MMS OCEAN SCIENCE

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THE SCIENCE & TECHNOLOGY JOURNAL OF THE MINERALS MANAGEMENT SERVICE

Visions, Partners, and Possibilities

Atlantis Field: No Myth

Securing Offshore Oil and Gas Production in the 2006 Hurricane Season

OCS Lease Sales in the Chukchi Sea

Historic Shipwrecks of the Gulf of Mexico

MMS Continues to Study and Protect Valuable Resources

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ABOUT THE COVERS

Top: Blue King Crab. Alaska Fisheries Science Center. Photo: Scott Van Sant.

Bottom: Point Barrow in the winter. A NOAA Clean Air Atmospheric Observatory is located here.

Back: Background platform image by Gregory S. Boland.

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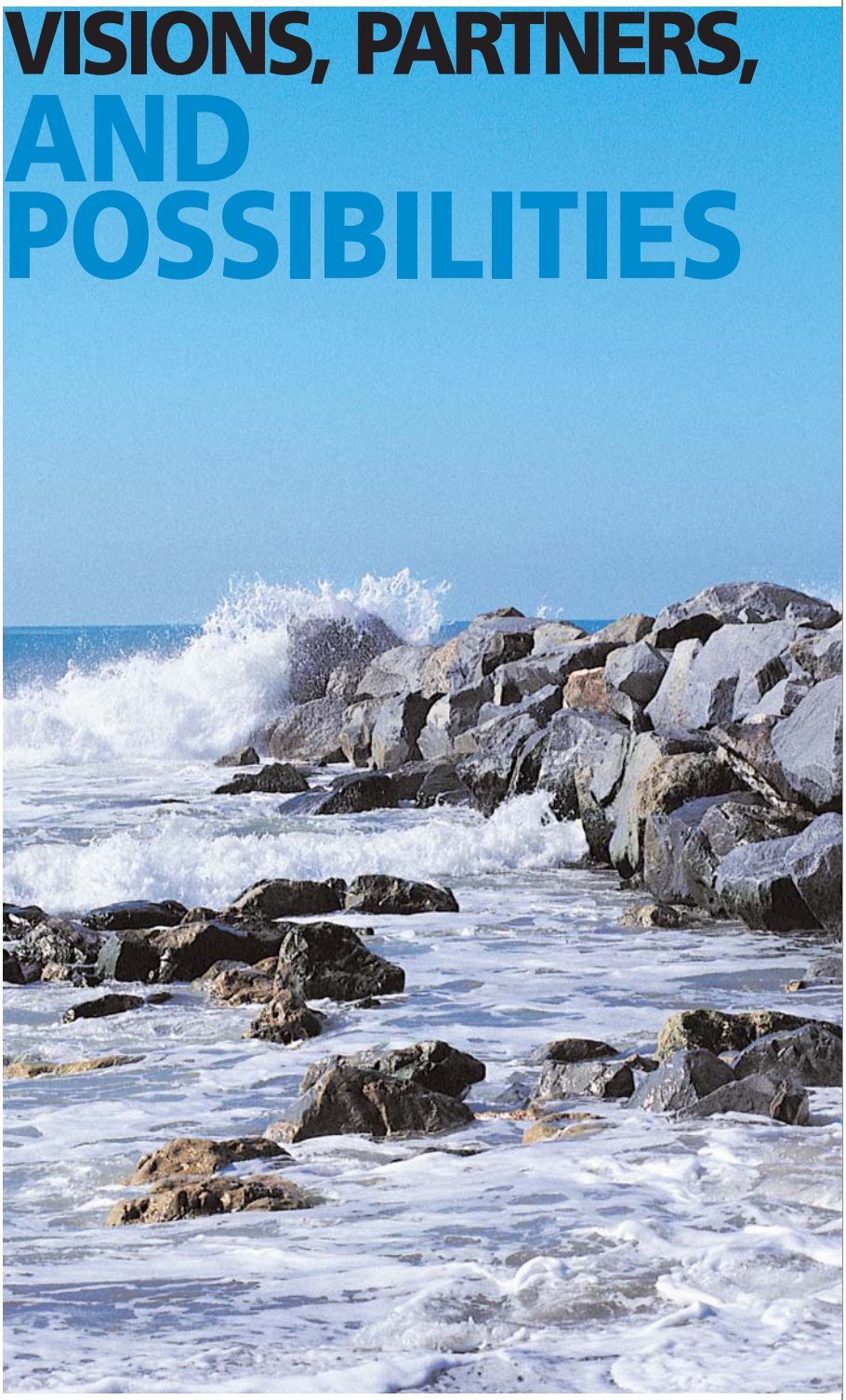
VISIONS, PARTNERS, AND POSSIBILITIES



Companies that invested in the Gulf of Mexico (GOM) deepwater region decades before technology existed to explore the resources far below are beginning to see the results of their foresight. Such is the case with BP's Atlantis project, scheduled for mooring later this year.

