of south Florida showed that dredged material disposal was affecting a significantly larger area of the seafloor than predicted. As a result, site use will have to be modified or the disposal site redefined. The *Bold* also helps in locating and assessing poten-

tial new areas to receive dredged material. This process keeps U.S. commerce moving while protecting the marine environment.

The following locations have ocean dredged material disposal sites that were surveyed:

- Mayaguez, Puerto Rico
- Yabucoa, Puerto Rico
- Pascagoula, Mississippi
- Fernandina, Florida
- Jacksonville, Florida
- Miami, Florida
- Port Everglades, Florida
- Key West, Florida
- Savannah, Georgia
- Brunswick, Georgia
- Dam Neck, Virginia
- Norfolk, Virginia
- Massachusetts Bay, Massachusetts
- Portland, Maine



EPA divers survey coral reef habitat.

### **Coral reef monitoring and biocriteria development**

Coral reefs are believed to be declining worldwide because of rising sea water temperatures, as well as effects from local sources, such as excessive nutrient loading, sedimentation, and direct physical damage to coral populations. Coral reefs are extremely important ecosystems, primarily because they provide habitat for many fish and invertebrate species. The structure of a well developed and diverse coral community supports fisheries, tourism, and biopharmaceutical opportunities. The physical presence of coral structure protects shorelines from

erosion by waves and currents. In addition, corals are important sensitive sentinels of water quality and general ecological health.

In August 2005, the *Bold* was part of a study that monitored the effects of dredged material disposal on coral reefs off the coast of southeast Florida. It was used for diver support for the collection of coral samples and for deployment of water quality monitoring equipment.

The *Bold* spent the month of February, 2006, supporting surveys to monitor and assess coral reef health in the Caribbean Sea. A number of partners contributed to the success of the surveys includ-

ing: U.S. Virgin Islands Department of Planning and Natural Resources, University of Puerto Rico, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service. The primary purpose of the St. Croix survey was to assist the U.S. Virgin Islands (U.S.V.I.) in developing strategies and assessment tools to define biocriteria for coral reefs. Biocriteria are narrative descriptions or numeric values that represent the biological condition of the community. Standards based on biocriteria are powerful management tools, because biological communities are dependable indicators of the health of an aquatic ecosystem. The survey provided U.S.V.I. managers with the data and information needed to develop a sound strategy for monitoring coral reefs for trends in coral condition, as well as to make comparisons among various management zones.

A side scan sonar survey, also in the U.S.V.I., successfully provided comprehensive benthic imaging of a 40-square mile area of shelf off the southern coast of St. John. The side scan sonar data were collected, in conjunction with a video shot from a remotely-operated vehicle. That work was done to characterize the structure of, and quantify the extent of, near-shore habitats that support important fish species off St. John. The data showed that the area was rich in coral resources. The habitats are coral-based, and

very sensitive to environmental stresses. Determining the current viability of those resources will allow managers to monitor changes and to establish long-term management strategies to ensure their sustainability. The survey built on work previously done by the *Anderson*, as well as other agencies. An unexpected reward of the survey was discovery and identification of expansive flats of rhodoliths, colorful marine algae that resemble coral, in an area that initially appeared to be just sand flats.

The *Bold* also inventoried sensitive coral reef habitats in the vicinity of the Yabucoa ocean dredged material disposal site off the coast of southeast Puerto Rico. Data were collected with side scan sonar and a remotely-operated vehicle video. A current meter and sediment trap were also deployed at the site, and the University of Puerto Rico's Research Vessel *Sultana* retrieved them in the summer of 2006. The current meter and sediment trap data will provide information on whether the prevailing currents in the area are bringing material from the disposal site to the sensitive reef habitats.

### **Red tide assessment and monitoring**

From May to June of 2005, a massive algal bloom of the toxic dinoflagellate *Alexandrium fundyense* occurred in the waters off southern New England. The bloom, also known as red tide, caused extensive

shellfish bed closures and major disruptions of local economies from Maine to Massachusetts.

