

# MMS OCEAN SCIENCE

VOLUME 4 ISSUE 3

JULY/AUGUST/SEPTEMBER 2007

THE SCIENCE & TECHNOLOGY JOURNAL OF THE MINERALS MANAGEMENT SERVICE



**Exploring New Frontiers of Knowledge**

**Less Ice, More Water**

**Protecting the Living Ice**

**Finding History in the Gulf of Mexico**

**Exploring in the Alaskan Frontier**

**New Depths, New Possibilities**

**Home Sweet Home**

**Cool New Projects for Alaska**

**International Oil & Ice Workshop**

**Expedition to the Deep Slope 2007**

**MMS Projects High Production Number in the Gulf of Mexico**



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 mineral recovery, ocean stewardship, and mineral revenues.



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#### ABOUT THE COVER

Top Left: Glacier Bay National Park, Alaska. Aerial view of freshly snow-covered landscape. Photo courtesy of [www.nps.gov](http://www.nps.gov).

Top Center: Close-up view of one of the undescribed species of *Lamellibrachia* that scientists discovered during the Expedition to the Deep Slope 2007. Photo courtesy of NOAA/Aquapix.

Top Right: Sea ice ecological group divers silhouetted against the sea surface. Photo courtesy of NOAA.

Main Photo: An asteroid sea star collected while feeding on coral. Photo courtesy of L. Mullineaux, NOAA.

Back Page: Background platform image by Gregory S. Boland

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[www.mms.gov](http://www.mms.gov)

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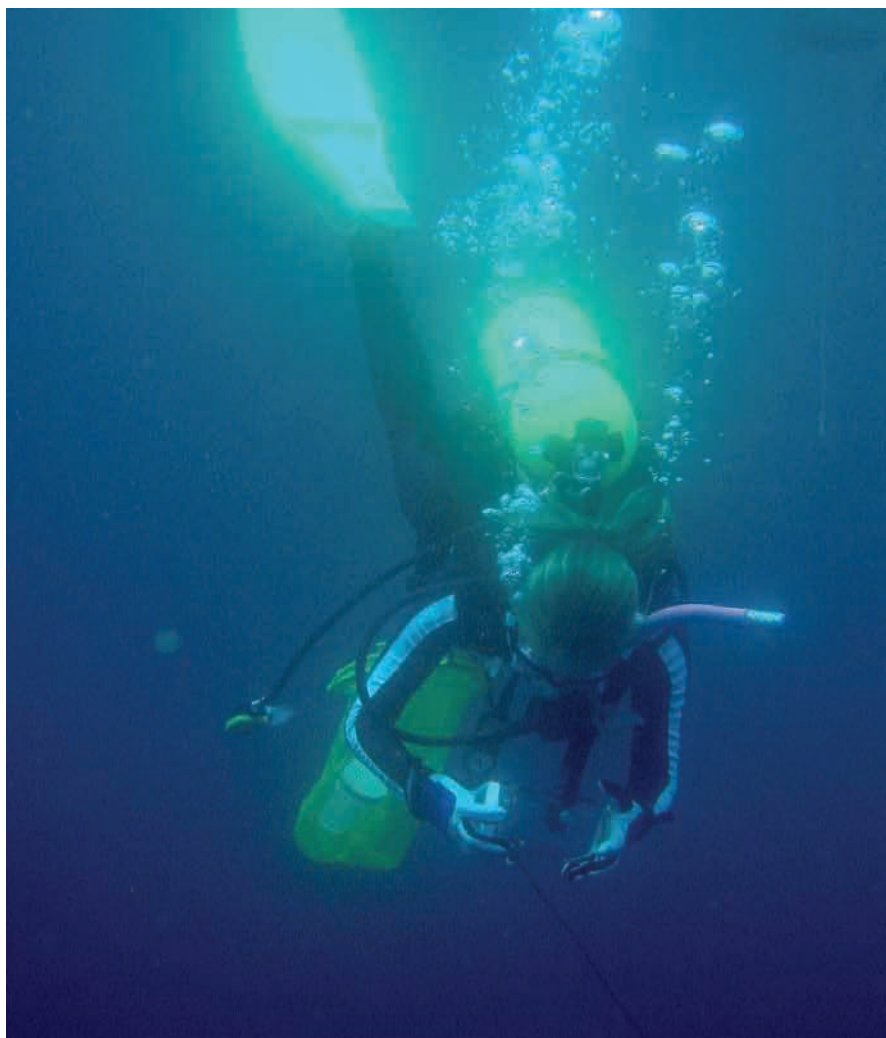
**E**very day it seems that new frontiers are opening up to the scientists at the Minerals Management Service (MMS) and their academic and industry partners. Whether it's new frontiers in energy reserves, animal research, weather research, anthropological study or technological innovations, MMS is at the forefront of environmental and energy research today.

