



# EPA's Ocean Survey Vessel *Bold*

2008 Annual Report  
Monitoring and Assessing the Health  
of Our Oceans and Coastal Waters



# Table of Contents

Executive Summary . . . . .	1
Introduction . . . . .	3
The Ocean Survey Vessel <i>Bold</i> . . . . .	4
Green Activities Onboard the OSV <i>Bold</i> . . . . .	6
No Discharge Practices . . . . .	6
Lower Sulfur Dioxide Emissions . . . . .	6
Better Hull Coating . . . . .	6
Non-toxic Fire-Fighting Foam . . . . .	7
Ballast Water Management . . . . .	7
Best Management Practices . . . . .	7
2008 Scientific Survey Highlights . . . . .	8
Alaska Cruise Ship Impact Assessment . . . . .	9
Assessment and Monitoring of EPA-Designated Ocean Dredged Material Disposal Sites . . . . .	11
Coastal Water, Sediment, and Organism Toxicity Assessments . . . . .	13
Invasive Coral Species Impacts Assessment . . . . .	14
Support to Federal, State, and Academic Partners . . . . .	15
Public Education on EPA's Oceans and Coastal Programs . . . . .	17
Scientific Surveys in 2009 . . . . .	18
Appendix 1: OSV <i>Bold</i> Facilities, Equipment, and Capabilities . . . . .	19
Appendix 2: Scientific Surveys and Public Education Events in 2008 . . . . .	20

# Executive Summary



**The OSV *Bold* docked in San Francisco, California.**

Photo by Jean Brochi, U.S. EPA

The mission of the U.S. Environmental Protection Agency's (EPA's) Ocean Survey Vessel *Bold* (OSV *Bold*) is to support EPA-regulated activities by monitoring and assessing the health of our oceans and coastal waters. The information gathered by the OSV *Bold* allows EPA to more effectively control pollution sources, whether from land or the ocean. As a floating laboratory, the OSV *Bold* is helping to chart a healthier course for our oceans.



Photo by Allan Ota, U.S. EPA

**EPA welcome banner displayed during an open ship event in San Diego, California.**

This is the third OSV *Bold* Annual Report. It highlights the vessel's 2008 scientific survey capabilities, accomplishments, and the unique role that this vessel plays in supporting EPA's monitoring and assessment programs. In 2008, the OSV *Bold* supported scientific surveys over a wide variety of geographic areas of the U.S., including the Taiya Inlet in Alaska, the Gulf of Mexico, the Florida Keys, and the Pacific Coast. These missions included monitoring ocean dredged material disposal sites, monitoring contaminant levels in sediments and aquatic organisms, and assessing coastal eutrophication and hypoxia. During this period, the OSV *Bold* completed 36 oceanographic surveys, involving 125 sampling locations, while spending 235 days at sea.

Scientific surveys completed in 2008:

- Conducted an assessment of cruise ship impacts in Skagway Harbor and Taiya Inlet, Alaska.
- Conducted monitoring for 30 ocean dredged material disposal sites managed by EPA.
- Evaluated contaminant levels of sediment in the Southern California Bight and Puget Sound.
- Monitored nutrient concentrations and zooplankton in Puget Sound.

- Assessed the impact of an invasive coral species within the Florida Keys National Marine Sanctuary.
- Assessed the extent of hypoxia along the coast of Oregon.
- Supported Federal, State, Territorial, and academic partners.

In 2008, various survey partners contributed to the OSV *Bold's* successful operation, including: U.S. Army Corps of Engineers; U.S. Geological Survey; National Oceanic and Atmospheric Administration; Alaska Department of Environmental Conservation; Florida Department of Environmental Protection; Oregon Department of Fish and Wildlife; Oregon Department of Environmental Quality; Oregon Department of Land Conservation and Development; University of Washington; Washington Department of Fish and Wildlife; and Washington Department of Ecology.

In addition to supporting scientific surveys on a number of environmental issues, the OSV *Bold* hosted nine public education events in 2008. During these events, EPA scientists gave tours and conducted presentations for visitors. The OSV *Bold* hosted these events in Alaska, Washington, Oregon, California, and Mississippi.

# 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.



**Coral species native to the Florida Keys National Marine Sanctuary.**

Human actions can adversely affect our oceans and coastal waters. Polluted sediments resulting from industrial activities and operations can significantly alter aquatic ecosystems. Improper discharge of wastewater from shore or from vessels 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



**Dolphins swimming along side OSV *Bold* near the Florida Keys.**

today. To protect and safeguard these resources, EPA undertakes many efforts to identify and control problems threatening 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*) supports EPA-regulated activities by surveying oceans and coasts to: monitor and sustain the health of our coastal waters and shores; protect human health; support economic and recreational activities; and influence actions that safeguard healthy habitat for fish, plants, and wildlife.

