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Ocean Survey Vessel *Bold*

Annual Report 2007

Monitoring and Assessing
the Health of Our Ocean and
Coastal Waters

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Executive Summary

The mission of EPA's Ocean Survey Vessel *Bold* (OSV *Bold*) is to monitor and assess the health of our oceans and coastal waters. The information gathered by the OSV *Bold* allows EPA to more effectively prevent effects from numerous pollution sources, whether from land or from the ocean. Acting as a floating laboratory, the OSV *Bold* is helping to chart a healthier course for our oceans, so they may be enjoyed for years to come.

This is the second OSV *Bold* Annual Report. It highlights the ship's scientific survey capabilities, accomplishments, and the unique role that this vessel plays in supporting EPA's monitoring and assessment programs. In 2007, the OSV *Bold* supported scientific surveys over a wide variety of geographic areas and missions, including an assessment of Gulf of Mexico hypoxia, monitoring of ocean dredged material disposal sites, monitoring ocean outfalls, and assessment of critical coral reef habitats. During this period, the OSV *Bold* completed a total of 40 oceanographic surveys, involving hundreds of sampling locations, while spending over 270 days at sea.

2007 Survey Highlights:

- Gathered data on two Gulf of Mexico hypoxia surveys in April and August.
- Conducted monitoring for 12 ocean dredged material disposal sites and one fish waste site managed by EPA.
- Surveyed coral reef environments in the Caribbean Sea and in Florida waters.
- Assessed coastal development impacts on fisheries in New England.
- Monitored shellfish waste disposal impacts to the marine environment off the coast of Virginia.
- Assessed coastal eutrophication in the Mid-Atlantic Bight from New York to North Carolina.
- Monitored five ocean discharge outfalls for the effects on the marine environment in the Caribbean Sea, Mid-Atlantic Bight, and Florida waters.
- Supported federal, state, territorial, and academic partners.

Executive Summary

Various survey partners contributed to the OSV *Bold's* second year of successful operation, including U.S. Army Corps of Engineers, U.S. Navy, U.S. Virgin Islands Department of Planning and Natural Resources, National Estuary Program, National Oceanic and Atmospheric Administration, University of Puerto Rico, University of Connecticut, and Rutgers University.

In addition to supporting a number of diverse scientific surveys, more than 15 public education events were held on the OSV *Bold* in 2007. The OSV *Bold* hosted these events in New York, Connecticut, Rhode Island, Maryland, Florida, the U.S. Virgin Islands, and Puerto Rico. In Puerto Rico, participants included National Estuary Program Directors, local newspapers and schools, and international non-governmental organizations.

Photo by Susan Hitch, U.S. EPA

The OSV *Bold* at dock in Baltimore, Maryland.

Introduction

Our oceans and coasts are unique resources that support a wide diversity of life. We depend on these 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 2004, the ocean economy contributed more than $138 billion to American prosperity, and supported more than two million jobs, according to market data from the National Ocean Economics Program. Of no less value are the marine resources that are difficult to measure economically, such as the beauty of our oceans and coasts, their cultural significance, and the vital ecosystem functions they provide.

Human actions adversely affect our oceans and coastal waters. Polluted sediments can significantly alter aquatic ecosystems. Wastewater discharged from shore or from vessels that violate permit requirements can be a threat to public health and marine life. Exposure to toxic chemical and pathogenic contamination negatively affects the entire food web. If not managed properly, ocean and coastal resources can be damaged by habitat modification, dredging, construction, and other human activities.

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. Gathering information and analyzing data to support management decisions are essential parts of marine resource protection. The Ocean Survey Vessel *Bold* (OSV *Bold*) surveys 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.

The OSV *Bold*

The OSV *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 Pacific Ocean. The Navy decommissioned the USNS *Bold* in 2004. EPA acquired the ex-USNS *Bold* on March 31, 2004, to replace the *Peter W. Anderson,* EPA's previous ocean survey vessel. EPA began scientific surveys with the OSV *Bold* on August 8, 2005.