The Alaska frontier has been an area of careful study, with recent research studies including thinning ice, leasing opportunities, drilling platform challenges, and many more projects in the Outer Continental Shelf (OCS). These studies will help MMS work to protect the environment as the search continues for energy resources in the icy waters of the Alaska frontier.

The MMS is also funding studies of microscopic biota to document possible changes in their behavior or habitat due to oil and gas development or larger climate changes. In the Pacific, studies are documenting ecosystems under existing oil and gas platforms in southern California and collecting ecological baseline data along California, Oregon, and southern Washington in support of future alternative energy projects that will harness energy from ocean waves and currents. As stewards of the Nation's offshore natural resources, MMS is concerned with protecting the animals and ecosystems that inhabit the Alaska and Pacific offshore frontier.

The deepwater frontier of the Gulf of Mexico continues to be the subject of intense interest to the offshore oil and gas industry. New discoveries in the Lower Tertiary are just beginning to be developed, and

Blue-water divers use glass jars to capture gelatinous specimens for further study. Photo courtesy of NOAA/Expedition to the Deep Slope.



## EXPLORING NEW FRONTIERS OF KNOWLEDGE

the area promises to be productive for years to come. In these waters, natural resources are not the only finds; archaeological crews have resurrected history by exploring shipwreck sites, preserving history

throughout the development of oil and gas production. As new frontiers are being explored deeper and deeper, MMS is driven to keep the OCS environmentally safe for future generations.



System of leads and adjacent deformed ice.



Floes and brash ice in a newly formed lead.

# LESS ICE, MORE WATER

**T**he sea ice cover of the Alaskan Arctic is a vital habitat for the marine mammals uniquely adapted to its harsh conditions. But in the last 20 years, the ice has thinned. The percentage of multiyear ice, ice that has survived two or more summer melt periods, appears to have decreased during the summer and fall months, and the sea ice is covering fewer square miles as it retreats northward. The time that the sea ice advances seaward in the fall and winter, how long it stays stable, and the time it begins to break up in the spring are of great importance to the native communities, the marine mammals who hunt and are hunted on the ice, and the oil and gas companies that explore and develop the resources beneath the seafloor. Hajo Eicken and others, from the University of Alaska, Fairbanks, analyzed 10 years of satellite imagery interpreting the changes in the lead and landfast ice conditions

for the Beaufort and Chukchi Seas (*OCS Study MMS 2005-068*).

Landfast ice is defined as sea ice that is attached to the shoreline and lacks motion detectable by satellite imagery. This differentiates it from pack ice, which is found seaward of the landfast ice and consists of mobile ice. Scientists analyzed satellite imagery gathered between 1993 and 2004 and archived the images in the Geographical Information Network of Alaska (GINA) at the University of Alaska, Fairbanks. The landfast ice is much more extensive and typically more stable in the Beaufort Sea because of the much larger shallow shelf area that extends out to almost 70 kilometers (43 miles). On the Chukchi side, the shallow shelf is more narrow, and the much narrower extent of landfast ice is less stable.

Lead systems are temporary stretches of open water in arctic ice. Lead systems can be found throughout the winter months as

ice continually shifts due to ocean currents and winds. One way in which lead systems develop is when the mobile pack ice separates from the stable landfast ice causing a flaw lead system. This condition is typically found off the Chukchi coast as northeast winds. In addition, numerous major lead systems also occur within the mobile pack ice. New insight was discovered on lead dynamics as the scientists determined that similar lead patterns in specific areas could be found from year to year. The flaw lead system in the Chukchi and the Beaufort Seas is a very important transit route for the migration of whales and birds during the spring months of April and May. Figure 1 (on the opposite page) shows the flaw lead system in the Beaufort and Chukchi Seas.