Other visionaries believe that the Chukchi Sea Outer Continental Shelf (OCS) holds similar reserves and conditions are right to act on their hunches. Partly because of this renewed industry interest, the Minerals Management Service (MMS) continues partnering with others to study potential effects of activity in the region. Sometimes we evaluate possible scenarios and predict probable consequences. Other times, we look at known issues and incorporate those findings into our decisionmaking. And sometimes we must study what happens after a catastrophic incident, such as the devastating 2005 hurricane season that left much of the oil and gas industry in the GOM region reeling, to learn how to prepare ourselves best for the future.

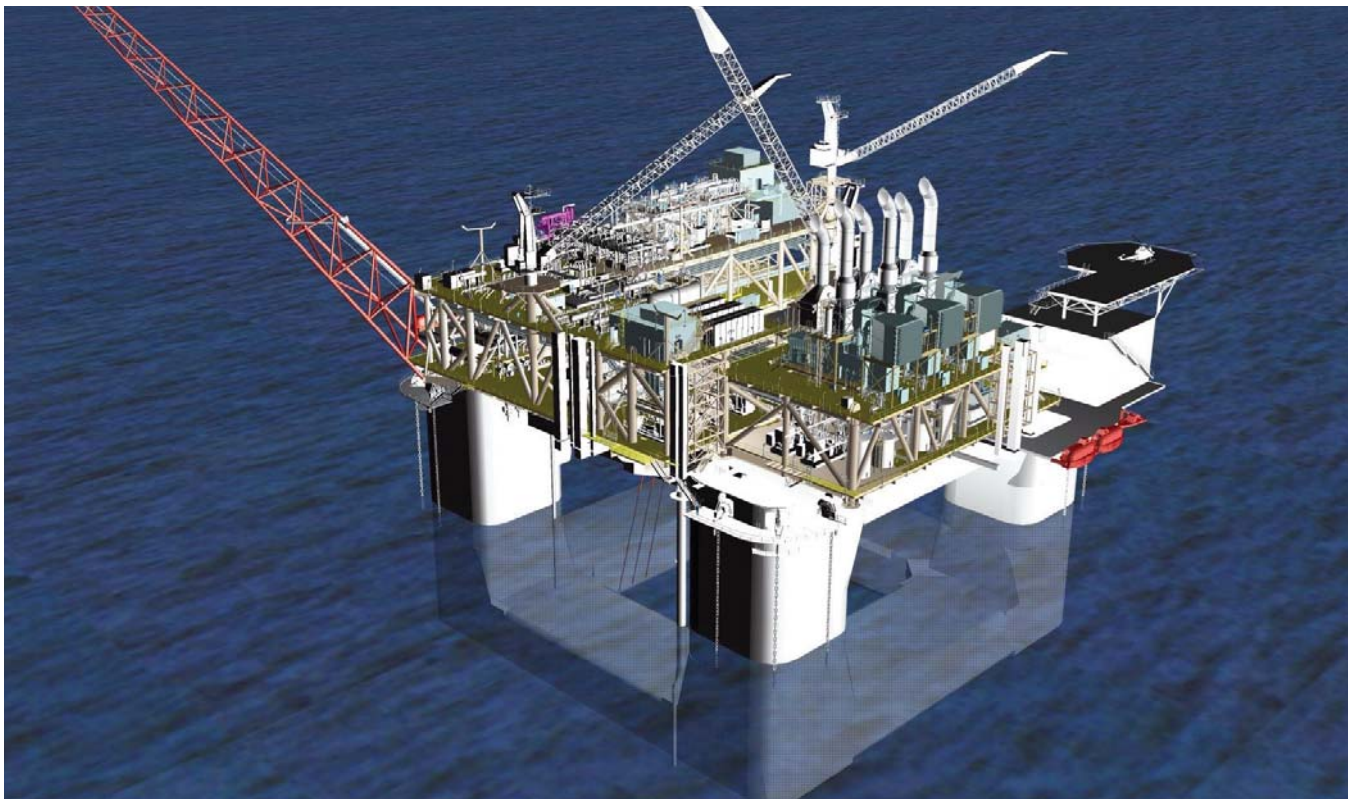
Will areas such as the Chukchi Sea someday rival the volume of oil and gas production in the GOM, which now provides a considerable portion of the Nation's energy supply? Will one of the new areas eventually become a more feasible place to extract resources and emulate the GOM region, where huge deepwater projects now command industry interest? Will technology evolve in a direction that allows GOM platforms to survive virtually untouched during storm seasons in the coming years?