The OSV *Bold* underwent dramatic changes in her transformation from a military surveillance vessel to an ocean and coastal monitoring vessel. EPA improved the deck machinery and added wet and dry laboratories, including a data acquisition laboratory where information is transmitted from the sampling equipment to computers. Sampling equipment includes, but is not limited to, a side scan sonar that produces digital acoustic images of the ocean floor and a water profiler that measures physical water characteristics in real-time throughout the water column. For a detailed list of scientific facilities and technical equipment on the OSV *Bold*, see Appendix 1.

The OSV *Bold* is managed by EPA's Oceans and Coastal Protection Division, in the Office of Water. The EPA Vessel Manager, Kennard Potts, provides direction to Seaward Services, Inc. (EPA's contractor) which handles the operation and maintenance of the vessel.

The OSV *Bold* provides EPA and its partners

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

Photo by Mark Strout, Seaward Services, Inc.

The OSV *Bold* at sea.

a platform to gather the scientific data needed to assess the marine environment, and to make informed decisions to protect these resources and human health. EPA's partners in 2007 included the U.S. Army Corps of Engineers, U.S. Navy, U.S. Virgin Islands Department of Planning and Natural Resources, National Estuary Program, National Oceanic and Atmospheric Administration, University of Puerto Rico, University of Connecticut, and Rutgers University. By the end of 2007, the OSV *Bold* had supported surveys along the Atlantic Coast, in the Gulf of Mexico, and in the Caribbean Sea.

Scientific surveys conducted on-board the OSV *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 ocean and coastal waters through a variety of programs, including partnerships and regulatory actions, as well as response to emergencies. Surveys are conducted by scientists from various EPA offices, including Regional Offices, Headquarters, and the Office of Research and Development; 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 serving in that capacity.

The OSV *Bold* at sea.

Green Activities On-Board the OSV *Bold*

The OSV *Bold* supports EPA's mission to protect the ocean and coastal environment. Staff and crew are dedicated to operating the vessel in the most environmentally sustainable way possible. Best management practices coupled with the latest technologies ensure that the ship is not degrading the resources that we seek to protect. New technologies and best management practices are utilized to reduce the impact of sewage, oil, and hull coatings that are part of the normal operation of the vessel.

No Discharge Practices

The discharge of untreated or partially-treated human waste from vessels can contribute to high bacteria counts and subsequent increased human health risks. These problems can be particularly harmful in lakes, slow-moving rivers, marinas, and other bodies of water with low flushing rates. Blackwater (sewage) and graywater (wastewater from showers, sinks, laundries, and kitchens) are kept as long as possible in holding tanks on the OSV *Bold*. The waste in the holding tanks is then pumped to an onshore facility. If a holding tank fills on a voyage, a marine sanitation device treats and disinfects the waste. After treatment, waste (containing blackwater and graywater) is disposed of only beyond three nautical miles from the shoreline.

In addition, all shipboard-generated garbage, cooking oils, and greases are collected and disposed of at onshore facilities. Any liquid collected in the bilge is disposed of onshore in special reception facilities. Strict rules apply to disposal of all chemicals used in ship laboratories.

Lower Sulfur Dioxide Emissions

Sulfur dioxide is an air pollutant that ships generate and that can travel over long distances. It contributes to respiratory illness and the formation of acid rain. Whenever available, the OSV *Bold* uses an ultra low-sulfur fuel that significantly cuts down on harmful air emissions.

A Better Hull Coating

Hull coatings prevent corrosion as well as biological growth, reducing drag and increasing fuel efficiency of a vessel. The hull coating on the OSV *Bold* does not contain organotin pesticides, and is certified as compliant with the International Maritime Organization's International Convention on the control of harmful antifoulants. Information collected by EPA and the Department of Defense (DoD) indicates that the hull coating used on the OSV *Bold* has the lowest copper leach rate of hull coatings approved for use on DoD vessels. A lower leach rate means a lower impact to surrounding waters.

Non-toxic Firefighting Foam

EPA uses a fire-fighting foam that can handle any possible fires on the ship and is also environmentally safe. This protein-based foam ensures efficient fire control.

Best Management Practices

The OSV *Bold* is operated with EPA's mission at the forefront. Best management practices are employed in daily operations of the vessel. Oil is carefully collected, and fueling of engines on rigid-hull inflatable boats is done with the utmost care to avoid spills. Special absorbent products and materials are used to collect drips of oil, grease, or fuel.