The *Bold* participated in two surveys in response to this red tide event. The first survey, in November 2005, mapped *A. fundyense* cysts in bottom sediments off the coast of Massachusetts. The cyst stage allows this species to remain dormant in bottom sediments even under adverse conditions. Cysts are important in bloom initiation, regulating both the size of the initial cell inoculums in surface waters and the location of blooms, but encystment also allows the species to disperse and colonize new areas. A massive bloom in 1972 introduced the organism into western Gulf of Maine waters, leading to recurrent outbreaks over the following decades. There is concern that the organism is expanding southward. Given the high cell concentrations of cysts observed in the water column during the 2005 bloom, many of the cysts may have dropped to bottom sediments. This could lead to colonization in southern New England waters which have historically been virtually free of *A. Fundyense*. High concentrations of toxic cells were observed in the water column south of Martha's Vineyard that could potentially seed the depositional areas, causing future blooms the following spring. Although there were high concentrations of cells in the water column, there was a low number of cysts found in the sediments.

The second survey, in July 2006, sought to determine whether shellfish beds in federal and state waters exposed to red tide in 2005 could be re-opened to harvesting. Paralytic shellfish poison levels were measured in specimens such as moon snails, blue mussels, ocean quahogs, and sea scallops, and compared to the abundance of the red tide algae. The effort by the *Bold* was the first survey dedicated to this task since the waters were closed a year earlier. Certain waters were opened to selective shell fishing by the end of 2006, though closures due to red tide still remain. Woods Hole Oceanographic Institution scientists have used cyst distribution data collected in the 2005 *Bold* survey (as well as information from other surveys) as initial input into coupled biological-physical models to simulate the 2006 bloom dynamics in near real-time. The July 2006 survey of cell and hydrographic observations by the *Bold* were used to verify the results of those simulations.

### **Coastal water, sediment, and organism toxicity assessments**

The *Bold* performed surveys to assess contaminant concentrations in sediments, water, and organisms.

A *Bold* survey provided essential data to support contaminant fate modeling by the New York/New Jersey Harbor Contaminant Assessment and Reduction Project (CARP). The goal of the project was to clean

up sediments in New York and New Jersey Harbors. Data from the survey will also be used to support the development of Total Maximum Daily Loads (TMDLs) for contaminants in the harbor. EPA Region 2, the New York/New Jersey Harbor Estuary Program (one of the 28 National Estuary Programs nationwide), and the New York State Department of Environmental Conservation worked together to collect large volume water samples along the boundary of the New York Bight at the edge of the continental shelf. This is the area of the Atlantic Ocean north of the line between Montauk, New York, and Cape May, New Jersey. In addition to water samples, zooplankton and air samples will also be analyzed for polychlorinated biphenyls (PCBs), dioxins/furans, pesticides and perfluorinated compounds to assess contaminant contribution from those factors.

Another contaminant assessment survey evaluated PCB levels in organisms that inhabit artificial reefs created from sunken vessels. The Maritime Administration and the Department of the Navy have a number of decommissioned vessels available to states for use as artificial reefs. It is known that military vessels, particularly those commissioned prior to the late 1970's, contain a variety of materials manufactured with PCBs. Some materials contain levels of PCBs that exceed the 50 parts per million (ppm) limit for handling, transportation, storage, and disposal as regulated by the Toxic Substance Control Act (TSCA). Since the

1990s, EPA requires removal of materials meeting or exceeding the 50 ppm limit from these vessels. In certain cases, solid materials manufactured with PCBs greater than or equal to 50 ppm can remain onboard if a risk-based disposal approval has been obtained under TSCA. Many former military vessels that were reefed prior to that time were not tested, and PCB-contaminated materials were not removed.

Many vessels procured by states for reefing are non-military commercial vessels, such as freighters, barges, and tugs. Much less is known about the usage of PCB-bearing materials on older non-military vessels. The level of testing and clean-up for non-military vessels has historically been much less than for warships. The *Bold* conducted a screening survey off the coast of Florida of reefed former military and non-military vessels to determine if traces of PCBs are present in tissues of organisms that inhabit the vessel reefs. The information and data gathered in the survey will help determine if a problem in the identified areas exists, and if so, will help to determine what corrective actions should be taken. In addition, the data may be useful for assessment of needed clean-up actions for vessels intended to be sunk as artificial reefs.

The *Bold* was also used for the collection of benthic organisms and/or sediment in the Gulf of Mexico, Massachusetts Bay, and the South Atlantic Bight for contaminant analysis. Samples are analyzed for metals, pesticides, PCBs, and dioxins to determine back-

ground levels in the coastal and offshore environment. The data will be used in the development of regional guidance for evaluation of dredged material testing results and in the monitoring of disposal sites.