# The Ocean Survey Vessel *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 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 oceans and coastal waters 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 a side scan sonar that produces digital acoustic images of the ocean floor and a water profiler that measures physical water characteristics throughout the water column in real-time. For a detailed list of scientific facilities and technical equipment on the OSV *Bold*, see Appendix 1.



Photo by Marcel Belaval, U.S. EPA

The OSV *Bold* docked in Eureka, California.

## Quick Facts About the OSV *Bold*

Overall length: 224 feet

Width: 43 feet

Draft: 15 feet

Water displacement: 2300 tons

Operating speed: 11 knots

Ship operating crew: 19

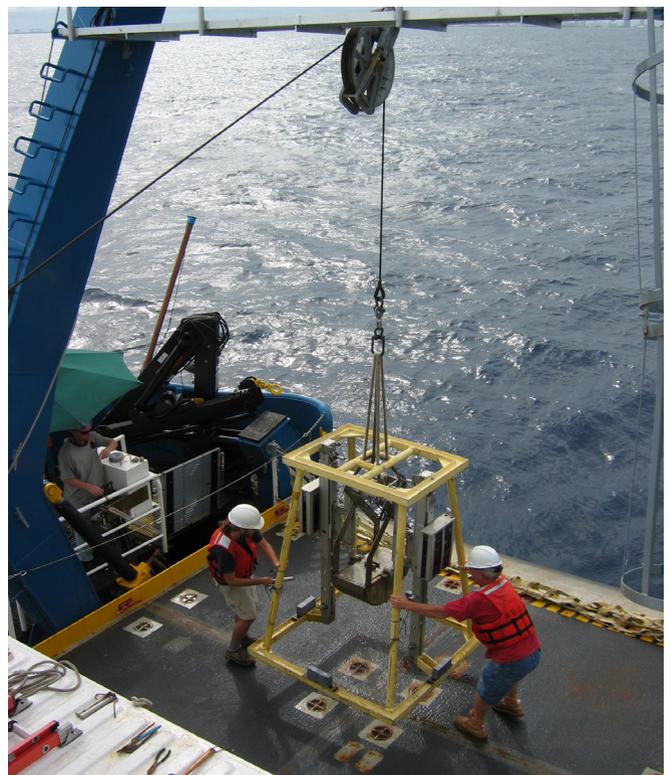
Scientific berths: 20

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). Seaward Services provides the sea-going crew; handles the operation and maintenance of the vessel; provides logistic support and contract management; and provides engineers, when needed, specializing in marine, mechanical, electrical, electronic, acoustical, or ocean engineering.

During 2008, the OSV *Bold* supported surveys along the Pacific Coast, in the Gulf of Mexico, in Alaska's Taiya Inlet, and in the Florida Keys. The OSV *Bold* provides EPA and its partners 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 2008 included the U.S. Army Corps of Engineers; U.S. Geological Survey; National Oceanic and Atmospheric Administration; Alaska Department of Environmental Conservation; Florida Department of Environmental Protection; Oregon Department of Fish and Wildlife; Oregon Department of Environmental Quality; Oregon Department of Land Conservation and Development; University of Washington; Washington Department of Natural Resources; Washington Department of Fish and Wildlife; and Washington Department of Ecology.

Scientific surveys conducted onboard 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, the Office of Water, 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.



**EPA scientists stabilizing a grab sediment sampler in a frame before deployment.**

# Green Activities Onboard the OSV *Bold*

The OSV *Bold* supports EPA's mission to protect ocean and coastal environments. 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 vessel 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 in holding tanks on the OSV *Bold*. The waste in the holding tanks is usually pumped to an onshore facility at the end of a mission. 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 gar-

bage, 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 from burning fuel 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 reduces harmful air emissions.

## **Better Hull Coating**

Hull coatings prevent corrosion as well as biological growth. These coatings reduce drag and increase 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 Anti-fouling Systems on Ships. 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.