In addition, EPA supports shipyards that employ creativity and innovation to make their operations more environmentally sustainable.

Ballast Water Management

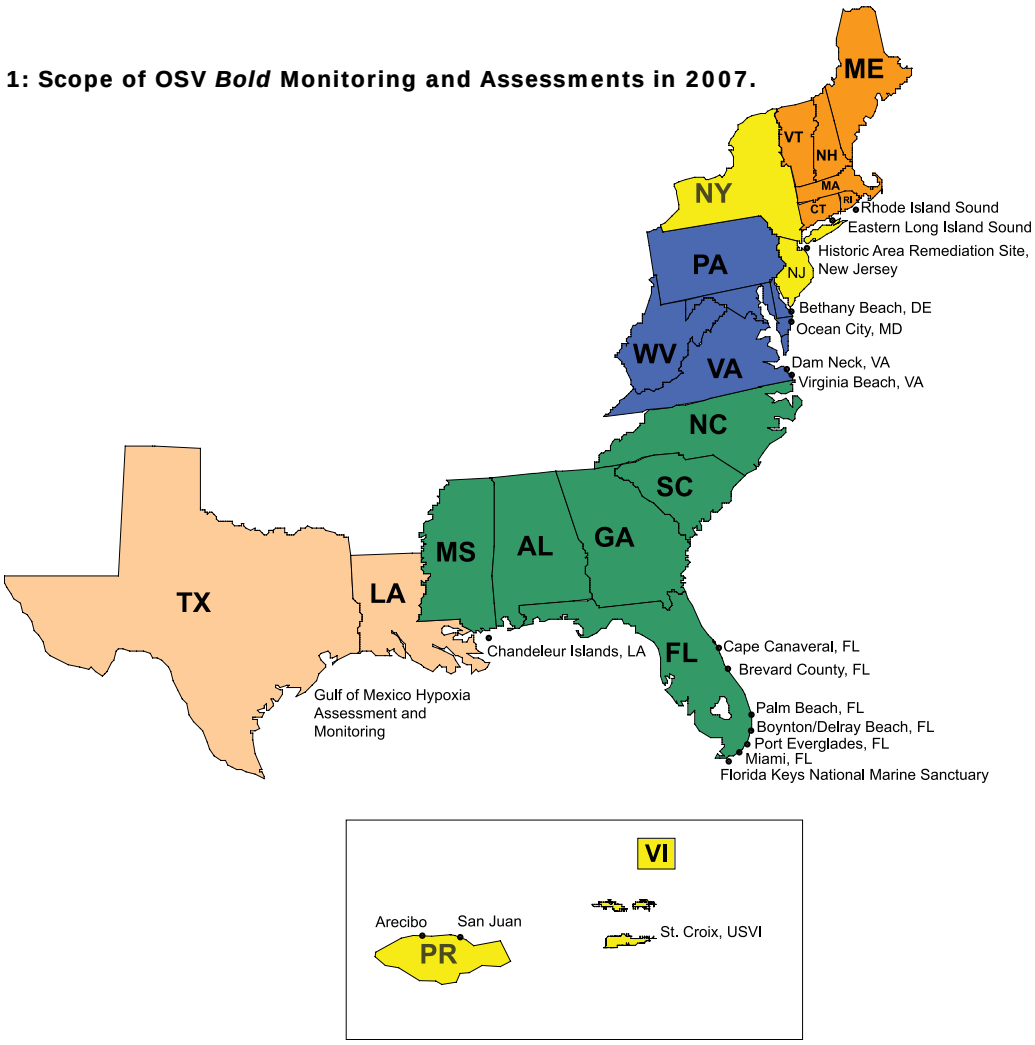
Ballast water tanks temporarily hold water to provide draft (immersion depth of a vessel) and stability. Ballast water discharged and transported by vessels may carry organisms from one waterbody to another. This is a main vector for introducing and spreading aquatic invasive species (alien species that can cause harm to the environment and to human health). Aquatic invasive species have affected all coastal waters of the U.S., including Alaska, Hawaii, and the Pacific Islands.

As part of standard operating procedure, ballast water exchange (emptying and refilling ballast tanks) is done at sea to limit transfer of invasive species between ports by the OSV *Bold*.

