

MMS OCEAN SCIENCE

VOLUME 5 ISSUE 4

OCTOBER/NOVEMBER/DECEMBER 2008

THE SCIENCE & TECHNOLOGY JOURNAL OF THE MINERALS MANAGEMENT SERVICE

**Sea Otter
Research
Expedition to
Bering Island:
Northwest to
Russia**

**Dynamics of the
Loop Current in
the Eastern Gulf
of Mexico**

**Feasting on Oil:
MMS-Funded
Study Reveals
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**2008 Hurricane
Season**

**Cold-Water
Corals:
Deepwater
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**Alternative
Energy
Markets and
Infrastructure
Needs**



MMS *OCEAN SCIENCE* is published quarterly by the Minerals Management Service to communicate recent ocean science and technological information and issues of interest related to offshore energy recovery, ocean stewardship, and mineral revenues.



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ABOUT THE COVER

Top left: Sea otter diver ready to capture an otter. Photo courtesy of Tom Campbell.

Top right: Brittle stars climbing on an antipatharian (black coral).

Middle right: Hurricane Ike. Photo courtesy of NASA.

Main photo: A converted offshore oil rig is fitted with the Sea-Based X-band Radar for the Missile Defense Agency. Photo courtesy of the Department of Defense.

Back page: Background platform image by Gregory S. Boland.

All photos courtesy of Minerals Management Service unless otherwise noted.

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Managing the exploration and development of energy resources on the Federal Outer Continental Shelf while protecting the sensitive natural environments from which those resources come requires skillful balance. The Minerals Management Service (MMS) meets this challenge by calling on the knowledge, skills, and experience of people from many backgrounds, specializations, and entities.

Collaboration and partnerships with other Federal agencies, State governments, private industry, academic and research institutions, and governments of other nations ensure that the most advanced research, methodologies, and techniques are brought to bear on the energy-related challenges that we all face. Sharing new data, methods, and research better protects the health and safety of the environment and of people in the energy industries.

To develop alternative energy sources, we need a practical understanding of what that new industry will require, such as energy markets and current and necessary infrastructure. The development and production of wind energy must be made as safe as current oil and gas energy development. To this end, monitoring, inspection, and safety techniques and methodologies must be researched and implemented. Wind turbine installations currently operating in Europe are useful information resources. Understanding more about the Gulf of Mexico's Loop Current—in both the American and the Mexican sectors—can improve ocean circulation models and hurricane forecast models, and it can contribute to improving design standards that will reduce hurricane damage to offshore facilities.

The MMS participates in many



IN GOOD COMPANY PARTNERSHIPS ADVANCE MMS OBJECTIVES

A school of fish swimming over a reef. Photo courtesy of *An Ocean Blueprint for the 21st Century*, Final Report of the U.S. Commission on the Ocean Policy.

multidisciplinary research projects, cooperative agreements, and joint projects with other agencies, governments, and industry. Joining two Federal agencies, the Marine Mammal Commission, the Alaska SeaLife Center, the Russian Pacific Institute of Geography, and the Komandorsky State Nature Reserve to conduct research and share technical expertise about sea otters on Bering Island, Russia, MMS gains important information

while sharing advanced techniques. Cooperative research benefits not only the research subjects but also the broader research and regulatory communities.

The MMS continues to provide substantial contributions by funding and participating in research endeavors for environmental studies and offshore operations and safety technology—reinforcing MMS's role as an effective steward of the ocean environment.

FOR MORE INFORMATION

MMS OEMM Partnerships

www.mms.gov/offshore/Partnerships.htm

MMS Environmental Studies Program research opportunities

www.mms.gov/eppd/sciences/esp/newstudies08.htm

MMS Offshore Energy and Minerals Management Partnerships

www.mms.gov/offshore/Partnerships.htm

MMS International Activities Program

www.mms.gov/international

MMS and Ohmsett

www.mms.gov/tarprojectcategories/ohmsett.htm

Ohmsett

www.ohmsett.com

NORTHWEST TO RUSSIA

In July 2008, divers from the U.S. Geological Survey (USGS) and the Minerals Management Service (MMS) joined sea otter trackers and veterinary staff from the Monterey Bay Aquarium for a sea otter research expedition to Bering Island off the east coast of Russia. This year's work was the final stage of a three-year project funded by the Alaska SeaLife Center, U.S. Fish and Wildlife Service, and the Marine Mammal Commission, with logistical support by the Russian Pacific Institute of Geography and Komandorsky State Nature Reserve.

Russia is a long way from home for the U.S. sea otter team. Why travel so far? Sea otters once ranged across the entire north Pacific, from the northern islands of Japan to the Baja Peninsula in Mexico. In the 18th century, harvest of sea otter furs led to widespread extirpation of sea otters and left only remnant colonies in Russia, Alaska, and California. Though sea otters are now fully protected by the Marine Mammal Protection Act and the Endangered Species Act, they are considered vulnerable. The California population is small and has a relatively low growth rate. The southwest Alaska population, once considered fully recovered, has suffered precipitous declines in the last decade, while neighboring otters in Russia appear to be doing well.