**EPA scientists deploy survey equipment off the coast of Tampa, Florida.**

### **Non-toxic Fire-Fighting Foam**

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

### **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 (nonnative species that can cause harm to human health, the environment, or the

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

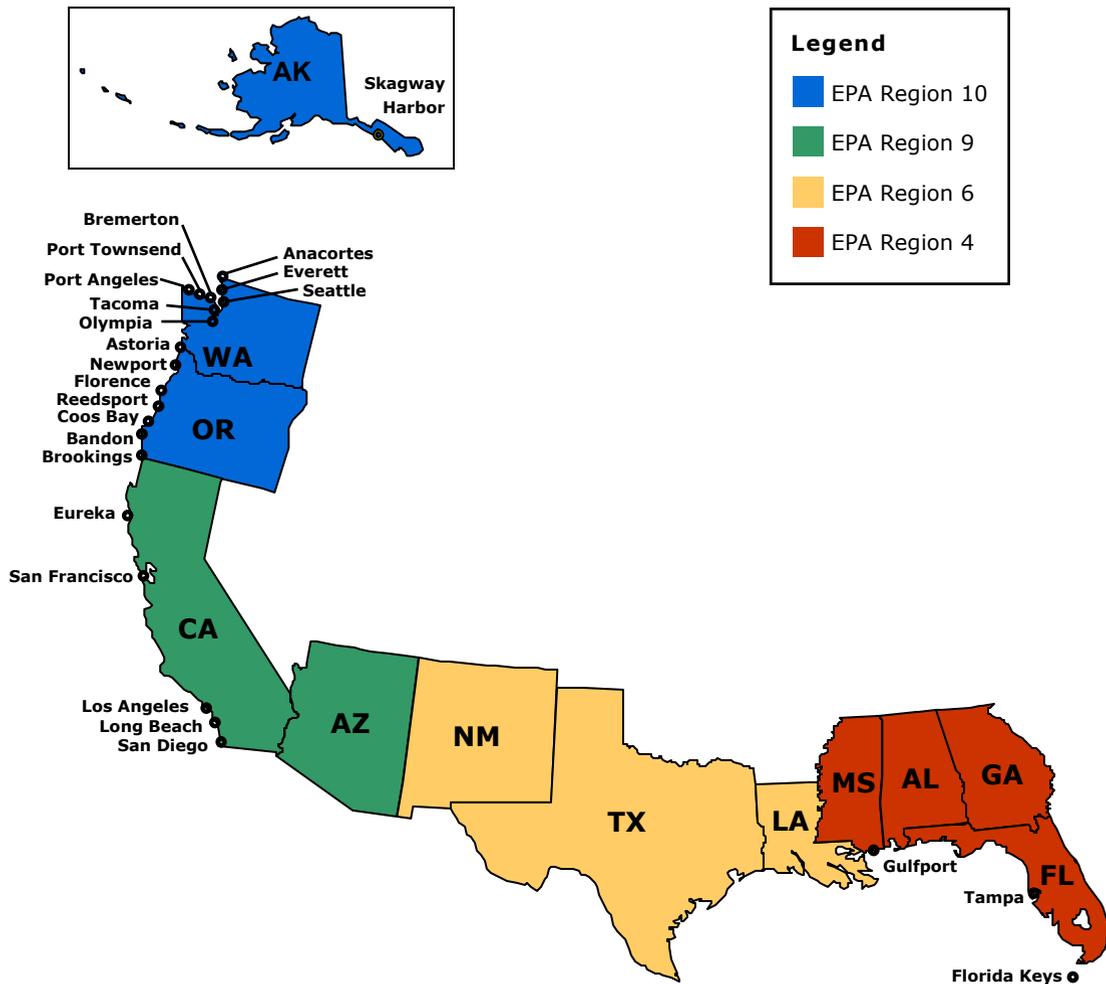
### **Best Management Practices**

Best management practices are employed in daily operations of the OSV *Bold*. 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.

# 2008 Scientific Survey Highlights

Figure 1: Scope of OSV *Bold* Monitoring and Assessments in 2008.



In 2008, the OSV *Bold* conducted scientific surveys in the Pacific Ocean, the Gulf of Mexico, Alaska's Taiya Inlet, and the Florida Keys (see Figure 1). While spending 235 days at sea, the OSV *Bold* completed a total of 36 oceanographic surveys, involving 125 sampling locations. In addition, the OSV *Bold* held educational events in Alaska, Washington, Oregon, California, Mississippi, and Florida.

## **EPA's Alaska Cruise Ship Impact Assessment**

Cruise ships give passengers an opportunity to enjoy our ocean and coastal resources. As the cruise ship industry expands, there is a growing concern about the potential impacts of cruise ship waste streams released in oceans and coastal waters. If not managed properly, cruise ship waste streams can affect water quality and can alter water column ecology.

EPA currently is involved in a number of activities addressing the potential environmental impacts of cruise ship waste stream discharges. In particular, EPA is evaluating various advanced sewage and graywater treatment systems and is completing the Cruise Ship Discharge Assessment Report.