2007 Survey Highlights

In 2007, the OSV *Bold* conducted scientific surveys in the Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea. The OSV *Bold* completed a total of 40 oceanographic surveys, involving hundreds of sampling locations, while spending over 270 days at sea. In addition, the OSV *Bold* held educational events in New York, Connecticut, Rhode Island, Maryland, Florida, the U.S. Virgin Islands, and Puerto Rico.

Figure 1: Scope of OSV *Bold* Monitoring and Assessments in 2007.



Gulf of Mexico Hypoxia Assessment and Monitoring

Since 1985, oxygen-depleted (or hypoxic) waters have been measured in the Gulf of Mexico, off the coast of Louisiana and Texas. The OSV *Bold* contributes to the assessment and monitoring of hypoxia in the Gulf by performing surveys of the hypoxic zone.

Hypoxia occurs when oxygen concentrations are less than two milligrams per liter, levels that can not sustain most marine life. The size of the hypoxic zone varies considerably each year, depending on natural and human-influenced factors. In 2007, the measured size of the hypoxic zone was 20,500 square kilometers (7,900 square miles), about the size of the State of Massachusetts. This was the third largest hypoxic zone since measurements began in 1985. Current evidence indicates that the development, extent, and persistence of hypoxia in the Gulf of Mexico are primarily caused by human-influenced factors including nutrient loading from the Mississippi-Atchafalaya River Basin.

Monitoring and assessment by the OSV *Bold* supports the Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Gulf of Mexico. The 2001 Action Plan was released by the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, a Federal and State agency working group. A revised Action Plan was released in June 2008, and will increase accountability and specificity through the inclusion of an Annual Operating Plan and Annual Report. These documents will provide mechanisms for maintaining and tracking progress between reassessments, state-led nutrient reduction strategies, complementary federal strategies, and an outreach plan to engage stakeholders.

The Action Plan calls for expanded long-term monitoring programs and enhanced research and modeling efforts. In 2007, the OSV *Bold* supported this key action through research efforts to characterize the magnitude of, and variability in, physical, chemical, and biological properties and processes in the water column. These monitoring activities help to better define the spatial and temporal extent and dynamics of the hypoxic zone.

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 attenuation (decreased light intensity with increasing water depth). The data will further refine a predictive model for Gulf of Mexico hypoxia, and should reduce scientific uncertainty about nitrogen and phosphorus loads, and the formation, extent, duration, and severity of the hypoxic zone. This information will support and provide adaptive management options to reduce the five-year average size of the zone to less than 5,000 square kilometers (about

1,900 square miles) as outlined in the Action Plan. The five-year average for 2003 to 2007 is 14,644 square kilometers (5,600 square miles), more than twice the size of the goal.

Maintaining Depth of Shipping Channels to U.S. Ports: Ocean Dredged Material Disposal Site Assessment and Monitoring

EPA scientists deploy a rocking chair dredge to collect oceanic organisms and sediments from the seafloor.

The nation's ports, harbors, and navigable waterways are vital to the U.S. economy and national security. Dredging, the removal of sediments to maintain access to those areas, 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 OSV *Bold* is to collect environmental data that can be used to designate new disposal sites and to perform the required periodic monitoring of existing designated ocean disposal sites. Under the MPRSA, EPA is responsible for designating ocean disposal sites, and for reviewing and concurring on dredged material ocean disposal permits issued by the U.S. Army Corps of Engineers. 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 site monitoring and management plans is a characterization of baseline conditions before any disposal activity is conducted at the site, so that changes in benthic habitat resulting from disposal activities can be identified during future surveys.

EPA regional scientists used the OSV *Bold* to assess and monitor conditions at a number of ocean dredged material disposal sites (ODMDS). For example, the OSV *Bold*, in conjunction with the U.S. Army Corps of Engineers' Antilles Office and University of Puerto Rico (UPR), was used to sample sediment at the Arecibo Harbor ODMDS. Samples of bottom sediment from various locations within and around the boundaries of the site were collected to determine the variability of baseline chemical and physical sediment characteristics.