While the future may not be entirely predictable, there are some things that

can be stated with certainty: MMS remains steadfastly committed to protecting the environment in areas of heightened interest and in areas of existing activity. Even within the Pacific Region, where production is waning, we must determine the best methods for decommissioning oil and gas platforms while leaving delicate ecosystems intact.

Regardless of the region, MMS will continue to study, monitor, and responsibly manage the Nation's natural gas, oil, and other mineral resources on the OCS.

ATLANTIS FIELD: NO MYTH



GVA 27000 Process and Quarters unit intended for the Atlantis development field in the Gulf of Mexico. Owner: BP

According to legend, Atlantis is a fabled island in the Atlantic that sank beneath the sea. In reality, however, Atlantis is one of the most exciting Gulf of Mexico (GOM) oil and gas projects in history, and with good reason.

Discovered in 1998, the Atlantis field is located approximately 298 kilometers (185 miles) south of New Orleans in Green Canyon Blocks 699, 700, 742, 743, and 744. The Atlantis production platform sits in a record water depth of 2,156 meters (7,074 feet). The field is the third largest ever discovered in the GOM. Atlantis will be developed utilizing two facilities, a production and quarters (PQ) facility on Block 787 and a separate drilling facility located in Block 743.

Impressive as its depth and reserves potential are, Atlantis is garnering attention for other reasons too. Scientists, geologists, and Research & Development teams from around the world will watch as Atlantis is moored. That operation, which began in the third quarter of 2006, utilizes relatively new technology to locate and extract the oil and gas resources from thousands of feet below the seafloor. Experience gained and new technology used while developing other well-known fields (e.g., Mad Dog, and Thunderhorse) are being utilized on the Atlantis project, along with some "firsts" for this behemoth.

Initial Atlantis development is based on reservoir images available during discovery and appraisal. However, significant hydrocarbons in the field sit beneath salt formations, making them harder to image. BP is applying new seismic imaging technology and has recently completed the world's deepest and largest full field ocean bottom seismic acquisition, utilizing an array of

Atlantis at a glance:

Start Date: 2007

Platform Design: Semisubmersible

Blocks: Green Canyon 699, 700, 742, 743, and 744

Platform Production Rating: 200,000 barrels of oil per day, 180 million cubic feet of gas per day.

independent nodes (seismic sensors) on the ocean floor, covering a 240-km^2 area. This will provide improved definition of the full reservoir potential and help increase the reserves and enhance the long-term development plan.

A rig was custom built for Atlantis, part semisubmersible drilling rig and part construction vessel. Rather than just focus on drilling, completions, and installation of well trees, the Atlantis team helped GlobalSantaFe design the Development Driller II (DD2) with the ability to install piping and heavy equipment that rest on the bottom and interconnect wells. The Atlantis production facility, the PQ, is equipped with the longest continuous wire mooring ropes ever built, and the platform will be anchored in place by 12 large suction piles embedded in the ocean floor to hold it in place.

How much oil and gas will this mammoth unit yield? Atlantis production design capacity is 200,000 barrels of oil per day and 180 million cubic feet of gas. The Atlantis development plan also calls for drilling and completion of nearby production and injection wells. If production estimates increase, Atlantis is prepared to handle the growth because the host facility will be able to accommodate twice the number of risers required for the number of wells currently planned.

Another exciting aspect of Atlantis is that its oil and gas will move through the Mardi Gras Gas Transportation System, the highest capacity deepwater pipeline ever built. When complete, the five main lines and two smaller lines will transport 50 percent of all current deepwater Gulf production at depths of more than 7,000 feet. With diameters up to 30 inches, Mardi Gras capacity is more than 1 million barrels of crude and 1.5 billion cubic feet of natural gas per day.