This report assesses the nature, regulation, and potential impact of sewage, graywater, oily bilge water, solid waste, and hazardous waste generated onboard Alaskan cruise ships.

To further assess the potential impacts of cruise ship discharges in Alaska, EPA partnered with the Alaska Department of Environmental Conservation (ADEC) in July 2008. EPA and ADEC conducted three studies in Skagway Harbor, which hosted 35 cruise ships in 2008 according to the Skagway Convention and Visitors Bureau. EPA and ADEC scientists used the OSV *Bold* to study potential nutrient impacts and discharge dispersal from cruise ships in Skagway Harbor by: (1) tracking treated sewage and graywater discharge plumes



**The OSV *Bold*, along with cruise ships, docked in Skagway Harbor, Alaska.**

(spreading fluids in the water column) from cruise ships; (2) determining whether phytoplankton (tiny aquatic plants), growth is influenced by nutrients in cruise ship discharges; and (3) determining anthropogenic (human-influenced) effects on nutrient uptake by macroalgae. Results of these studies currently are being reviewed.

To track treated sewage and graywater discharge plumes, scientists added a tracer dye to treated cruise ship sewage and graywater; the dye concentration was measured as the treated wastewater was discharged from ships into Skagway Harbor. These data will help the scientists determine the near-field dilution (i.e., dilution within 15 meters of the point of discharge) of cruise ship discharge plumes.

To determine the potential effect of nutrients from treated cruise ship wastewater on phytoplankton, scientists added various forms and combinations of nitrogen and phosphorus to water samples collected from Skagway Harbor. Additionally, treated cruise ship wastewater was added to water samples. Changes in the phytoplankton population in response to these nutrients were determined by: (1) measuring changes in chlorophyll levels (chlorophyll is a pigment found in plants such as phytoplankton); and (2) measuring changes in the densities of various phytoplankton size classes.

Scientists also studied the impacts of cruise ship discharges on Skagway Harbor by measuring nutrient uptake by macroalgae. Using both native macroalgae col-

lected from Skagway Harbor and laboratory-grown macroalgae, scientists measured nutrient levels to ascertain if nitrogen uptake by macroalgae is linked to anthropogenic nutrient sources such as cruise ship discharges.



Photo by Bryan Hecceg, U.S. EPA

**EPA scientists deploy a water profiler to measure physical characteristics — such as conductivity, temperature, and depth — of the water column in Skagway Harbor, Alaska.**

## **Assessment and Monitoring of EPA-Designated Ocean Dredged Material Disposal Sites**

The nation's ports, harbors, and navigable waterways are vital to the U.S. economy and national security. Dredging is the removal of sediments to maintain 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 requirements of the Marine Protection, Research, and Sanctuaries Act (MPRSA), or the Clean Water Act. Under the MPRSA, EPA is responsible for designating ocean dredged material 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 environmental 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.

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. EPA scientists used the OSV *Bold* to assess and monitor conditions at a number of

ocean dredged material disposal sites (ODMDS). Under the MPRSA, ODMDS trend assessment surveys are required to evaluate the extent and trends of environmental impacts of dredged material disposal. Along the coast of Oregon, EPA scientists used the OSV *Bold* to perform several ODMDS trend assessments. EPA scientists collected sediment samples to determine physical and chemical characteristics, and collected benthic invertebrate samples to determine species presence, composition, and abundance. EPA scientists also performed side scan sonar and dive surveys to document bathymetry (seafloor bottom topography) and to record benthic habitat features. These data will help scientists establish baseline conditions for designating new EPA disposal sites at Siuslaw and Yaquina Bays; determine physical characteristics of sediments in the U.S. Army Corps of Engineers' Columbia River navigation channel; and assess conditions in two research sites in the Mouth of the Columbia Deep Water Site.

In the State of California, EPA scientists conducted surveys at three ODMDSs to assess the impacts of dredged material disposal. These sites are located along the San Francisco Bay/Delta Estuary, the largest estuary on the West Coast of the U.S. This estuary supports a highly concentrated population, and drains a large amount of land area in California. As a result, the estuarine environment has been adversely impacted by human activities such as habitat modification for development projects

and associated construction dredging, as well as regular maintenance dredging. EPA scientists used side scan sonar to physically characterize the seabed and sediments at, and in the vicinity of, these three sites.

EPA scientists also used the OSV *Bold* to confirm that dredged material is disposed properly at ocean disposal sites, that the dumping does not unreasonably degrade or endanger human health or the marine environment, and that the sites are performing as expected. Conditions at disposal sites located offshore of Los Angeles, San Diego, and Eureka, California, were assessed by EPA scientists to determine if the monitoring and management of the sites is effective and to ensure that dredged material disposal is not adversely affecting the sites. In addition to side scan sonar surveys, EPA scientists collected sediment samples for physical and chemical analyses to confirm suitability from pre-disposal testing.