EPA regional scientists also use the OSV *Bold* to confirm that dredged material is disposed of properly at ocean disposal sites, 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, the OSV *Bold* was used to measure dissolved organic tin levels in the water and sediment at two ODMDS in Florida: Cape Canaveral and Miami. The surveys confirmed that there are elevated levels of organic tins (tributyl, dibutyl, and monobutyl tin) at these sites. Future surveys will be designed to assess the extent of the areas with elevated organic tin levels and potential environmental impacts from increased levels of tin.

The OSV *Bold* also helps in locating and assessing potential new areas to receive dredged material. For example, sediment mapping surveys conducted offshore of the Chandeleur Islands, Louisiana, determined the baseline conditions for the proposed Gulfport Offshore ODMDS. Dredging maintains waterways on which the U.S. commerce and military depend. Selection of appropriate sites to receive suitable dredged material and continued monitoring of these sites helps to protect the marine environment.

The following locations have ocean dredged material disposal sites that were surveyed in 2007:

- Arecibo Harbor, Puerto Rico
- Cape Canaveral, Florida
- Fort Pierce, Florida
- Miami, Florida
- Palm Beach Harbor, Florida
- Port Everglades, Florida
- Dam Neck, Virginia
- Eastern Long Island Sound, Connecticut

Coral Reef Monitoring and Biocriteria Development

Coral reefs are declining in many areas of the world, partly because of increasing 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 important ecosystems because they provide habitat for many fish and invertebrate species. The structure of a well-developed and diverse coral community supports fisheries, tourism, and research opportunities, and protects shorelines from erosion by waves and currents. In addition, corals are important sensitive sentinels of water quality and general ecological health.

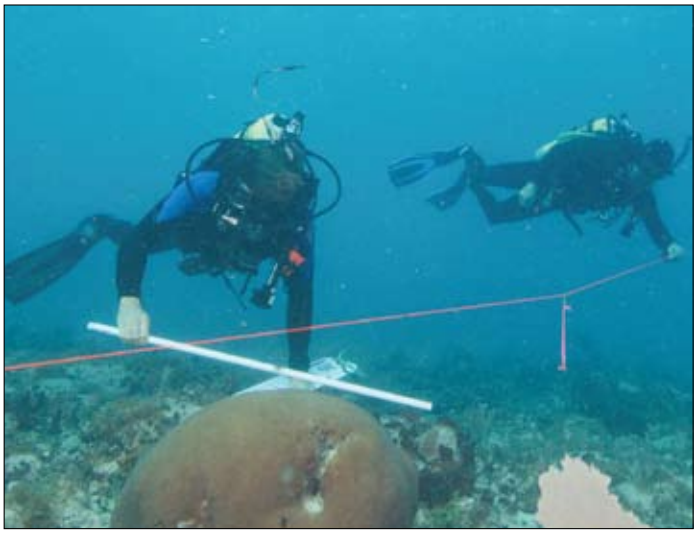


Photo by Charles LoBue, U.S. EPA

EPA divers survey coral reef habitat.

A coral condition survey was conducted in St. Croix, U.S. Virgin Islands (U.S.V.I.). The primary purpose of this survey was to assist the U.S.V.I. government in developing new

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. Strategic observation and documentation of the coral conditions were performed using the Stony Coral Rapid Bioassessment Protocol developed by EPA's Office of Research and Development.

Coastal Water, Sediment, and Organism Toxicity Assessments

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

The OSV *Bold* supported a survey to assess the importance of near-shore habitats on winter flounder fisheries off the coast of Rhode Island. Winter flounder is a commercially and recreationally important fish species whose population has declined dramatically in the past 25 years. Near-shore habitats provide critical nursery areas for winter flounder that develop offshore into the adult population. Previous studies conducted by EPA identified chemical fingerprints (i.e., stable isotopes and trace metals) of the otoliths (ear bones) of juvenile flounder residing in nursery areas within Narragansett Bay, Narrow River, and coastal salt ponds. After using the OSV *Bold* to collect adult offshore winter flounder, scientists removed the juvenile cores (i.e., calcium carbonate deposits in otoliths) to attempt to match them to chemical fingerprints previously

Photo by Barbara Sherman, U.S. EPA

EPA scientists collect winter flounder, along with starfish and stingrays, aboard the OSV *Bold*.

identified for nursery areas. Growth patterns in otoliths help us to understand life cycles in fish populations, and through chemical fingerprinting of these structures, scientists hope to identify what critical habitats support recruitment to the adult offshore winter flounder population.