Major lead and landfast ice patterns are repeated from year to year. The lead patterns appear to display a consistent seasonal variability in their spatial patterns. These patterns are controlled by

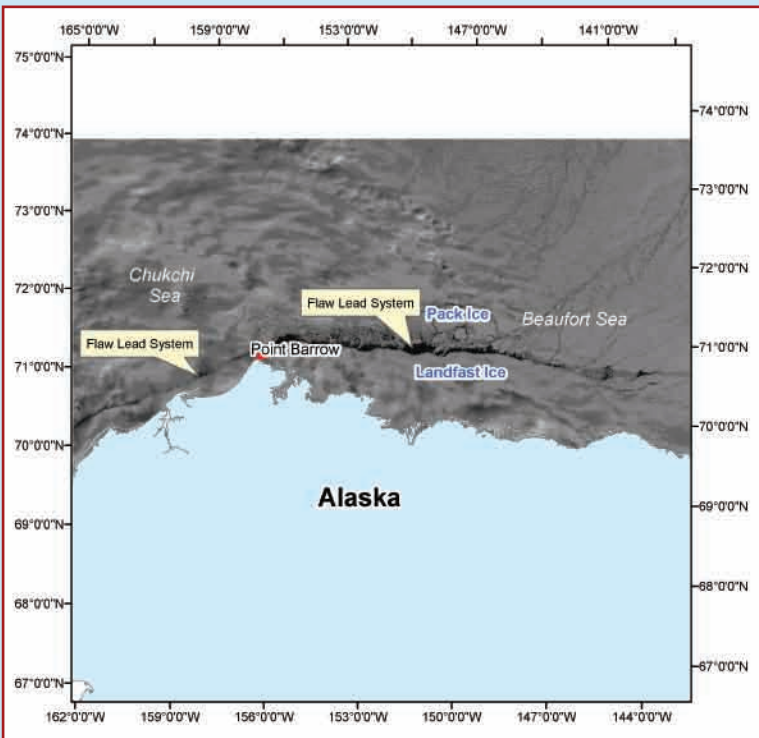


Figure 1: April 26, 1995, Advanced Very High Resolution Radiometer (AVHRR) Satellite Image of the Flaw Lead System in the Beaufort and Chukchi Seas, Alaska.

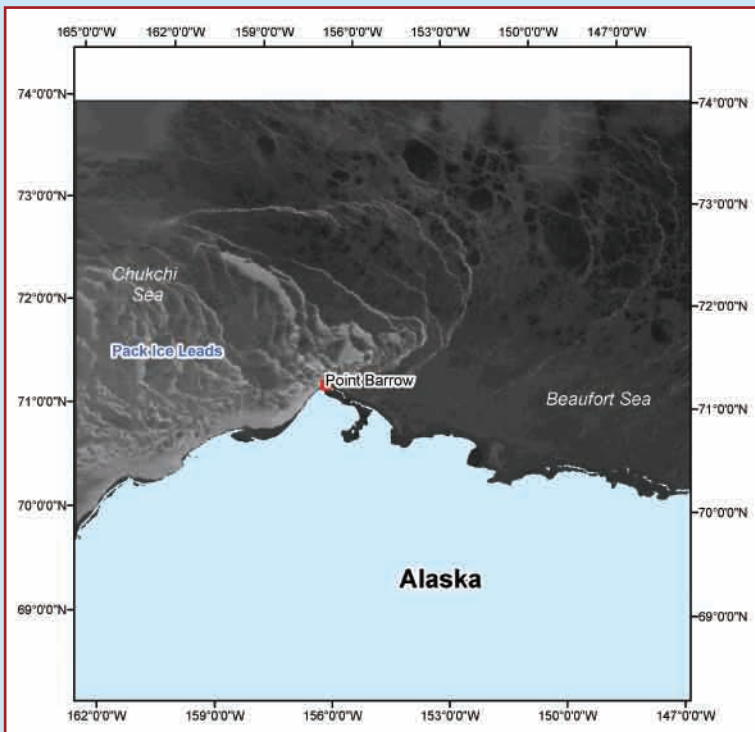


Figure 2: December 15, 1995, Advanced Very High Resolution Radiometer (AVHRR) Infrared Satellite Imagery displaying pack ice leads in the Chukchi Sea, Alaska.

seafloor topography, atmospheric forcing, and large-scale ice dynamics.

Based on their analysis, scientists noted the fraction, size, and number density of lead systems varied seasonally with the highest degree of fraction in late spring (10 percent). A prevailing easterly wind in the eastern Chukchi Sea and the Mackenzie Delta, which forced the ice offshore, resulted in the highest lead fractions and the largest sizes studied. There were fewer and smaller leads in the Beaufort Sea.