In 2008, EPA scientists used the OSV *Bold* to characterize bottom habitat and water conditions at the Tampa ODMDS in the Gulf of Mexico. Maintenance dredging of ship channels is important for commercial marine transportation in Tampa Bay. Since options for beneficial use or disposal of dredged material are limited in this area, there is an increased need for using more of the Tampa ODMDS. Though the site is quite large and deep, its capacity to receive more dredged material is somewhat hindered by the presence of a “Briar Patch”

habitat. This habitat is a disposal mound of dredged material which now serves as a habitat for sessile (not free-moving) communities and finfish populations. During this survey, scientists also identified and characterized the species that inhabit the “Briar Patch” to assess the possible impacts of increased dredged material disposal. This continuing effort in Tampa, Florida, will provide the critical data needed for managing disposal within the ODMDS in the most environmentally-protective manner.

Selection of appropriate sites to receive suitable dredged material, as well as subsequent monitoring of designated ODMDSs, protects the marine environment. The OSV *Bold* also helps locate and assess potential



**EPA scientists load survey equipment onto a rigid-hulled inflatable boat.**

new areas to receive dredged material. Before designating a site for dredged material disposal, EPA scientists must ensure that activities at the proposed site do not affect areas of natural, scientific, historical, or cultural importance.

A proposed ODMDs, located offshore of the Chandeleur Islands, Louisiana, is being designated to support the deepening and widening of the Gulfport Federal Navigation Channel. In 2007, a sediment mapping survey was conducted to determine baseline conditions at this proposed ODMDs. In 2008, EPA scientists continued characterizing baseline conditions by documenting the bathymetry of the proposed site.

### **Port Cities Near ODMDs Surveyed by the OSV *Bold***

**California:** San Diego, Long Beach, Los Angeles, San Francisco, and Eureka

**Oregon:** Brookings, Bandon, Coos Bay, Florence, Newport, Reedsport, and Astoria

**Washington:** Tacoma, Olympia, Seattle, Everett, Bremerton, Port Townsend, Anacortes, and Port Angeles

**Mississippi:** Gulfport

**Florida:** Tampa

## **EPA's Coastal Water, Sediment, and Organism Toxicity Assessments**

The OSV *Bold* performed numerous surveys to assess contaminant concentrations in sediments, water, and organisms. Levels of potentially harmful chemicals such as polychlorinated biphenyls (PCBs), dichlorodiphenyl-trichloroethane (DDT), dioxins, and furans were assessed in offshore waters along the West Coast and in Puget Sound, Washington.

The Washington State Dredged Material Management Program (DMMP)—a partnership between EPA, U.S. Army Corps of Engineers, Washington Department of Natural Resources, and Washington Department of Ecology—ensures that dredged material disposal does not harm human health or the environment, maintains the Puget Sound open-water disposal program, and ensures consistency with regulatory requirements. The DMMP is developing new procedures for evaluating dredged material containing dioxins, furans, and PCBs, and considering alternatives for determining the suitability of this dredged material for unconfined, open-water disposal. Before finalizing evaluation procedures, the DMMP needed additional information on Puget Sound conditions. Scientists on the OSV *Bold* collected sediment samples from throughout Puget Sound and analyzed them for PCBs, dioxins, and furans. These data will be used to evaluate the economic, environmental, and regulatory consequences of the new evaluation procedures.

Potentially harmful levels of DDT have been recorded in the Southern California Bight. Historical discharges (1950s to mid-1970s) from the Los Angeles County Sanitation District's ocean outfall is likely the primary source of DDT in these waters. Periodic monitoring of DDT in the Southern California Bight is accomplished through coordinated efforts between EPA and federal, local, and academic partners. The two goals of periodic monitoring are to: (1) complete a contaminant budget for DDT and other contaminants such as PCBs; and (2) determine the distribution of DDT beyond the mainland shelf. In 2008, EPA supported monitoring efforts by using the OSV *Bold* to sample sediments within the Southern California Bight. Scientists performed chemical and biological analyses of, and measured total DDT amounts in, sediment samples.

Low levels of dissolved oxygen (DO) have been reported in coastal waters of Oregon and Washington. These changes are periodic and caused by natural upwelling events where colder, oxygen poor, and nutrient-rich waters are brought towards the coast. These events are becoming longer in duration and more frequent, causing hypoxia, an environmental condition where DO is so low that the system no longer supports aquatic organisms. Hypoxia along the coast of Oregon and in Puget Sound's Hood Canal has been killing fish and invertebrates during summer months. In 2008, the OSV *Bold* monitored the coastal waters of Oregon. EPA scien-

tists used a water profiler to measure conductivity, temperature, DO, and additional physical properties. These data will be used to determine the timing, severity, and extent of DO depletion along the Oregon coast.