The OSV *Bold* also supported a survey to identify the natural bottom features and sediment characteristics of significant benthic habitats in Long Island Sound. Data from this survey will provide information on the influence of gas pipelines on these sites. Collaborators on this project included the EPA Long Island Sound Office; Connecticut Department of Environmental Protection; and University of Connecticut's National Undersea Research Center (NURC) and Department of Marine Sciences. They evaluated approaches to identify critical benthic habitats in Stratford Shoal, which is a topographic rise in Long Island Sound where a gas pipeline is proposed for installation. Existing multibeam sonar and side scan sonar maps were used to select sites for the survey. Using the OSV *Bold's* side scan sonar, the survey team took images of the sediment and determined the spatial distribution of lobster-attributed "burrow features." The side scan sonar data were collected in conjunction with benthic grab samples, as well as video footage from the NURC underwater video camera array. The survey team also observed general characteristics of benthic habitats and organisms across the varying sediments. Areas with coarser sediments were characterized by dead mollusk shells such as razor clam, slipper shell, and blue mussel. Hard substrate communities found on both small gravel and boulder-size rocks (some of which were adjacent to the proposed pipeline route) supported finger sponges, northern star coral, blue mussel, and erect bryozoans. The survey team demonstrated that a combined approach, using acoustic (multibeam sonar and side scan sonar) and video imaging, was useful for characterizing benthic habitats and communities.

Fish Waste Disposal Site Assessment and Monitoring

The OSV *Bold* supported the annual survey at a shellfish waste disposal site off the Virginia Capes. The surveys evaluated the effect of this disposal on the marine environment. The survey investigated whether the site was being degraded by the placement of shellfish waste.

Coastal Eutrophication Assessment

A coastal eutrophication survey aboard the OSV *Bold* continued a previously established coastal trend monitoring plan effort that is examining eutrophication in the Mid-Atlantic Bight. Data from the survey is being used to determine if coastal eutrophication, an increase in chemical nutrients such as nitrogen and phosphorus, off the coasts of Virginia, Maryland, and Delaware is improving or declining, and what management actions should be considered to improve water quality.

Ocean Outfall Monitoring

The OSV *Bold* supported three surveys on the impacts of ocean outfall discharges on coastal waters in 2007.

Off the coast of Palm Beach, Florida, the OSV *Bold* conducted a survey to assess the potential effect of discharges from the Delray Outfall on Gulf Stream reef health. The OSV *Bold* sampled five coral colonies off Horseshoe Reef in Palm Beach. Stress responses of the coral to outfall effluent were measured and monitored. The data were used to determine the relationship between the outfall and increased harmful cyanobacteria blooms occurring offshore of Palm Beach.

Another study using the OSV *Bold* investigated waters in the Mid-Atlantic Bight near three ocean outfalls in Delaware, Maryland, and Virginia. Levels of bacterial contamination due to *Enterococci* were assessed. The purpose of these efforts was to monitor the effect of the disposal of pollutants in accordance with the requirements of section 403(c) of the Clean Water Act.

Another ocean outfall study took place in the Caribbean Sea. In a 2003 survey, the Virgin Islands Rum Industries, Ltd. (VIRIL) ocean outfall discharge was assessed and the site was biologically characterized. The survey results showed potential for aquatic toxicity and detrimental light attenuation. In 2007, field observations, including video footage of the outfall discharge and surrounding area, were obtained from the site. The data obtained from the survey will help scientists monitor conditions of the VIRIL discharge to determine the effectiveness of current mitigation practices.

Disposal Site Surveys

The Historic Area Remediation Site (HARS), a site off the coast of New Jersey which was historically used for disposal of contaminated dredged material, is being remediated with uncontaminated dredged material. A survey, supported by the OSV *Bold*, assessed the condition of the remediated surfaces, including changes to the benthic habitat and movement of materials at and around the site. The OSV *Bold* used side scan sonar and sediment characterization data to determine conditions at the site. These data will be used to identify specific sediment types and to develop a benthic map of sediment types at the HARS.