For more information:

Website:

http://www.bp.com/genericarticle.do?categoryId=9004519&contentId=7008067

http://www.bp.com/genericarticle.do?categoryId=9006198&contenId=7013436

Atlantis

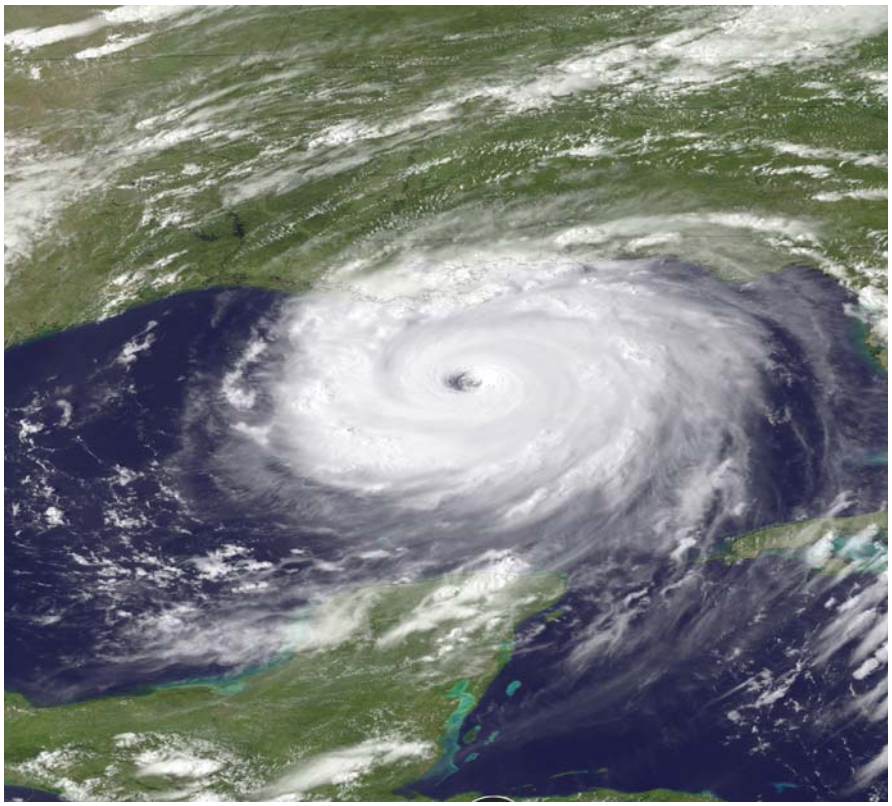
SECURING OFFSHORE OIL AND GAS PRODUCTION IN THE 2006 HURRICANE SEASON

In 2005, the Gulf of Mexico (GOM) endured an unusual volume of destructive hurricanes. Records have been kept concerning storm activities of the Atlantic basin since 1871, and the GOM storms of 2005 were the worst in the history of the United States.

In July 2005, Hurricane Dennis blew through as a Category 3 hurricane. Dennis resulted in storm surge and wind damage of more than $2 billion along the Florida and Alabama coasts, along with scattered wind and flood damage in Georgia, Mississippi, and Tennessee. Yet Dennis was merely a prelude of things to come.

Hurricane Katrina arrived in August 2005 and crossed the U.S. coast near Miami, Florida, as a Category 1 storm. Katrina then moved into the Gulf and increased intensity to a Category 5 prior to making landfall as a Category 4 along the eastern Louisiana and western Mississippi coastlines. Katrina produced severe storm surge damage along the Louisiana, Mississippi, and Alabama coasts, wind damage, and caused the failure of parts of the levee system in New Orleans. Inland effects included high winds and some flooding in the states of Alabama, Mississippi, Florida, Tennessee, Kentucky, Indiana, Ohio, and Georgia. Preliminary damages were estimated to exceed $100 billion, making this the most expensive natural disaster in U.S. history.

Hurricane Rita followed on the heels of Katrina in September 2005, reaching Category 5 over the warm Gulf waters before downgrading to a Category 3 hurricane at landfall along the coastal border region of Texas and Louisiana. Rita created significant storm surge and wind damage along the coast, and some inland flooding in the Florida panhandle, Mississippi, Louisiana, Arkansas, and Texas. Preliminary estimates exceeded $8 billion in damage.



Hurricane Katrina about to make landfall.