Dr. Mike Murray and Bridget Cummings prepare a sea otter for surgery. Photo courtesy of Alexander Burdin.

Similarities and differences among areas help us understand what may be driving population changes and give us valuable insight into the otters' environments.

Comparative studies of sea otters' daily activities in different geographic areas help answer fundamental questions about sea otter ecology and population changes. How much time are they foraging? How much time do they rest? What are they eating? Where do they go during the day (and night)? How successful are they at weaning pups? How healthy are individual otters? Similarities and differences among areas help us understand what may be driving population changes and give us valuable insight into the otters' environments.

Until now, our Russian colleagues have been largely limited to counting sea otters and examining carcasses of stranded animals. Working with the U.S. research team on this study, they have incorporated techniques developed in California and Alaska.

For the first year of the study, sea otters were captured, flipper tagged, and surgically implanted with radios to track their movements and time-depth-recorders (TDRs) to record their diving activity in detail. In the second year, trackers followed the tagged animals, noting their locations, activity, and what they were eating. The final stage of

the field work was recapturing the tagged animals and surgically removing their TDRs. This was the primary mission of the 2008 Bering Island expedition.

Virtually every aspect of the 2008 expedition was challenging. The logistics of transporting gear was daunting. The team worked in remote locations with limited resources and in primitive conditions. Then there were the usual limitations imposed by weather, tides, and daylight.

Data from recovered TDRs have been downloaded, but it will be more than a year before results of the study will be fully analyzed.

There is little doubt, however, that this dataset will be useful for many years to come.

It took a highly-skilled team, hard work, dedication, and a bit of luck to fulfill the objectives of this study. More important, this collaborative, interdisciplinary effort crossed traditional government agency, private sector, and international boundaries. The MMS played a role in the success of this study, demonstrating that cooperation, coordination, and shared use of resources can pay great dividends toward our understanding and stewardship of the marine environment.



Sea otter. Photo courtesy of David Menke, U.S. Fish and Wildlife Service.

FOR MORE INFORMATION

Alaska Sea Life Center

www.alaskasealife.org

"Bering Island," in "Kamtchka: Siberia's Forbidden Wilderness," PBS

www.pbs.org/edens/kamchatka/bering.html

Center for Russian Nature Conservation

www.wild-russia.org/bioregion14/14-komandorsky/14_komandorsky.htm



WILDLIFE BIOLOGIST GREG SANDERS



Far left: Greg Sanders with a sea otter pup in the Bering Sea.

Top: Work at Rose Atoll National Wildlife Refuge yielded a new species of fish, *Ostorhynchus leslie*. Photo: Jim Maragos, U.S. Fish and Wildlife Service.

Left: Sea anemones and mussels compete for space on offshore oil and gas platforms in the Pacific.

Offshore, the wind is blowing 25 knots (about 30 miles per hour). I'm covered with dust from head to toe. I have not shaved or been able to bathe for weeks. I'm tired and hungry. I am beginning to question my career choice but then my sense of adventure returns. Where am I and how did I get here?

My name is Greg Sanders and I am a marine mammal, seabird, and sea turtle biologist with the Minerals Management Service (MMS). In July 2008, I joined a very special team of sea otter trackers, divers, and veterinary staff. Our mission: to capture sea otters in Russia's Far East.

In grade school, I confidently declared that I wanted to be a "deep-sea diver" when I grew up. A passion for diving has been a common thread in my

career choices ever since. I was certified as a diver in high school, studied aquatic biology in college, worked as a dive instructor, and harvested shellfish under offshore oil platforms before starting on a career of Federal service with the Department of the Interior's MMS.

My work days, more often than not, are dominated by reviewing project proposals, writing environmental review documents, managing contracts and agreements, and attending meetings, briefings, and training sessions. Interspersed with more mundane tasks have been opportunities for me to contribute on a scale far exceeding the dream job I first imagined when I was a second grader.

Offshore California's Channel Islands National Park, I've captured video to share with park visitors eager to catch a glimpse of the underwater world. At the remote

South Pacific Fish and Wildlife Service Refuge of Rose Atoll, I participated in a multi-disciplinary natural resource damage assessment that inadvertently led to the discovery of a new species of fish. On the continental shelf, I've documented phenomenal marine ecosystems associated with oil and gas platforms. Across the north Pacific, I've helped capture sea otters for studies that shed light on the biology and ecology of this charismatic marine mammal.

For all of these projects, my greatest reward has been working with skilled, talented, and dedicated people from all corners of the Department of the Interior and beyond. The success of every project comes down to the people involved and their ability to work together toward a common goal. The MMS plays a significant role in ocean science and I am fortunate to be a member of this team.

Sea otters are well known for their playfulness and agility. In many Native American traditions, the otter is a totem that represents cleverness, laughter, and inquisitiveness.

A member of the Mustelidae family, the sea otter (*Enhydra lutris*) is the largest mustelid (by weight) and the smallest exclusively marine mammal in the world.