Other important findings confirm that the cycle of landfast ice has been shorter in the last five years – it breaks up earlier and forms later. Data on the historical air temperatures also confirm this trend toward early thawing in the spring and later freezing in the fall. An important component of landfast ice formation is the entrance of pack ice into the coastal waters. As the permanent pack ice edge has retreated northward, the landfast ice has also experienced changes. Current and atmospheric circulation patterns also affect the time and location of lead ice formations.

Predicting the duration that landfast ice will remain stable and the factors and patterns that will result in lead ice formations are of vital economic interest to native communities and offshore development concerns. The studies that MMS is conducting in the region as steward of its ocean environment may lead to a reliable predictor of the spatial and temporal state of the ice resources in the Alaskan offshore frontier.

FOR MORE INFORMATION:

### Landfast Ice Study

Website: [www.mms.gov/Alaska/reports/2005rpts/2005\\_068.pdf](http://www.mms.gov/Alaska/reports/2005rpts/2005_068.pdf)



# PROTECTING THE LIVING ICE

**W**hen most of us think of the Arctic, we envision thousands of miles of barren, pristine sea ice. But that ice isn't barren, nor is it always pristine. Living in and below that ice are hundreds of tiny life forms. These small varieties of bacteria, algae, protozoa, and metazoa are a vital part of the Arctic food chain. The Minerals Management Service (MMS) funded studies of effects of sediment deposited in the ice from natural causes in order to determine how human activities could adversely affect that chain.

Sea ice is a complex combination of ice crystals and channels of salty brine. Clean ice allows light to nourish the biota within its structure, and the community thrives in this environment. The introduction of sediment into the ice from either

*Sea ice is a complex combination of ice crystals and channels of salty brine. Clean ice allows light to nourish the biota within its structure, and the community thrives in this environment.*

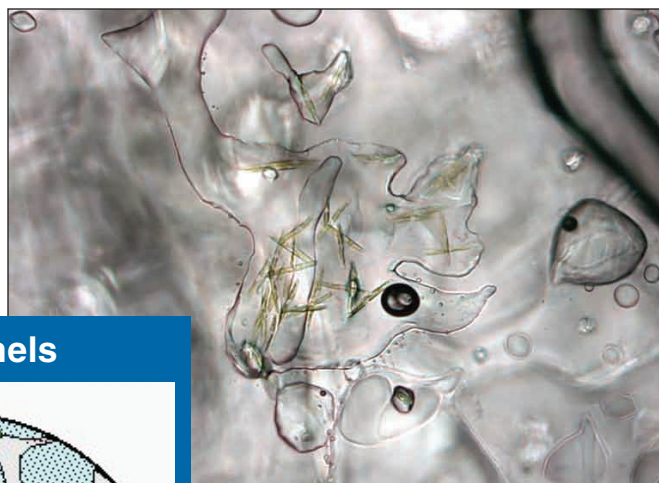
natural causes or from future human activity, such as construction of ice roads, oil and gas spills, and other human activity, could greatly reduce the clarity of the ice. The light the biota needs for growth is greatly diminished. Consequently, the biota's diminished growth results in declining food supplies for animals higher up the food chain.

Another byproduct of human activity – global warming – may also be affecting the sea ice biota. Scientists estimate that the total thickness and volume of sea ice in the Arctic has

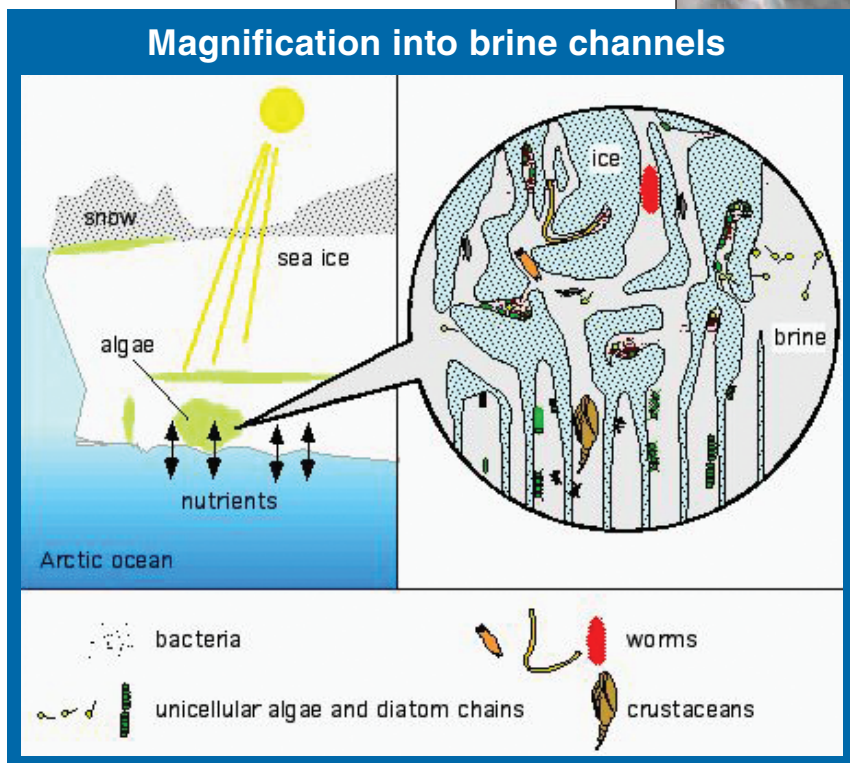
decreased 2.5 percent each decade of the last 30 years. With less ice to support the population, it is estimated that the amount of biota available as food will decrease.