Hurricane Dennis took a path that kept it close to the Gulf Coast of Florida, crossing the Florida panhandle and diminishing to a tropical depression over Alabama. The impacts to oil and gas operations within the Gulf were minimal. However, the same could not be said for Hurricanes Katrina and Rita.

The MMS estimates that 3,050 of the Gulf's 4,000 platforms and 22,000 of the 33,000 miles of Gulf pipelines were in the direct path of either Hurricane Katrina or Rita. Because of the large amount of infrastructure in the path of hurricane-force winds and waves, the amount of damage was substantial. However, there was no loss of life and no significant environmental damage from wells on the OCS attributed to either storm.

MMS Regional Director Chris Oynes noted, "The overall damage caused by Hurricanes Katrina and Rita has shown them to be the greatest natural disasters to oil and gas development in the history of the Gulf of Mexico."

In preparation for the 2006 hurricane season, MMS implemented several improvements to their oversight system. They include

1. Extensive pre-season planning with the Department of Energy and the U.S. Coast Guard to facilitate communications during storms.

2. Coordination with the industry to improve safety, specifically through Mobile Offshore Drilling Unit (MODU) improvements, jack-up site assessment guidelines, risk assessment tools, and platform upgrades.

3. Inviting a representative of the U.S. Coast Guard (USCG) to join the MMS Continuity of Operations Plan

The power of Hurricane Katrina was evidenced throughout the Gulf Coast Region.

(COOP) team. This will improve and enhance communications regarding damage to facilities, and subsequent warnings to mariners by the USCG.

4. Improvements to electronic hurricane reporting system to improve communications between industry and MMS.

The MMS also requested research proposals in six areas related to Hurricanes Katrina and Rita and their damage to offshore oil and gas facilities.

1. Assess and evaluate pipeline movement or damage. The MMS remains attentive to the destructive forces of the hurricanes and the extensive challenges to protect pipelines in advance of hurricanes and to re-start pipeline production following these natural catastrophic events.

2. Assess and evaluate platform damage. The objective of this effort is to conduct a qualitative and quantitative assessment of fixed offshore platforms that were affected by Hurricane Katrina and/or Rita. Resulting data will be evaluated to determine if any common trends occur and to determine if current American Petroleum Institute (API) standards are an accurate indicator of expected performance.

3. Provide hurricane hindcast data. A study to develop a database of wind, sea state, and currents resulting from Hurricanes Katrina and Rita meteorological data and application of advanced hindcast models. Ocean Weather, Inc. (OWI) responded to urgent industry needs for a preliminary assessment of the impact of Hurricanes Katrina and Rita by performing and distributing an "Emergency Response (ER)" wind and wave hindcast. As part of this MMS-funded study, OWI has made the ER data available to other MMS-contracted researchers. Following completion of their new work, OWI will deliver a second and more in-depth hindcast data analysis (referred to as "Fast Response" or FR).

4. Evaluate and assess the performance of jack-up rigs. The destructive forces of hurricanes challenge jack-up rigs and knowing how they have performed is essential for future preparations.

5. Assess methods to eliminate hydrates in pipelines and risers during startup after a hurricane. This joint industry project will study risk-based re-starts of untreated subsea oil and gas flowlines in the GOM. During a hurricane, pipelines are shut-in to stop oil production. This study will determine if it is possible to reduce the risk of a hydrate (hydrocarbon and water compound formed at reduced temperatures resembling snow or ice) plug by selecting an appropriate restart rate.

6. Assess the response of waves and currents throughout the water column in the northern Gulf of Mexico slope and shelf.

Using numerical modeling techniques in conjunction with available meteorological and physical oceanographic data, this study aims at

a. a realistic simulation of circulation throughout the entire water column in the Northern Gulf of Mexico continental slope and shelf regions, including the response of currents and waves to Hurricanes Katrina and Rita;

b. determination of the length of time for which substantial ocean response to these hurricanes persisted; and

c. determination of the area or areas of greatest wave height and speed of the current.

IN THE CHUKCHI SEA

The Chukchi Sea, located off northwestern Alaska, has the potential to hold very large volumes of oil and gas resources. The Minerals Management Service (MMS) estimates that 2-40 billion barrels of conventionally recoverable oil and 10-210 trillion cubic feet of conventionally recoverable gas could occur in this remote Outer Continental Shelf (OCS) province. This represents 58% of all undiscovered oil and gas that could be present in all of Alaska's OCS planning areas.