Sea otters live in temperate coastal waters where they are often found resting or foraging in kelp beds. Their average life span is 15-20 years. Females have one pup per year. On average, adults are 4.5 feet (1.4 meters) long, but some reach up to 6 feet (1.8 m). Adult males often weigh 50-90 pounds (22-41 kilograms), females 40-60 pounds (18-27 kg), roughly the size of a Labrador retriever dog.

Sea otters have the densest fur in the animal kingdom. Because they have no subcutaneous fat layer (blubber), sea otters depend on their water-resistant fur to protect them against cold. If their fur becomes soiled or compromised, it loses its insulating ability and the animal may die.

An apex predator (species that, as adults, are not typically prey), the sea otter eats a range of invertebrates, such as clams, crabs, mussels, octopus, sea stars, sea urchins, snails, and squid.

Sea otters are handy with tools. In fact, they are one of the few mammals known to use tools. They often carry small rocks and other objects to pry shellfish from rocks. It's not unusual to see a sea otter, floating on its back, using a rock like an anvil on its chest to pound hard-shelled prey into small pieces.

Originally, sea otters inhabited shore waters from Hokkaido, Japan, northward along Kamchatka through the Aleutian archipelago and along the Pacific coast to Baja, California, Mexico. There may have been as many as 300,000 sea otters. Between 1742 and 1911, commercial harvest by the Russian and American fur trades drastically reduced the world population.

By 1911, when sea otters were protected under the International Fur Seal Treaty, only 13 small otter colonies remained—an estimated total of 1,000-2,000 animals. Most of these remnant populations became extinct.

Remnant sea otter colonies gradually expanded across Alaska and Russia. In California, the



Sea otter with a sea urchin. Courtesy of Gena Bentall.

population began its recovery from a low of about 50 animals and sea otters are now common along the central coast. Beginning in 1965, Alaskan otters from the Aleutian Islands and Prince William Sound were translocated to create new colonies in South East Alaska, British Columbia, and Washington.

Southern sea otters (California) and the southwest stock of sea otters in Alaska are listed as threatened under the Endangered Species Act. Throughout the U.S., the sea otter is protected by the Marine Mammal Protection Act. Human-related threats to sea otters include entrapment in fishing gear, human pathogen pollution, as well as oil and gas transport and spills. Threats vary from area to area. Sharing and comparing data about sea otters in different areas can help identify why some populations are faring better than others.

The MMS contributes to protecting the ocean environment not only by funding studies but also by sharing technology and expertise with a range of partners, as with Greg Sanders' participation (see opposite page) with the 2008 Bering Island Expedition.

Kingdom:	<i>Animalia</i>
Phylum:	<i>Chordata</i>
Class:	<i>Mammalia</i>
Order:	<i>Carnivora</i>
Suborder:	<i>Mustelidae</i>
Subfamily:	<i>Lutrinae</i>
Genus:	<i>Enhydra</i>
Species:	<i>lutris</i>

FOR MORE INFORMATION

“Threatened Pinnipeds and Sea Otters in the Southern California Planning Area,” MMS Pacific OCS Region

www.mms.gov/omm/pacific/enviro/pin-and-seaotter.htm

“Possible Effects of OCS Oil and Gas Activities on the California Sea Otter,” MMS Pacific OCS Region

www.mms.gov/omm/Pacific/enviro/calseaotter.htm

“Precipice of Survival: The Southern Sea Otter,” U.S. Geological Survey video (watch the streaming video or order DVD)

<http://online.wr.usgs.gov/outreach/otter/GIP3video.html>

Marine Mammal Commission

www.mmc.gov/species/seaotter.html

DYNAMICS OF THE LOOP CURRENT IN THE EASTERN GULF OF MEXICO

To many people who live or work in the Gulf of Mexico coastal region, “the Loop Current” is a familiar term, frequently heard during hurricane season. But the term’s meaning is perhaps less well known.

The Loop Current forms the upstream portion of the Gulf Stream; it transports energy, heat, mass, momentum, and salt from the eastern half of the Gulf to the western. Because the Loop Current is the principal ocean current in the Gulf of Mexico, its dynamics can affect all activities in the Gulf and along the Gulf Coast. It spawns clockwise eddies that carry warm water westward across the Gulf. Its seasonal circulation patterns contribute to physical and biological processes.

The warm Loop Current enters into the eastern Gulf of Mexico as the “Yucatan Current,” then extends northward, where it turns eastward and then exits through the Straits of Florida. During its movement, at an average interval of about every 9 months, it sheds warm eddies or rings; this shedding has important effects on the entire water column of the Gulf’s circulation. The Loop Current is hypothesized to be a source of bottom-trapped waves that predominate in the deep Gulf circulation.

To learn more about this powerful current, the Minerals Management Service (MMS) has awarded a \$5.5 million contract to Science Applications International Corporation for a 5-year study.

Understanding more about the evolution of the current near the surface and its deepwater impacts will have important implications for hurricane forecasting and for the Gulf’s oil and gas industry. Data from the study should improve ocean circulation models that characterize the flow of Gulf waters and so contribute to improving forecast models that use ocean-atmosphere interactions.

Eddies are vortices carrying mass and energy and can interrupt or interfere with oil production, especially in deep waters where floating production, storage, and



Illustration of Loop Current movement.

offloading vessels, which extract oil and gas, often require precise docking activities.