### **Fish waste disposal site assessment and monitoring**

The *Bold* supported two surveys at a shellfish waste disposal site off the Virginia Capes. The objective of the surveys was to evaluate the effect of this disposal on the marine environment. Is the site being degraded by the placement of shellfish waste? Data and information provided by the investigation will determine if water quality standards are being met.

### **Coastal eutrophication assessment**

The coastal eutrophication survey aboard the *Bold* was a continuation of an established coastal trend monitoring plan that is examining eutrophication in the Mid-Atlantic Bight. Data from the survey will help determine if coastal eutrophication off the coasts of Virginia, Maryland, and Delaware is improving or worsening, and what management actions should be considered.

### **Ocean outfall monitoring**

Two surveys of the impacts of ocean outfall discharges upon coastal waters were supported by the *Bold* in 2006.

A bacterial contamination study investigated waters near a Virginia Beach ocean outfall. Levels of bacterial contamination due to *enterococci* were assessed. The intent of these efforts aboard the *Bold* was to determine if water quality standards are being met at the outfall.

Another study took place in the Caribbean Sea. The Virgin Islands Rum Industries, Ltd. (VIRIL) ocean discharge had been assessed and the site characterized biologically in a 2003 survey. The results of the 2003 survey found the potential for aquatic toxicity and detrimental light attenuation. Field observations, including video footage of the outfall, discharge and surrounding area, as well as light penetration monitoring, were obtained from the site. The data obtained from the 2006 survey will help scientists to evaluate if the VIRIL discharge is adversely affecting the marine environment.

### **Disposal site surveys**

The U.S. Coast Guard sank two vessels in the vicinity of the Portland Ocean Dredged Material Disposal Site. The *Bold* utilized side scan sonar and was successful in locating the exact location of one of the vessels. Scientists can now evaluate if the vessels are negatively affecting the disposal site.

The Massachusetts Bay Disposal Site was historically used for not only dredged material disposal, but also for disposal of industrial waste, such as con-

struction debris, munitions, and barreled toxic waste. Though the dumping of industrial waste at this site was terminated in 1976, the waste could still be adversely affecting the environment today. A *Bold* survey conducted in 2006 determined the location and condition of the barrels thought to contain hazardous and low level radioactive waste. The data will assist in determining whether the historically disposed waste poses a threat to human health, and will help to identify any necessary actions to protect human and ecosystem health.

### **Public education on EPA oceans and coastal programs**

In addition to scientific surveys, the *Bold* was used as a platform for public environmental education on



**At port in Corpus Christi, Texas, *Bold* Captain Jere Chamberlain takes time to show schoolchildren the ship.**

challenging issues facing the health of marine waters when in port between scientific surveys. The *Bold* has been host to Coastal America educational events as well as open to the public. Events in New York, Puerto Rico, and the U.S. Virgin Islands revealed substantial interest by the public and broadcast media. Governors Charles Turnbull (U.S.V.I.) and John Baldacci (Maine), as well as a number of EPA senior executives, have all had the opportunity to tour the ship and to learn about its many scientific capabilities.

### **Surveys in 2007**

- Gulf of Mexico hypoxia assessment and monitoring
- Maintaining depth of shipping channels to U.S. ports: Ocean dredged material disposal sites assessment and monitoring
- Coastal water, sediment, and organism toxicity assessments
- Evaluation of the Historic Area Remediation Site of New York and New Jersey
- Survey in support of an Environmental Impact Assessment, Long Island Sound
- Coral reef monitoring and biocriteria development
- Coastal eutrophication assessment
- Ocean outfall monitoring

# APPENDIX 1



Edward McLean: OSV *Anderson* ship manager, 1978-1999.



Photo by Jonathan E. Anson

The OSV *Anderson*, EPA's coastal and oceans survey vessel, 1979-2005.

## **Ocean Survey Vessel Peter W. Anderson Top Accomplishments (1979- 2005)**

The Ocean Survey Vessel (OSV) Peter W. *Anderson* served as the Agency's oceans and coastal monitoring vessel from 1979 until it was retired in 2005. In 25 years of monitoring and assessing our oceans and coasts, the *Anderson* performed many physical, chemical, and biological investigations that supported numerous EPA and state oceans and coastal programs initiatives. The following are highlights of the *Anderson's* accomplishments.

### **1. Responding to oil spills**

- A major oil well blew out on the sea floor level in the Gulf of Campeche (Mexican waters of the Gulf of Mexico). The *Anderson* joined NOAA survey vessels and aircraft to track the

oil spill coming toward the U.S. Texas coastline. Data provided by the *Anderson* helped NOAA to assess potential impacts of the spill and mitigation actions.