**Aquatic invasive species, *Tubastraea coccinea* (orange cup coral).**

### **Aquatic Invasive Species Impacts Assessment**

Aquatic invasive species have affected all coastal waters of the U.S., including Alaska, Hawaii, and the Pacific Islands. The most common sources of aquatic invasive species include ballast water discharges, escapes from aquaculture sources, and accidental or intentional introductions. Invasive species can affect aquatic ecosystems either directly or indirectly; they can decrease native populations, modify water tables, and change run-off dynamics. These changes in turn can affect many recreational and commercial activities.

In 2008, EPA scientists conducted a survey within the Florida Keys National Marine Sanctuary to assess the impacts of a non-native coral species, *Tubastraea coccinea* (*T. coccinea*). This nonnative coral species has the potential to negatively impact native coral reef communities due to several factors, including: (1) its high reproduction rates; (2) its ability to kill tissues in native corals; (3) the lack of a natural predator in Florida waters; and (4) its ability to out-compete native coral species for important resources.

EPA scientists collected tissue samples from the nonnative coral and photographed both invasive and native coral colonies. These data will help scientists determine the colony/population growth and recruitment rates (the rate at which free-swimming coral larvae settle onto coral reefs) in the nonnative species. These data will also help them determine if *T. coccinea* is an aquatic invasive species causing changes in the native coral population, such as low levels of biodiversity and low recruitment rates.

### **Support to Federal, State, and Academic Partners**

In 2008, the OSV *Bold* supported federal, state, and academic partners in a number of oceanographic surveys.

The U.S. Geological Survey (USGS) used the OSV *Bold* to conduct research on the potential risks associated with geological hazards, such as tsunamis, submarine

landslides, and earthquakes, caused by offshore faults along the southern coast of California. In this survey, USGS scientists recorded a series of high-resolution seismic profiles within and around the San Diego Trough and Coronado Bank faults. These profiles will help scientists characterize the size, extent, and activity of these faults. Using these data, scientists will achieve several goals, including: (1) tracing active faults and associated structures; (2) identifying features for stratigraphic (rock layer) sampling; (3) determining the maximum magnitude of earthquakes from offshore faults; (4) improving interpretation of the sub-bottom features; and (5) providing information on Southern California ODMDs, all of which are located in an active earthquake region.

In Washington, there have been many efforts to understand the factors that influence water quality in Puget Sound. One group, the Puget Sound Regional Synthesis Model, or PRISM, is a partnership between state, federal, tribal, and academic leaders working together to: advance more scientific understanding of Puget Sound; contribute to education about Puget Sound; and provide input for regional planning efforts. For several years, Puget Sound has had low DO levels, particularly in areas where flushing rates are low and coastal development and nutrient inputs are high. If depletion of DO continues, Puget Sound may be affected by hypoxia. In 2008, the OSV *Bold* worked with PRISM to monitor water conditions in Puget Sound.

PRISM partners, the Washington Department of Ecology, and University of Washington, used the OSV *Bold* to collect data on the biological, chemical, and physical characteristics of Puget Sound waters. These data will be used to further refine models of anthropogenic impacts on Puget Sound.

The National Oceanic and Atmospheric Administration (NOAA) and the Washington Department of Fish and Wildlife (also PRISM partners) worked together to characterize the geographic extent and the magnitude of toxins such as PCBs, pesticides, and polybrominated diphenyl ethers (PBDEs) in phytoplankton and zooplankton (tiny aquatic animals) living in Puget Sound. Using the OSV *Bold*, scientists collected biological samples, and later analyzed the samples for toxins at the NOAA's National Marine Fisheries Service ecotoxicology labs. These data will be used to help scientists understand how these toxins are transported through the ocean food web.

Every year in Puget Sound, shellfish harvesting is halted as a result of harmful levels of paralytic shellfish toxins — poisonous toxins that can cause numbness, paralysis, disorientation, and death if ingested by humans. Paralytic shellfish toxins are byproducts of harmful algal species that accumulate in shellfish tissues. The first documented closing of shellfish harvesting, in 2003, was due to high concentrations of domoic acid (a neurotoxin produced from harmful algal species). During the survey, EPA scientists sampled Puget Sound for do-

moic acid to determine the levels and spatial distribution of harmful algal species.