The study will describe oceanographic conditions leading to and during the shedding and reattachment of eddies, gather statistics from *in situ* observations, carry out numerical modeling that describes the general circulation patterns inferred from remote sensing and geostrophic calculations, and analyze the data and model output to test several hypotheses.

Because the Loop Current crosses international boundaries, the study will be divided into U.S. and Mexican territories. This study will concentrate on the U.S. sector, while Mexican oceanographers from Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE) will cover the Mexican territory.

The coordination and cooperation of a number of entities include scientists from the University of Miami, the Atlantic Oceanographic and Meteorological Lab, the National Hurricane Center, the U.S. Navy, CICESE, and members of the oil and gas industry.

FOR MORE INFORMATION

Graphic and definition, Coastal Services Center, National Oceanic and Atmospheric Administration
www.csc.noaa.gov/crs/definitions/loop_current.html

“The Loop Current,” University of Miami, Rosenstiel School of Marine & Atmospheric Science
<http://oceancurrents.rsmas.miami.edu/atlantic/loop-current.html>

MMS press release
www.mms.gov/ooc/press/2008/press1008a.htm



Hurricane Ike. Photo courtesy of NASA.

The 2008 hurricane season had a significant impact on oil and gas production in the Gulf of Mexico, but despite the destruction, all offshore personnel were evacuated safely. There were no significant oil spills and no evidence that oil from Outer Continental Shelf (OCS) facilities reached shore or adversely impacted birds or mammals.

In preparation for a hurricane, OCS operators follow procedures established by the Minerals Management Service (MMS) to reduce the potential damage to key infrastructure as well as platforms, rigs, and equipment. Personnel not only tie down and secure equipment; they also activate a shut-in procedure that closes off safety valves below the seabed to prevent the release of oil or gas. Safety is a priority for both MMS staff and for the operations under MMS supervision. Before production can be resumed, standard safety and environmental checks must be performed both above and below the waterline. Results of these

damage inspections are reported to MMS and are used to make decisions about repair plans.

The MMS Continuity of Operations Plan team is currently monitoring restoration activities from damage caused by Hurricanes Gustav and Ike. In September alone, an estimated 1,450 of the 3,800 offshore oil and gas production platforms in the Gulf of Mexico were exposed to hurricane winds. In spite of the hurricanes' devastation, offshore oil and gas operators have reoccupied platforms and are restoring production.

The loss of four drilling rigs from Hurricane Ike has been reported. As of October 8, MMS has confirmation that 54 of the smaller production platforms were destroyed. Initial estimates indicate a loss of production of 13,300 barrels of oil per day and 90 million cubic feet of gas per day from these destroyed facilities. In addition, 35 production platforms report extensive damage that will require 3-6 months to repair; 60 sustained moderate damage, which will take

Production from the Gulf of Mexico accounts for 25 percent of the oil produced domestically and 15 percent of the natural gas produced domestically. As of June 2008, daily production estimates for the Gulf of Mexico were 1.3 million barrels of oil and 7.0 billion cubic feet of gas. Since then, gas production from the Independence Hub facility increased and in August 2008 gas production from the Gulf was estimated at 7.4 billion cubic feet of gas per day.

1-3 months to repair. It is possible that some of the platforms initially assessed as having extensive damage may later be considered destroyed.

Damage inspections have confirmed that one oil pipeline system and eight gas transmission pipeline systems have been damaged. The scope of the impacted area is quite large so it will take some time to evaluate the full extent of any damage, and visual inspection of the remaining pipeline systems continues. In the meantime, tools are available to help oil and gas operators resume production. However, these options—barging, temporary flaring, and re-routing of product through other pipelines—require that offshore operators submit requests to MMS for approval.

The facilities destroyed by these two hurricanes account for only a small fraction of the oil and gas resources produced in the Gulf of Mexico, but their loss is of great concern to MMS. The MMS will continue to collaborate with the American Petroleum Institute and members of the offshore oil and gas industry to be as prepared as possible and reduce the risk of future interruption to the production of the Nation's energy resources.