The MMS is continuing to support research as scientists seek to understand more about the effects that oil and gas exploration and development may have on the fragile web of Arctic food supplies.

Graphic courtesy of NOAA.



Above: Single-celled (unicellular) algae, which develop in the lowermost sections of sea ice, often forming chains and filaments. Ice algae are an important component of the Arctic marine food web. Photo courtesy of NOAA.



FOR MORE INFORMATION:

## Sea Ice Disturbances Report

Website: [www.mms.gov/Alaska/reports/2005rpts/2005\\_062.pdf](http://www.mms.gov/Alaska/reports/2005rpts/2005_062.pdf)

## Thinning Ice

Website: [www.arctic.noaa.gov/essay\\_untersteiner.html](http://www.arctic.noaa.gov/essay_untersteiner.html)



An artifact collected from the shipwreck.  
Photo courtesy of Texas A&M University.



The crew of the *Toisa Vigilant*.

**O**n May 21, 2007, a crew of archaeologists from the Minerals Management Service (MMS) and Texas A&M University arrived at Port Fourchon, Louisiana, to begin field research on the “Mardi Gras Shipwreck Project.” As they boarded the *Toisa Vigilant*, the research vessel they would occupy for the next two and a half weeks, they eagerly prepared to resurrect an important piece of history in the Gulf of Mexico.

## FINDING HISTORY IN THE GULF OF MEXICO

*Without a known identity, archaeologists have labeled the ship “Mardi Gras Shipwreck.”*

Approximately 200 years ago, a small ship sank to the ocean floor about 40 miles off the coast of Louisiana. Although the exact identity of the sunken ship has not been discovered, there are many speculations as to its origin, with variations from merchant to privateer ships. According to MMS Acting Regional Director Lars Herbst, “This ship likely sailed around the time of the Louisiana Purchase, the War of 1812, and the infamous buccaneer Jean Lafitte. Its recovery will tell a story about what life at sea was like at that time that cannot be found in history books.”

Without a known identity, archaeologists have labeled the ship “Mardi Gras Shipwreck.” The

name is based on its discovery in 2002 by oilfield inspection crews surveying the pipeline of the Mardi Gras Gas Transmission System. The excavation of the ship reached world record depths for non-commercial scientific excavations. At 4,000 feet beneath the surface, the pressure

of the sea water only allowed for remotely operated vehicles and created an exciting study for the crew. Among the discovered artifacts was a chest of small arms, five sand clocks (hourglasses), two types of ceramics, the remains of two compasses, a telescope, and most intriguingly, one of only four cast-iron ship stoves known in existence.

But why is MMS involved? As a Federal agency, MMS is bound by the National Historic Preservation

Act (NHPA) of 1966 to protect archaeological sites on the Outer Continental Shelf (OCS). To do so, MMS requires remote sensing surveys as part of its permitting process in order to identify potential archaeological resources such as historic shipwrecks or submerged prehistoric sites.

On June 7, 2007, the archaeology team made their last entry in their daily log as they headed back to port. With the field work complete, the long process to detail and conserve the artifacts will begin. After conservation of the artifacts is complete, all finds from the excavation will be sent to the Louisiana Department of Culture, Recreation, and Tourism to be displayed at the Louisiana State Museum. Through the collaboration of MMS and Texas A&M University, marine archaeologists are helping to understand a 200-year-old historical treasure in the Gulf of Mexico.