Despite these impressive figures, interest in the area by the oil industry has been low over the past 15 years. Two lease sales in the late 1980's and five exploration wells failed to discover commercial quantities of oil. The remoteness of the area and harsh Arctic conditions increase the costs of operations compared with other areas, and low oil prices did not support profitable operations.

However, industry has renewed interest in this remote and rugged offshore province. With ever-increasing dependence upon foreign oil, skyrocketing gasoline prices, and the loss of jobs to foreign countries with lower costs, the opportunities in this rich area cannot be ignored. Many companies, with experience gained in other hostile offshore environments, see the Chukchi Sea as a new area of opportunity in terms of oil and natural gas.

In the summer of 2006, offshore seismic operations will collect 2-D and 3-D surveys at selected sites within the sale area proposed for Sale 193 in the Chukchi Sea. Shell Offshore Inc., ConocoPhillips Alaska Inc., and GX Technology Corporation were permitted to conduct seismic surveys on a proposed area of the Chukchi Sea numbering approximately 34 million acres located offshore of northwestern Alaska, following a line roughly from Barrow in the north to Point Hope in the south.

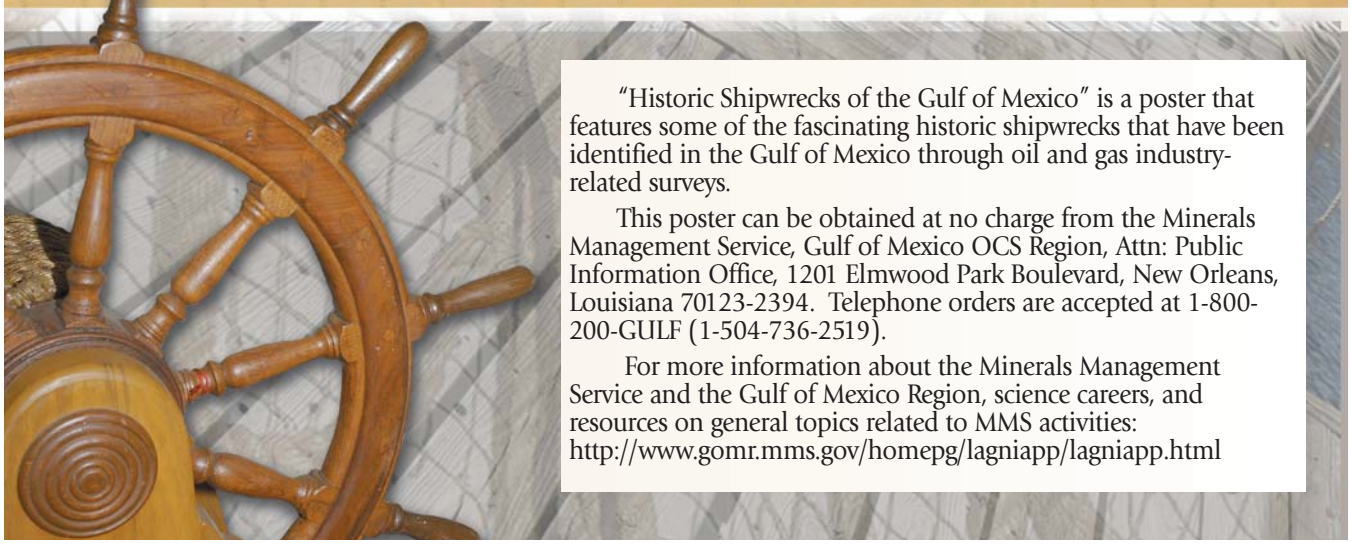
The population of bowhead whales in the western Arctic, known as the Bering-Chukchi-Beaufort Sea Stock, has doubled in number in recent decades. More than 10,000 now swim in Alaska waters.

Seismic surveys are projected to run from July to November 2006, at which time a more concrete picture of industry commitment will begin to develop. The MMS, which has analyzed seismic survey activity and its potential impacts on the Arctic and reviewed hundreds of documents from around the world, has concluded that no significant adverse impacts will affect any native or resident marine resources (including the bowhead whale), provided that mitigation measures appropriate to area and season are in place. The MMS worked with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USF&WS) to provide National Environmental Policy Act (NEPA) coverage for the incidental harassment authorizations and consulted on endangered species located in the area.