FOR MORE INFORMATION

MMS press releases

www.mms.gov/ooc/press/2008/press0930a.htm

www.mms.gov/ooc/press/2008/press1007c.htm

www.mms.gov/ooc/press/2008/press1016.htm

MMS Gulf of Mexico Region Hurricane Information

www.gomr.mms.gov/homepg/whatsnew/hurricane/index.html

Houston Chronicle

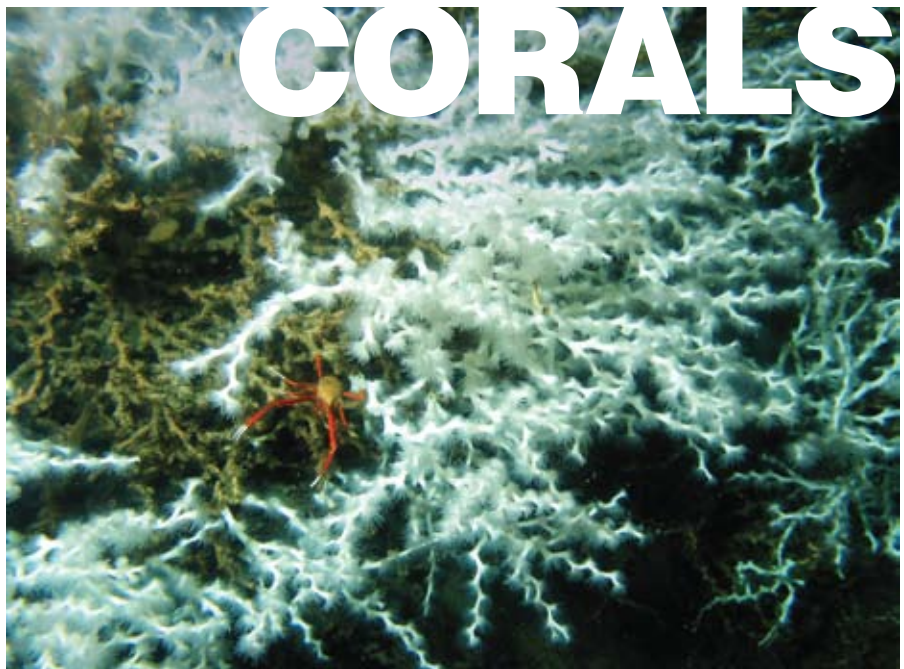
www.chron.com/disp/story.mpl/front/6039282.html

The search for domestic energy sources is progressing to great depths in the Gulf of Mexico. As economic interests move oil and gas operations into these previously unexplored areas, the Minerals Management Service (MMS) works to increase understanding of the organisms residing at these depths. By examining distribution, relative abundance, and population structure, MMS is better equipped to protect their habitat from potential future impacts.

In September 2007, MMS announced the release of a new report, *Characterization of Northern Gulf of Mexico Deepwater Hard-Bottom Communities with Emphasis on Lophelia Coral* (MMS 2007-044). This is the first dedicated Gulf study of deepwater corals designed to gain a better understanding of their biology and distribution. The resulting publication indicates that “*Lophelia pertusa* plays a significant role in the ecology of hard bottom habitats on the upper slope of the northern Gulf of Mexico.” The report suggests the need for additional research to address questions arising from the study and makes recommendations for further exploration and investigations at greater depths.

Now, a new MMS study is underway, exploring Gulf deepwater coral habitats from 300 to 3,000 meters (984 to 9,842 feet) deep. The new project, “*Lophelia II*,” or “Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs, and Wrecks,” is an exciting 4-year study, teaming MMS with the National Oceanic and Atmospheric Administration’s Office of Ocean Exploration and Research (NOAA’s OER). Funded by a \$3.7 million MMS contract, researchers will use NOAA research vessels and

COLD-WATER CORALS



Lophelia pertusa with *Mumida* sp. (galatheid crab).

DEEPWATER CORAL EXPEDITION IN THE GULF OF MEXICO

remotely operated vehicles (ROVs) to explore both natural and human-made (including shipwrecks and platforms) sites to better understand the deepwater coral communities.

Little is known about deepwater corals. In this first year of the *Lophelia II* project, the goal is to locate and explore new coral sites and discover more about the habitat characteristics, biology, ecology, and population connectivity of deepwater corals.

The first leg began on September 5, 2008, aboard NOAA’s *Nancy Foster* and focused on eight shipwreck sites: three previously explored and five new wreck sites. The main goals of the cruise were

to determine the archaeological and biological potential of each site and to choose which might be included for future work during cruises. Of the previously explored sites, two were 19th-century sailing vessels; the third was *Gulfpenn*, a World War II tanker sunk by a German U-boat. By re-visiting these sites, the scientists can compare information with previous observations to conduct experiments and help determine deterioration rates.

Exploration of the first newly-found site resulted in an exciting discovery of an approximately 200-year-old sailing vessel off the coast of Galveston, Texas, in the Ewing Bank Area. Although no



Diversity of the bottom habitat includes black corals, anemones, crinoids, and brittle stars.

visible artifacts remained, biologists were pleased to find *Lophelia pertusa*, the expedition's most anticipated deepwater coral community, on the ship. In addition, another new site visited was identified as the *Gulfoil*, a World War II casualty sunk by a German U-boat in 1942. It, too, was found to be a habitat for *Lophelia*. Hurricane Ike forced the research crew to dock in Pensacola, Florida; fortunately, the crew and ship were unharmed and able to return to sea.

The second leg focused on the natural, hard-bottom areas and deepwater coral communities, which were explored through photographic surveys and specimen collection. The 2-week cruise included 13 site visits, with 10 ROV dives at 8 of the sites. During the site visits, a variety of technologies was used, including ocean floor mapping using multibeam bathymetry (echo sounding), physical data collection using a conductivity-temperature-depth logger, and high-resolution video and still cameras attached to the ROV.

The cruise also provided important information about little-known species connected to coral reef habitats, such as catsharks, squat lobsters, and many deep reef fish. Even in deep water with no sunlight, corals can create new complex habitat where numerous other animals can live, and their survival is important for maintaining marine diversity. Ocean dynamics, such as effects of climate change, currents, and recruitment and survival of corals, were also elements of the research cruise.