- The *Anderson* played a major role in assessing the impacts of an oil spill from the *Presidente Riveria* oil tanker in Delaware Bay. The information collected and provided to the Coast Guard enabled them to appropriately place barriers to protect critical habitats on Pea Island, a major wading bird rookery.

### **2. Assessing the effects of toxic waste dumping at sea**

- The *Anderson* assisted in locating containers of arsenic trioxide that went overboard from a large container ship during a storm off the coast of New Jersey. The two containers

were located using the ship's side scan sonar equipment. Serial numbers that identified the containers with arsenic trioxide were obtained through the use of a remotely operated vehicle (ROV) submersible equipped with a camera. All but 2 of the 104 barrels in the containers that went overboard were recovered.

- The *Anderson*, using side scan sonar and ROVs, identified and assessed the location of barrels of toxic waste that were dumped in Massachusetts Bay from the 1960s to 1970s. The barrels were rusted through and empty. This information was included in NOAA charts to alert fishermen not to bottom trawl in that area.
- EPA Office of Enforcement requested *Anderson* assistance to find illegally dumped barrels of toxic waste in the Mississippi River between New Orleans and Baton Rouge. The *Anderson* located the barrels and provided information for successful enforcement action.

### 3. Designating dredged material sites

- The *Anderson* collected data for the Environmental Impact Statements for the designation of over 100 dredged material dumpsites along the East Coast and Gulf Coast.

- *Anderson* surveys assessed the dumping of dredged material in sensitive Gulf of Mexico coastal waters off of Tampa Bay, Florida. The findings resulted in the designation of a new ocean dumpsite for disposal of material dredged from Tampa Bay 30 miles offshore.

### 4. Identifying sources of marine debris

- *Anderson* surveys identified the source of medical waste, such as syringes, found on beaches of New Jersey and New York. The debris was alleged to be from the illegal dumping of hospital waste. After exhaustive studies by EPA scientists, it was determined the waste was washed down from city streets into combined storm sewers after heavy rains.

### 5. Incineration of PCB wastes at sea

- In the Gulf of Mexico, the *Anderson* supported the assessment of the potential impacts of the fall-out of incineration of PCB wastes upon ocean waters. The *Anderson* tracked in the wake of the incinerator ship *Vulcanus* and measured air and water column parameters from the incinerator plume discharge. While no adverse impacts were found, the incineration at sea program was canceled in the late 1980s.

## 6. Protecting coral reefs

- The *Anderson* supported extensive studies in coastal Florida and Puerto Rico.
- The *Anderson* was utilized as a support platform to conduct annual surveys of the Florida Keys National Marine Sanctuary (FKNMS) as part of EPA's responsibilities under the Florida Keys Water Quality Protection Program (WQPP). The coral monitoring portion of the WQPP annually surveyed 160 EPA fixed sites at 40 stations on 29 of the FKNMS reefs. This is one of the most comprehensive coral monitoring programs in the world. By utilizing the *Anderson*, scientists had a 100% sampling rate.
- The *Anderson* supported a project in the U.S. Virgin Islands that identified and characterized benthic areas rich in coral structures that provided habitats for fish spawning.
- In Puerto Rico, the *Anderson* surveyed ocean outfalls to assess impacts to coral reef habitat.

## 7. Special studies on vessel impacts

- The *Anderson* assisted the U.S. Navy in recertifying overhauled nuclear submarines to ensure that they were running quietly.

- The *Anderson* conducted an assessment in Massachusetts Bay on the impacts of motor boat noise on North Atlantic right whales.
- Wastewater discharges from four cruise ships were surveyed by the *Anderson* to determine the amount of wastewater dilution.

## 8. Assessing impacts of dumping activities on the marine environment

- The *Anderson* assisted in major oceanographic efforts to determine the impacts of sewage sludge dumping in a dump site 106 miles off the New York/New Jersey harbor in up to 12,000 feet of water.
- The *Anderson* supported diver surveys of environmental effects of drilling muds discharged from drilling platforms in the Gulf of Mexico.

## 9. Supporting assessments of water quality and habitat in the Caribbean

- The *Anderson* provided oceanographic survey support and training in the Dominican Republic, Jamaica, Puerto Rico, and Virgin Islands. Surveys included the assessment of the health of coral reefs, impacts of dumping of dredged material, and impacts of sewage discharges.



*Anderson* scientists work with a sediment sampler.