Because of the current industry interest, MMS has tentatively scheduled an areawide lease sale in the Chukchi Sea (Sale 193) in late 2007 or early 2008. Originally proposed under the 5-Year Program of 2002-2007, plans are now to incorporate several more Chukchi sales in the next 5-year plan. Environmental protections will include a leasing exclusion zone along the Chukchi coastline, which is a key migratory corridor for bowhead whales and migratory birds.

If exploration is successful, the Chukchi Sea could provide decades of oil and gas production to help meet the future energy needs of the Nation.

EDUCATION CORNER



"Historic Shipwrecks of the Gulf of Mexico" is a poster that features some of the fascinating historic shipwrecks that have been identified in the Gulf of Mexico through oil and gas industry-related surveys.

This poster can be obtained at no charge from the Minerals Management Service, Gulf of Mexico OCS Region, Attn: Public Information Office, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394. Telephone orders are accepted at 1-800-200-GULF (1-504-736-2519).

For more information about the Minerals Management Service and the Gulf of Mexico Region, science careers, and resources on general topics related to MMS activities: http://www.gomr.mms.gov/homepg/lagniapp/lagniapp.html

MMS CONTINUES TO STUDY AND PROTECT

VALUABLE RESOURCES

The Minerals Management Service (MMS) has long been a steward of the environment, and partnering with other organizations to conduct studies is a big component of its efforts. Without a thorough understanding of the ecology in the areas managed, we can only guess at how activities affect various resources.

Recent reports and study findings demonstrate an ongoing MMS commitment to learn, but we still have work to do in some areas. For example, king eiders are one of the most northerly nesting ducks, but migration counts at Point Barrow, Alaska, indicate apparent declines between 1976 and 1996. Some of the highest known density of nesting king eiders on the north slope of Alaska occurs within the National Petroleum Reserve-Alaska (NPR-A), which is being developed for oil and gas exploration, so it is important to examine factors that influence the nest site choice of king eiders.

In a recent report, MMS partners looked at the habitat and behavior of king eiders between their arrival and departure at two breeding locations *(Breeding Biology of King Eiders on the Coastal Plain of Northern Alaska, OCS Study MMS 2005-060)*. Nest success and brood survival were low at both study sites. At this time, it is not known where king eider females with broods disperse to and the habitats used during the critical brood rearing period. This information could be very beneficial to mitigate potential impacts of oil extraction on the North Slope. While there is much more to learn about king eiders, the information gathered was critical for a baseline understanding of their nesting ecology.

Similarly, research was conducted on polar bears feeding on bowhead whale carcasses along the Beaufort Sea coast to determine how any possible disturbance from oil and gas development and other human activities could be minimized *(Demographics and Behavior of Polar Bears Feeding on Bowhead Whale Carcasses at Barter and Cross Islands, Alaska, 2002-2004, OCS Study MMS 2006-14)*.

Looking back at some of our accomplishments reminds us that we still have much to learn about our environment.

By determining the demographics of polar bears using Barter and Cross Islands during fall months and monitoring their behavior and habitat use, resource managers will be better equipped to assess oil and gas lease sales, exploration and development projects, and oil-spill contingency planning. These studies lead to new information and oftentimes new questions to be explored. For example, are changes in ice conditions or food availability contributing to the increased use of coastal habitat in the Beaufort Sea? Is the presence of large males at the carcass sites an indicator of food stress in the marine environment?

Because of the large numbers of bears concentrating near human developments and the subsequent potential for increased bear-human interactions, information obtained from this study can guide management activities aimed at minimizing those interactions.

Analyzing the potential for adverse and significant impacts is critical because it provides decisionmakers the necessary information to act on future issues. For example, a recent report summarized findings on the impact of sediment load on biological communities in nearshore fast ice and underlying waters close to Barrow, Alaska *(Susceptibility of Sea Ice Bota to Disturbances in the Shallow Beaufort Sea: Phase 1: Biological Coupling of Sea Ice with the Pelagic and Benthic Realms, OCS Study MMS 2006-062)*. Sampling, done in 2002 and 2003, shows sea ice sediments have a profound impact on sea ice biology, suppressing biological spring bloom formation and decreasing the abundance of ice fauna compared to a clean ice location. Armed with that information, management can determine ways to decrease the sediment.