This year's *Lophelia* II cruises are just the beginning of the project. During cruises over the next 2 years, coral colonies on oil platforms will also be explored, additional mapping surveys will be conducted,



Squat lobster with gooseneck barnacles on an antipatharian.

and more in-depth physical and photographic sampling of the corals and associated communities will be completed. The data collected over the 3 years of field work will be carefully analyzed, and questions will be formulated for future explorations and studies of the newly discovered sites. The knowledge gained will help MMS regulate oil and gas exploration and operations in sensitive areas, protecting the associated communities through the creation or modification of existing policies.

As part of the *Lophelia* II project, the U.S. Geological Survey (USGS) is conducting a companion study of the Gulf's deepwater corals. Called the "USGS DISCOVER Expedition," this separately-funded 4-year study uses NOAA's *Nancy Foster* during its first field year to examine the deepwater coral environments, combining resources, data, and samples to add to the understanding of these unfamiliar habitats.

FOR MORE INFORMATION

Characterization of Northern Gulf of Mexico Deepwater Hard-Bottom Communities with Emphasis on *Lophelia* Coral (OCS Study MMS 2007-044)

www.gomr.mms.gov/PI/PDFImages/ESPIS/4/4264.pdf

***Lophelia* II 2008: Deepwater Coral Expedition: Reefs, Rigs, and Wrecks, NOAA Ocean Explorer**

<http://oceanexplorer.noaa.gov/explorations/08lophelia/welcome.html>

U.S. Geological Survey DISCOVER Expedition

<http://fl.biology.usgs.gov/DISCOVER/index.html>

The Deep Wreck Science of the Gulfpenn, NOAA Ocean Explorer

<http://oceanexplorer.noaa.gov/explorations/08lophelia/background/archeology/archeology.html>

STUDY OF INSPECTION METHODOLOGIES FOR OFFSHORE WIND TURBINES



Lillgrund Sweden. Photo courtesy of DNV. B. Vestergaard photographer.

Ensuring that our Nation benefits from resources available on Federal offshore lands today and in the future is a prime concern of the Minerals Management Service (MMS). For that reason, the development of a renewable energy resource like offshore wind to generate electricity on the Outer Continental Shelf (OCS) waters is exciting. As with the development of any energy supply, safety and environmental concerns must be addressed. The potential introduction of wind turbine facilities necessitates the establishment of Integrity Management activities, particularly inspections, to ensure the safe and long-term operation of these facilities.

This 6-month study, “Inspection Methodologies for Offshore Wind Turbine Facilities,” is funded by MMS and led by Frank Puskar, president of Energo Engineering, Inc., an engineering firm specializing in advanced offshore structural engineering. The project has brought together an impressive group of experts from the scientific and energy production fields to develop Integrity Management methodology, including inspection and monitoring, for offshore wind turbine facilities operating on the OCS. Data gathered and reviewed includes information about specific offshore wind turbine installations in Europe, various configurations of components, and technical data about equipment and systems. The MMS compiled information about accidents occurring throughout the wind power industry. Combined with other information, this will help identify high-risk components in various systems and enable a risk-based approach to developing inspection priorities.

NASA’s QuikSCAT, launched in 1999, tracks the speed, direction, and power of winds near the ocean surface. If ocean areas with high winds were tapped for wind energy, they could potentially generate 500 to 800 watts of energy per square meter.

Source: www.nasa.gov/centers/jpl/news/quikscat-20080709.html



Turbine blades. Photo courtesy of RePower Systems.

Final recommendations from the study are expected to be presented by the end of 2008 and will cover offshore wind turbine components, expected field development configurations, degradation mechanisms and other inspection preventable hazards, inspection techniques, and regional variations. Recommended guidelines will address critical items for inspection, inspection frequencies and techniques, and sample checklists.

The prospects afforded by development of this renewable energy resource are promising, and MMS will continue to safely develop these assets for the Nation’s energy supply.

FOR MORE INFORMATION

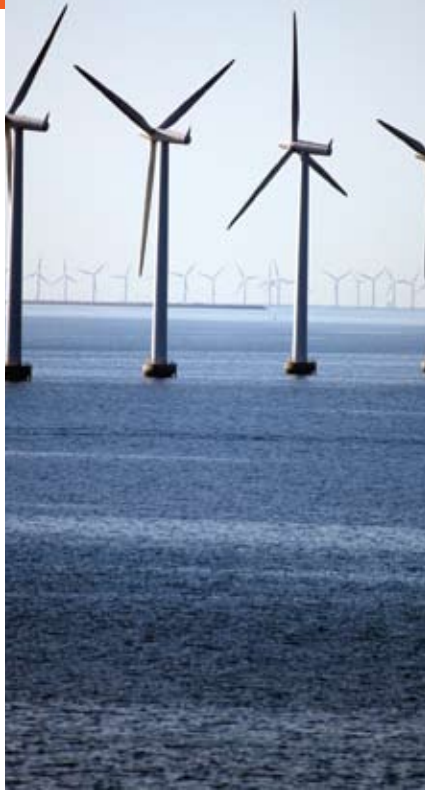
MMS Technology, Assessment & Research Program

www.mms.gov/tarphome

TAR Project 627 description

www.mms.gov/tarprojects/627.htm

ALTERNATIVE ENERGY MARKETS AND INFRASTRUCTURE NEEDS



Wind turbines near Copenhagen, Denmark. Stock photo courtesy of Schatz Publishing.