In December 2004, the U.S. Coast Guard sunk the 60-foot steel-hulled Fishing Vessel *Miss Dottie* (F/V *Miss Dottie*) because the ship was on fire, and drifting towards the Florida Keys National Marine Sanctuary. The Coast Guard sunk the vessel to minimize damage to the Sanctuary. However, after sinking the vessel, the Coast Guard determined that the disposal may have occurred within the Florida Keys National Marine Sanctuary's boundaries. In October 2007, a survey was conducted on the OSV *Bold* to locate the F/V *Miss Dottie*, since the Coast Guard only provided an approximate location. Side scan sonar images indicated that the vessel was intact and located

within the Florida Keys Particularly Sensitive Sea Area's boundaries. Bottom features in the vicinity of the vessel also were observed using side scan sonar. Considering the vessel's location and proximity to the Sanctuary, scientists will assess potential impacts on the marine environment in the future.

Support to Federal, State, Territorial, and Academic Partners

From late October to early December 2007, the OSV *Bold* supported surveys to monitor and assess coastal conditions in EPA's Caribbean jurisdictions—Puerto Rico and U.S. Virgin Islands (U.S.V.I.). A number of partners contributed to the success of the Caribbean Initiative 2007 surveys, including U.S.V.I. Department of Planning and Natural Resources, University of Puerto Rico, Rutgers University, U.S. Army Corps of Engineers, U.S. Department of Energy, and National Oceanic and Atmospheric Administration (NOAA). In Puerto Rico and U.S.V.I., several surveys were undertaken to support various EPA programs, as well as cooperative efforts with federal, commonwealth, and academic partners.

In collaboration with the San Juan Bay Estuary (SJBE) Program and University of Puerto Rico (UPR), the OSV *Bold* conducted a benthic habitat and water quality assessment of San Juan Bay and the offshore environment. The offshore area consists of areas along the SJBE shoreline, from the mouth of San Juan Bay to the Loiza River (approximately 0.25 to 1 mile offshore). This area is composed of cemented sand dunes with coral and other benthic communities. The offshore habitats support a diverse collection of marine and estuarine fish and invertebrates, some of which are important for recreational and commercial fishing. A side scan sonar survey was performed to provide comprehensive benthic imaging of the offshore habitats. The side scan sonar data were collected in conjunction with video footage shot from a remotely-operated vehicle. The data will be used to classify the bottom types identified by side scan sonar, and to determine the percent cover for each bottom type found. In addition, conductivity-temperature-depth measurements were taken beyond the seaward entrance of the San Juan Bay Channel to describe river plume behavior (the way in which mixtures of river water, nutrients, sediments, and marine organisms flow into the ocean).

Sponsored by EPA and U.S. Department of Energy, research groups from UPR and Rutgers University Coastal Ocean Observing Laboratory used the OSV *Bold* to study waters of the Mona Passage, separating the islands of Puerto Rico and Hispaniola. The Mona Passage is influenced by complex hydrodynamic processes. These processes are believed to influence microbial ecology and light attenuation in the water column. The research groups also monitored water quality indicators in the Mona Passage using an autonomous underwater vehicle.

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

Photo by Barbara Sherman, U.S. EPA

In Rhode Island Sound, EPA scientists study the aquatic organisms collected during the winter flounder survey.

Photo by Jeanethe Falvey, U.S. EPA

While at dock in Newport, Rhode Island, the OSV *Bold* is open to visitors for a public education event.

Photo by Alex Charles Post, University of Connecticut

The OSV *Bold* at dock in Long Island, NY.

Using the OSV *Bold*, EPA and NOAA conducted a side scan sonar survey to provide comprehensive benthic and shelf reef habitat imaging of Lang Bank in St. Croix, U.S.V.I. The data will be used to characterize the structure of, and quantify the extent of, near-shore habitats that support important fish species off Lang Bank. In addition to the survey, NOAA scientists were invited aboard for collaboration and cross-training in protocols for coral reef monitoring, such as EPA's Stony Coral Rapid Bioassessment Protocol, and NOAA's protocols for fish counting and benthic biological and structural characterization.