#### 10. Educating the public on oceans and coastal issues

- In addition to performing scientific work, *Anderson* was used by EPA for public education programs on oceans and coastal protection. On numerous occasions the *Anderson* and crew were highlighted by the media, including an appearance on “Good Morning America” with a story on how the *Anderson* was protecting our oceans and coastal waters.

# APPENDIX 2

## OSV *Bold* facilities and technical equipment

### Scientific facilities

**Wet laboratory:** Equipped with sieve station (i.e., sieving table and trays), wash station with hot and cold freshwater and saltwater, ice machine (ice is for sample preservation), refrigerator, electronic navigation data ports, and electronic navigation chart display with ship's location and navigation information.

**Survey operations center:** Equipped with refrigerators, freezers, sub-zero freezers, distilled water, computers, storage space, microscopes, and about 85 linear feet of lab benches.

**Microbiology laboratory:** Equipped with autoclave and incubator.

**Data acquisition center:** Equipped with computer systems to support digital data recorded from side scan sonar operations, CTD deployment, and underwater video filming.

### Sampling equipment

**Klein 3000 side scan sonar:** Produces digital acoustic images of ocean floor.

**Conductivity Temperature Depth (CTD) water profiler:** Measures physical water characteristics *in situ* in real-time throughout the water column.

**Rosette:** Collects water at specified various depths in the water column.



This net is used by *Bold* scientists to collect plankton samples.

**Sediment sampling equipment:** A variety of grabs and corers are available for the collection of sediments from the ocean floor.

**Sampling nets:** Collect oceanic organisms, such as fish and plankton, from various depths in the water column.

**Dredges:** Collect oceanic organisms from the seafloor and sediments.

### Diver operation capabilities

**Rigid-hulled Inflatable Boats (RHIBs):** At any time, the *Bold* carries two RHIBs to support dive operations.

**Dive locker:** Nitrox/Air compressor, 31 SCUBA tanks, diver communication devices (i.e., diver-to-diver, diver-to-surface), diver recall system for emergency situations, dry suits, and full face masks are available for use.

# APPENDIX 3

## OSV *Bold* scientific surveys, August 2005- December 2006

Survey	Location	Date
Hurricane Katrina and Rita emergency response	Gulf of Mexico	October 2005
Gulf of Mexico hypoxia assessment and monitoring	Gulf of Mexico	April 2006
		June 2006
		September 2006
Maintaining depth of shipping channels to U.S. ports: ocean dredged material disposal sites assessment and monitoring	Dam Neck, Virginia	December 2005 and August 2006
	Norfolk, Virginia	December 2005 and August 2006
	Brunswick, Georgia	May 2006
	Savannah, Georgia	May 2006
	Pascagoula, Mississippi	April 2006
	Fernandina, Florida	August 2005
	Jacksonville, Florida	August 2005 and May 2006
	Key West, Florida	May 2006
	Miami, Florida	May 2006
	Port Everglades, Florida	May 2006
	Massachusetts Bay	July 2006
	Portland, Maine	July 2006
	Mayaguez, Puerto Rico	January 2006
	Yabucoa, Puerto Rico	January 2006
Ocean dredged material disposal reference site survey	Gulf of Mexico	April 2006
	South Atlantic Bight	May 2006
Coral reef monitoring	St. John, USVI	February 2006
	Yabucoa, Puerto Rico	February 2006

**OSV *Bold* scientific surveys, August 2005- December 2006 (Continued)**

Survey		Location	Date
Coral reef biocriteria development		St. Croix, USVI	February 2006
Red tide assessment and monitoring		Southern New England	November 2005
		Gulf of Maine	July 2006
Contaminant fate modeling		New York and New Jersey Harbors	November 2005
Coastal water, sediment, and organism toxicity assessments	Vessel artificial reef PCB survey	Pensacola, Florida	October 2006
	Coastal fish tissue contaminant assessment	South Atlantic Bight	August 2006
	Fish waste disposal site monitoring	Southern Virginia	December 2005 and August 2006
Coastal eutrophication assessment		Mid-Atlantic Bight	August 2006
Ocean outfall monitoring		Mid-Atlantic Bight	August 2006
		Virgin Islands Rum Industries Outfall, USVI	February 2006
Disposal site surveys	Sunken vessel monitoring	Portland, Maine	July 2006
	Historical industrial waste site survey	Massachusetts Bay	July 2006



**EPA's Ocean Survey Vessel *Bold***  
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