Recently the Minerals Management Service (MMS) awarded a 2-year, \$443,000 contract to Eastern Research Group, Inc. (ERG) to study energy markets and the infrastructure needs of alternative energy development. To expand progress on these new energy initiatives, the most current information for alternative energy will help MMS make the most informed decisions.

The MMS is responsible for developing energy resources on the Federal Outer Continental Shelf (OCS). The Energy Policy Act of 2005 gave MMS the authority to

include alternative energy in this mission, and so made possible the ability to grant alternative energy-related leases, easements, or rights-of way (detailed in Section 388 of the Act). Under this new authority, MMS is developing proposed regulations intended to encourage orderly, safe, and environmentally responsible development of alternative energy resources and alternate uses of facilities on the OCS. Examples of potential alternative energy include, but are not limited to, wind energy, wave energy, ocean current energy, solar energy, and hydrogen production.

In November 2007, MMS announced its interim policy to begin gathering basic information about the development of alternative energy resources on the OCS. Projects approved under the interim policy could include activities involving the installation of meteorological or marine data collection facilities to assess alternative energy resources or to test alternative energy technology. The interim policy is in effect until the final rule is promulgated.

The study awarded to ERG will support MMS's efforts in implementing the offshore alternative energy program. The first part of the study will focus on possible markets for alternative energy, including regional, emission, and trading markets. The overview will include information on market trends and Federal and State

policies that could be involved. The second part of the study will examine energy infrastructure. Working with State Coastal Zone Management programs, ERG will define the coastal areas. They will also identify economic connections to alternative energy use, such as seaports, transport facilities, and manufacturers of blades and towers for wind energy. Finally, the study will ascertain the infrastructure needed to develop alternative energy on the OCS. This could include energy grid operations, substations, transmission lines, ports, manufacturing capabilities, shipyards, shipbuilding, and transportation.

The final report is expected to be complete in late 2010. In the meantime, MMS continues to advance in developing proposed regulations to encourage the orderly, safe, and environmentally responsible development of alternative energy resources and alternate uses of the facilities on the OCS.



Offshore commercial wind-powered electricity generator.

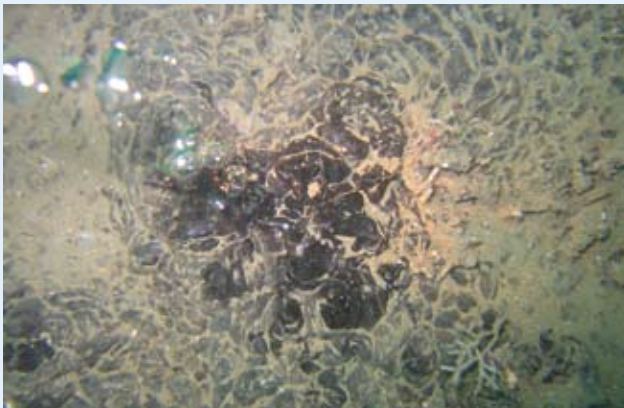
FOR MORE INFORMATION

MMS Offshore Alternative Energy

www.mms.gov/offshore/alternativeenergy

Press release

www.gomr.mms.gov/homepg/whatsnew/newsreal/2008/081008a.pdf



FEASTING ON OIL

Oil on the floor of the Pacific Ocean. Photo courtesy of University of California, Santa Barbara.

Oil-eating organisms living thousands of feet beneath the ocean floor could one day become an integral part of the Mineral Management Service's (MMS) efforts to protect the marine environment.

New research partially funded by MMS and led by David Valentine of the University of California at Santa Barbara (UCSB) and Chris Reddy of Woods Hole Oceanographic Institution (WHOI) in Massachusetts has shown that single-cell microbes are feasting on the thousands of compounds found in oil that seeps from the seafloor.

The study is one of more than 700 environmental research projects funded by MMS as part of the Environmental Studies Program (ESP), which was initiated in 1973. The ESP's mission is to gather environmental, social, and economic science

information. As a steward of the ocean environment, MMS uses the findings to make informed decisions as it balances the development of resources, including offshore oil and gas, and potential impacts on the environment. Data gathered is also used to develop solutions for industry activities that could adversely affect the environment.

Much of the research for the study of the oil-devouring microbes took place about 2 miles (3.2 kilometers) offshore of Santa Barbara, California, in an area where close to 100 barrels of oil per day seep from the seafloor.

Reddy, a marine chemist who has undertaken a number of long-term studies on the impacts of oil spills on the environment, was awed by the potential it provides. "I knew right away this site provided an important window into the fate of oil in the environment by providing the opportunity to simultaneously sample oil from its sub-seafloor source to the seafloor and up to the surface," he said.