Ice caught the attention of researchers for another reason, too. Arctic sea ice off the coast of northern Alaska has undergone significant

changes in the past two decades. Among the most startling findings was a reduction in summer ice with four consecutive record minima attained (2001-2005) and a substantial thinning of the ice pack. Mapping and documenting changes in the distribution of spring lead systems and landfast ice off the northern Alaska coast provides baseline data to evaluate further changes and compares present-day conditions to studies conducted in the 1970's *(Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Beaufort and Chukchi Seas, OCS Study MMS 2005-068)*.

A recent look at oil-spill occurrence estimates for several probable future oil and gas development scenarios in the Beaufort Sea Offshore Continental Shelf (OCS) lease regions provided valuable information for industry and government as well *1 (Alternative Oil Spill Occurrence Estimators and Their Variability for the Beaufort Sea – Fault Tree Method: OCS Study MMS 2005-061, Final Report, Volume 1)*.

Sufficient historical data on offshore oil spills for these regions do not exist, so an "oil-spill occurrence model" based on fault tree methodology was developed and applied. Using the fault trees, base data from the Gulf of Mexico (GOM) were modified to represent expected Arctic offshore oil spillage frequencies. The report indicates that, generally, the non-Arctic spill indicators were likely to be significantly higher than those for similar scenarios in the Arctic.

In the Pacific region, where production has been stable for the past few years, the focus of future research has shifted to environmental monitoring and understanding the role that offshore oil and gas platforms play in the regional marine ecology of Southern California. Many populations of commercially important fish have been overfished and are in drastic decline except at offshore oil and gas facilities. These facilities tend to have reduced fishing pressures, and MMS research has demonstrated that they serve as fish habitat and recruitment sites. Some research continues into future decommissioning of the deepwater rigs offshore California and into the possible new and innovative uses for existing oil and gas platforms. The Pacific Region is continuing with its long-term rocky shoreline monitoring research efforts via the Multi-Agency Rocky Intertidal Network (MARINe) and in-house staff scientists' research. These efforts are well into their second decade of data collection and have compiled unique, long-term datasets for the rocky shoreline adjacent to offshore oil and gas operations. This year, the Pacific OCS Region has teamed with the U.S. Geological Survey Biological Resources Division (USGS BRD) for an effort to publish to the web much of the marine mammal and seabird data that MMS has funded beginning in the late 1970's and extending to the present. These data cover the entire Pacific Coast from Mexico to Canada.

Looking back at some of our accomplishments reminds us that we still have much to learn about our environment. The MMS serves as the Nation's steward of the offshore energy resources and is committed to ensuring that our environment is protected as we explore these resources. Through sound study endeavors with our educational and industry partners, MMS can fulfill its mission on the basis of information it gains from ongoing research.

For more information

MMS Studies

Website: http://www.gomr.mms.gov/homepg/espis/espisfront.asp

Healthy oceans and the surrounding environment are a prime focus of MMS.

MMS – A Leader in Securing the Nation's Domestic Energy Supply

Divers take closeup shots of aquatic life.

NEW WAVES

Late-breaking News & Information

Gulf of Mexico Alliance Shares Resources to Protect Region

In 2004, Florida's governor challenged fellow governors in Alabama, Louisiana, Mississippi, and Texas to join in a regional effort to protect the Gulf of Mexico (GOM). Shortly thereafter, they formed the Gulf of Mexico Alliance to share expertise and financial resources for protecting the complex GOM ecosystem, which comprises about half the wetlands in the United States. President Bush's U.S. Ocean Action Plan (USOAP) recognized the Alliance leadership, and 13 Federal agencies soon pledged their support.

In March 2006, the Alliance focused attention on achieving sustainable economies and environmental quality within the GOM region by releasing a Governors' Action Plan for Healthy and Resilient Coasts. This Action Plan is a starting point with short- and long-term goals for creating a healthier GOM ecosystem and economy. With input from Gulf State citizens collected during eight workshops, the Action Plan calls for measurable progress within 3-5 years on the following priority issues:

(1) water quality;

(2) wetlands restoration;

(3) environmental education;

(4) characterization of Gulf habitats; and

(5) reduction of nutrient inputs.

GULF OF MEXICO ALLIANCE

Specific actions within the Plan are underway, particularly those that support Gulf Coast recovery, and rebuilding efforts following the 2005 hurricane season and steps to mitigate future environmental and economic impacts created by hurricane damage.

For more information on the Gulf of Mexico Alliance, go to http://www.dep.state.fl.us/gulf/default.htm

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