The Washington Department of Ecology and NOAA also used the OSV *Bold* to monitor the carbon chemistry in Puget Sound. Increased carbon dioxide levels have been found in, and are gradually acidifying, these waters. Using a water profiler, scientists measured the water column for acidity; alkalinity (the ability to neutralize acids); carbon dioxide partial pressure; and levels of dissolved inorganic carbon. These data will be used to assess patterns of anthropogenic contributions of carbon dioxide, and to monitor changes in ocean acidification.

### **Public Education on EPA's 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. In 2008, the OSV *Bold* hosted open ship visits in Alaska, Washington, Oregon, California, and Mississippi. Scientists described the OSV *Bold's* scientific facilities, sampling equipment, and dive-operation capabilities to the public.

While in Seattle, Washington, the OSV *Bold* hosted an event in which EPA scientists demonstrated some of the work conducted around the Puget Sound by EPA and our partners. Participants included senior EPA regional management; members of the U.S. Congress; representatives from the



Photo by Allan Ota, U.S. EPA

**EPA scientist demonstrates survey equipment to visitors.**

Puget Sound Partnership; and local elected officials and members of tribal governments.

In Portland, Oregon, the OSV *Bold* hosted events in conjunction with the Portland Rose Festival. EPA partnered with the Oregon Museum of Science and Industry, giving tours and conducting presentations for visitors.

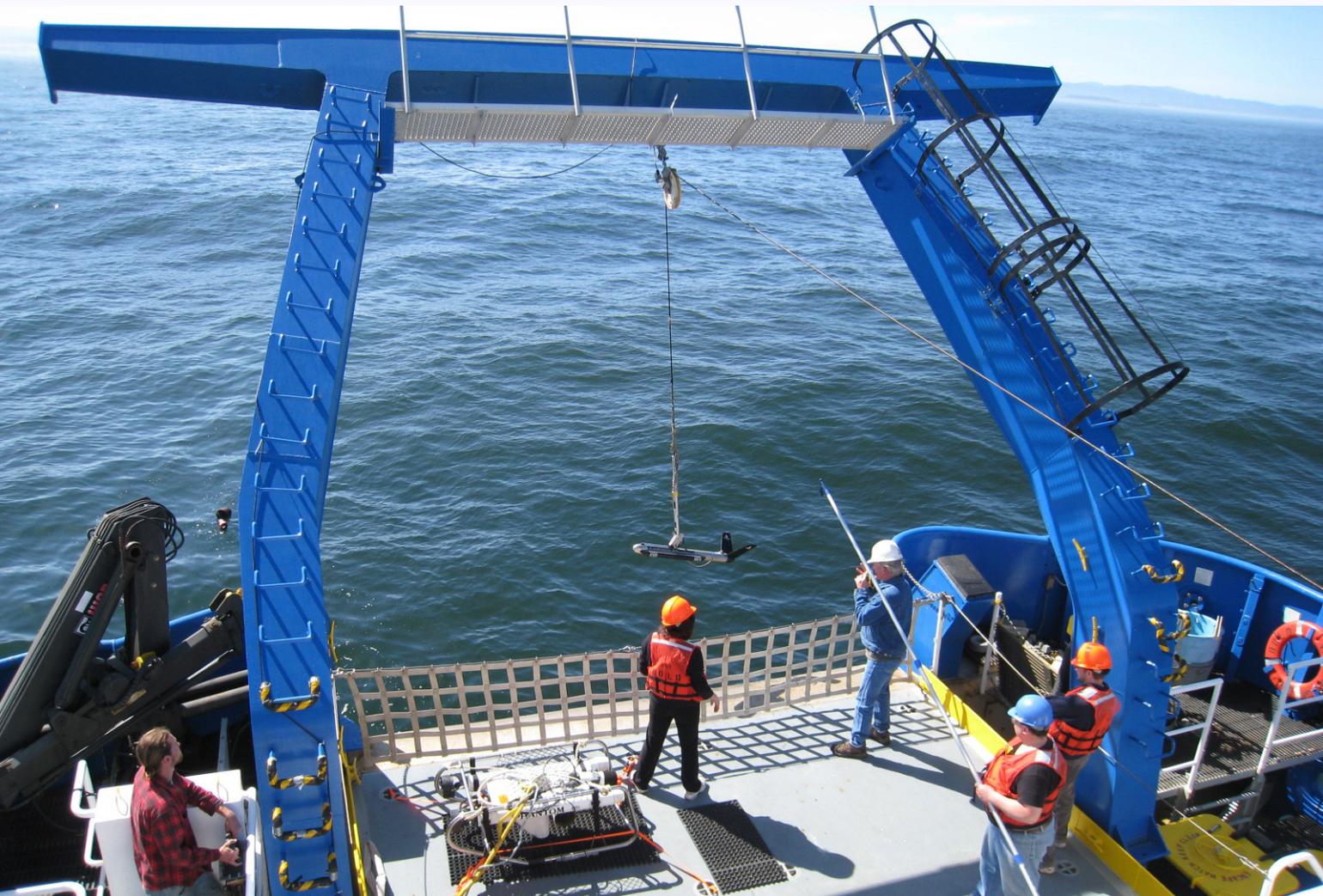
In Gulfport, Mississippi, EPA scientists held an event in coordination with various partners including EPA's Gulf of Mexico Program; University of Southern Mississippi; Mississippi Department of Marine Resources; and the Gulf of Mexico Governors' Alliance. During this event, visitors learned about state-of-the-art technology and scientific methods used for oceanographic surveys aboard the OSV *Bold*, as well as local efforts to protect the health and resiliency of the Gulf of Mexico Coast.