The research team was surprised to find that microbes living without oxygen were able to eat so many of the compounds that make up crude oil. Until now, it was thought that only a small number of the compounds could be degraded anaerobically. "This is a major leap forward in understanding petroleum geochemistry and microbiology," said Reddy.

The study showed that as organisms eat away at the oil, they might be producing natural gas as a byproduct. The 7-year-long research study's methods, findings, and implications are included in "Disentangling Oil Weathering at a Marine Seep Using GCXGC: Broad Metabolic Specificity Accompanies Subsurface Petroleum Biodegradation," in *Environmental Science & Technology*, Volume 42, Issue 19.

According to Valentine, the next steps in the research are already under way. The team is following the oil diet in controlled laboratory conditions and is tracking the fate of the oil once it forms a slick at the sea surface. The goal is to gather

more information about what the microbes will eat to gain a better understanding of the link between bacterial activity and oil.

FOR MORE INFORMATION

UCSB press release

www.ia.ucsb.edu/pa/display.aspx?pkey=1857

Environmental Studies Program

www.mms.gov/eppd/sciences/esp/index.htm

Environmental Science & Technology abstract

<http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2008/42/i19/abs/es8013908.html>

MMS-Sponsored Research Available Online

The Environmental Studies Program makes all completed research available to the public through the Environmental Studies Program Information System (ESPIS), a Web-based, searchable, full-text retrieval system. Users can download documents or view them online.

The database includes the full text of over 2,000 MMS-sponsored research reports and the technical summaries of over 700 research projects.

ESPIS: www.gomr.mms.gov/homepg/espis/espisfront.asp

Recognizing that ocean and coastal communities are interconnected economically and environmentally and that any action toward positive health must address ocean and coastal ecosystems as a whole, Governors Arnold Schwarzenegger (California), Ted Kulongoski (Oregon), and Chris Gregoire (Washington), along with concerned Federal agencies have announced a plan of collaborative action to address these issues. Released on July 29, 2008, the West Coast Ocean Action Plan is an outcome of the West Coast Governors' Agreement on Ocean Health, which was signed in 2006. It calls for Federal agencies, such as the Department of the Interior, the Department of Commerce, the Environmental Protection Agency, and the White House Council on Environmental Quality to support joint action by the western states with scientific research and management expertise.

The West Coast Ocean Action Plan focuses on seven points or goals to maintain healthy ocean ecosystems. The goals include clean coastal waters and beaches; healthy ocean and coastal habitats; ecosystem-based management of ocean and coastal resources; reducing impacts of offshore development; increasing ocean awareness and literacy; improving ocean and coastal scientific information, research,



The Pacific Ocean from Rialto Beach, Olympic National Park, Washington. Photo courtesy of U.S. National Park Service.

WEST COAST GOVERNORS TAKE ACTION

and monitoring; and promoting sustainable economic development in coastal communities. These goals are based on recommendations from the U.S. Commission of Ocean Policy and the Pew Oceans Committee. The Plan has identified 26 actions to meet these 7 goals.

Any environmental plan must address the energy, environmental, and economic needs of the whole ecosystem—including humans—to be a long-term success. The

West Coast Ocean Action Plan's constructive regional approach ensures that all concerned users will collaborate on shared goals, actions, and challenges, including recreational users, energy development, academic institutions, the public, and State and Federal entities. This approach increases the likelihood of positive, sustainable long-term change for the ocean and coastal environment.

FOR MORE INFORMATION

West Coast Governor's Agreement on Ocean Health and West Coast Governor's Agreement on Ocean Health Action Plan

<http://westcoastoceans.gov/documents/>

MMS press release

www.mms.gov/omm/pacific/public/News-Releases/NR-2008-WestCoastOceanActionPlan.pdf

MMS: A steward of the ocean environment

NEW WAVES

Late-Breaking News & Information

A Commitment to New Orleans

In a clear affirmation of the continued viability of the metro New Orleans area and the importance of the Gulf of Mexico region to the Nation's energy future, the Minerals Management Service (MMS) announced the signing of a 15-year lease for its Gulf of Mexico regional offices. The MMS offices in New Orleans, opened in 1982, sustained severe damage during Hurricane Katrina in August 2005; MMS employees were forced to evacuate and the agency's staff and day-to-day operations were moved to Houston. Full operations, staffed by more than 600 employees, returned to New Orleans in 2006.

The lease for the offices, known as the Elmwood Tower Building, provides for updated scientific capabilities, including a state-of-the-art visualization room with 3-D capacity. The data interpretation capabilities of MMS geoscientists and engineers will be greatly enhanced by this new facility. Renovations included in the lease agreement also provide increased security and easier access to the public information offices. The offices will be totally



Main office building for the Minerals Management Service, Gulf of Mexico OCS Region. Photo taken September 2005 after Hurricane Katrina.

renovated and updated.

The updated office facilities, scientific capabilities, and the stability of a long-term lease reinforce MMS's commitment to the Gulf of Mexico region, southeast Louisiana, and its economic, energy, and environmental growth.

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