Public Education on EPA Oceans and Coastal Programs

When in port between scientific surveys, the OSV *Bold* was used for environmental education on challenging issues facing the health of marine waters. The OSV *Bold* hosted open visits for the public in New York, Connecticut, Rhode Island, Maryland, Florida, the U.S.V.I., and Puerto Rico. In Puerto Rico, the OSV *Bold* held two public outreach events in November, coordinating with the San Juan Bay Estuary Program and the Fall meeting of the Association of National Estuary Programs. Participants included National Estuary Program Directors, local newspapers and schools, and international non-governmental organizations.

Surveys in 2008

In 2008, the OSV *Bold* is supporting surveys on the West Coast of the United States. Surveys occurring in 2008 include:

- Maintaining Depth of Shipping Channels to U.S. Ports: Ocean Dredged Material Disposal Site Assessment and Monitoring
- Coastal Water, Sediment, and Organism Toxicity Assessments
- Alaska Cruise Ship Survey
- Puget Sound Survey
- Ocean Outfall Monitoring
- Disposal Site Surveys

Photo by Susan Hitch, U.S. EPA

The OSV *Bold* at dock in Baltimore, Maryland.

Photo by Mark Strout, Seaward Services, Inc.

The OSV *Bold* in the Panama Canal, heading for the West Coast.

Appendix 1

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 (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; water profiler deployment; and underwater video filming.

A new A-frame installed on the stern of the OSV *Bold*.

In Eastern Long Island Sound, technicians prepare a Klein 3000 side scan sonar for surveying an ocean dredged material disposal site.

Sampling Equipment

- Klein 3000 Side Scan Sonar: Produces digital acoustic images of ocean floor.
- Conductivity, Temperature, and Depth Water Profiler: Measures physical water characteristics in situ in real-time throughout the water column.
- Rosette Water Sampler: Collects water at specified depths in the water column.
- Sediment Sampling Equipment: A variety of grabs and corers are available for the collection of sediments from the ocean floor.
- Dredges: Collect oceanic organisms from the seafloor and sediments.
- Sampling Nets: Collect oceanic organisms, such as fish and plankton, from various depths in the water column.
- A-Frame: Assists the deployment and retrieval of the side scan sonar and sediment sampling equipment.

Diver Operation Capabilities

- Rigid-Hulled Inflatable Boat (RHIB): At all times, the OSV *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 available for use by certified diving personnel.

Appendix 2

OSV *Bold* Scientific Surveys in 2007

Survey		Location	Month(s)
Gulf of Mexico Hypoxia Assessment and Monitoring		Gulf of Mexico	April and August
Maintaining Depth of Shipping Channels to U.S. Ports: Ocean Dredged Material Disposal Site Assessment and Monitoring		Cape Canaveral, Florida	March
		Fort Pierce, Florida	March
		Eastern Long Island Sound, Connecticut	July
		Dam Neck, Virginia	August
		Miami, Florida	October
		Palm Beach Harbor, Florida	October
		Port Everglades, Florida	October
		Arecibo, Puerto Rico	November
Ocean Dredged Material Disposal Reference Site Survey		Brevard County, Florida	March
		Broward and Dade Counties, Florida	October
Coral Reef Monitoring and Reef Biocriteria Development		Palm Beach County, Florida	March and September
Coastal Water, Sediment, and Organism Toxicity Assessments	Coastal Fish Tissue Contaminant Assessment	Rhode Island Sound	July
	Fish Waste Disposal Site Monitoring	Southern Virginia	August
Coastal Eutrophication Assessment		Mid-Atlantic Bight	July–August
Ocean Outfall Monitoring		Delray Outfall, Florida	March and September
		Mid–Atlantic Bight	August
		Virgin Islands Rum Industries Outfall, U.S. Virgin Islands	November–December
Disposal Site Surveys	Vessel Disposal Site Assessment	Florida Keys	October
	Historical Area Remediation Site Survey	Historic Area Remediation Site, New Jersey	June
Support to Federal, State, Territorial, and Academic Partners	Hydrodynamic Processes in the Mona Passage	Mona Passage, Puerto Rico	October–November
	Structural Characterization of Lang Bank	St. Croix, US Virgin Islands	November
	San Juan Bay National Estuary Program	San Juan, Puerto Rico	November

Ocean Survey Vessel *Bold*

Annual Report 2007

Monitoring and Assessing the Health of Our Ocean and Coastal Waters

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