Photo by Mel Parsons, U.S. EPA

**The OSV *Bold* docked in Seattle, Washington.**

# Scientific Surveys in 2009



**EPA scientists deploy survey equipment from the A-frame off the coast of Eureka, California.**

Photo by Marcel Belaval, U.S. EPA

OSV *Bold* surveys scheduled for 2009 include:

- Assessment and Monitoring of EPA-designated Ocean Dredged Material Disposal Sites
- Fish Waste Disposal Site Assessment and Monitoring
- Ocean Outfall Monitoring
- Coral Reef Monitoring and Biocriteria Development
- Coastal Water, Sediment, and Organism Toxicity Assessment
- Coastal Eutrophication Assessment

# Appendix 1: OSV *Bold* Facilities, Equipment, and Capabilities

## 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 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.



**EPA scientist observes an underwater video.**

## Sampling Equipment

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 used for the collection of sediments.

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.



**EPA scientists onboard a rigid-hulled inflatable boat in Skagway Harbor, Alaska.**

# Appendix 2: Scientific Surveys and Public Education Events in 2008

Survey/Event	Location	Month(s)
Alaska Cruise Ship Impacts Assessment	Skagway Harbor and Taiya Inlet, Alaska	June and July
Assessment and Monitoring of EPA-Designated Ocean Dredged Material Disposal Sites	San Diego, California	April
	Long Beach, California	April
	Los Angeles, California	April
	San Francisco, California	April
	Eureka, California	May and September
	Florence, Oregon	June
	Newport, Oregon	June and August
	Coos Bay, Oregon	June and August
	Brookings, Oregon	June and August
	Bandon, Oregon	June and August
	Astoria, Oregon	June and August
	Reedsport, Oregon	August
	Olympia, Washington	July
	Tacoma, Washington	July
	Seattle, Washington	July
	Bremerton, Washington	July
	Port Townsend, Washington	July
	Everett, Washington	July
	Port Angeles, Oregon	July
	Anacortes, Washington	July
Tampa, Florida	November	
Gulfport, Mississippi	December	

Survey/Event		Location	Month(s)
Coastal Water, Sediment, and Organism Toxicity Assessments	DDT Contaminant Budget	Southern California Bight, California	April
	Puget Sound Sediment	Puget Sound, Washington	August
	Puget Sound Water Quality	Puget Sound, Washington	August
	Oregon Coast Hypoxia	Oregon Coast, Oregon	June and August
Aquatic Invasive Species Impact Assessment	Invasive Coral Species	Florida Keys National Marine Sanctuary, Florida	December
Support to Federal, State, and Academic Partners	Geological Hazards	Southern California Bight, California	April
	Persistent Organic Pollutants	Puget Sound, Washington	August
	Puget Sound Characteristics	Puget Sound, Washington	August
	Harmful Algal Species	Puget Sound, Washington	August
	Ocean Acidification	Puget Sound, Washington	August
Public Education on EPA's Oceans and Coastal Programs		San Diego, California	April
		Portland, Oregon	May
		Newport, Oregon	June
		Juneau, Alaska	July
		Seattle, Washington	August
		Gulfport, Mississippi	December



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

2008 Annual Report  
Monitoring and Assessing the Health  
of Our Oceans and Coastal Waters

Oceans and Coastal Protection Division  
Office of Wetlands, Oceans, and Watersheds  
Office of Water  
EPA West (4504T)  
1200 Pennsylvania Avenue, N.W.  
Washington, DC 20460  
[www.epa.gov/owow](http://www.epa.gov/owow)  
EPA 842-R-09-002