FOR MORE INFORMATION:

### Mardi Gras Shipwreck

Website: [www.flpublicarchaeology.org/mardigras/](http://www.flpublicarchaeology.org/mardigras/)

Website: [www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070522a.pdf](http://www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070522a.pdf)



# Exploring in the ALASKAN FRONTIER

**A**laska is known for its unsurpassed natural beauty and for its abundance of natural resources. Those resources include oil and gas supplies that have yet to be discovered and developed. Overseeing the responsible economic development of these resources is a mission of the Minerals Management Service (MMS). As part of its 2007-2012 5-Year Program for energy exploration and development, MMS is opening areas with promising geological potential. The question for both MMS and oil companies is whether the petroleum resources will be large enough to justify the tremendous expense of infrastructure in these remote frontier areas. Potential lease areas include the Beaufort Sea, Chukchi Sea, North Aleutian Basin, and Cook Inlet.

The Beaufort Sea has about 269 active leases, a wealth of available seismic data surveys, and 36 wells, according to the 2006 Oil and Gas Assessment. The data indicate that some of the geologic characteristics

offshore are an extension of the economically-proven North Slope fields. Infrastructure around Prudhoe Bay is available so new developments would not have to construct costly new facilities and an oil transportation system.

The Chukchi Sea planning area is located in a remote area off Alaska's northwest coast and extends from about 25 to 275 miles offshore. The proposed sale area excludes nearshore waters within 25 miles of the coast that encompasses the open water corridor ("polynya") through which whales, other marine mammals, and birds migrate north in the spring. This polynya corridor is heavily used by local communities for their subsistence hunting.

Between 1988 and 1991, a total of 483 leases were issued in four sales in the Chukchi Sea. Five exploration wells were drilled by industry without making a commercial discovery. By 1996, all the leases were relinquished to the Federal Government and there has been little exploration activity in the past decade. High oil prices

and excellent geology have recently prompted a renewed industry interest in the Chukchi Sea. Evidence of oil and gas were noted in each of the Chukchi wells in reservoir formations correlative to fields on the North Slope. The MMS's estimates of undiscovered petroleum resources in the Chukchi Sea include 15 billion barrels of oil and 77 trillion cubic feet of gas. However, huge expenditures would be required for development and transportation infrastructure, so only a portion of this petroleum endowment would be commercially viable at current high oil prices.

One sale in the North Aleutian Basin is tentatively scheduled for 2011. Before authorizing the lease sale, MMS will conduct studies on the North Pacific right whale and other issues of concern. The MMS will then prepare an environmental impact statement for the proposed sale and will coordinate closely with the State of Alaska and local governments. The area considered for new leasing would be limited to the area previously offered in

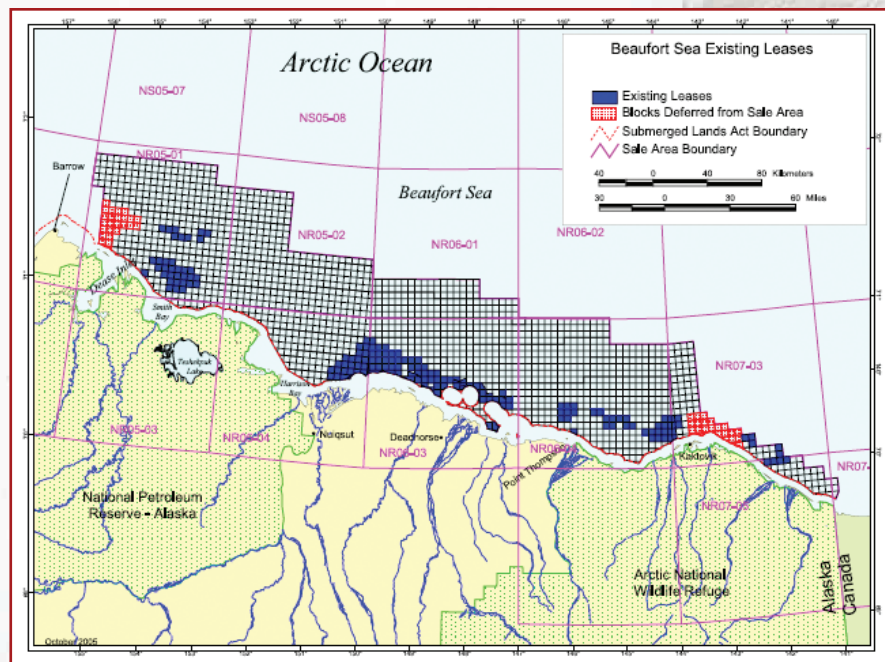


*Exploration and production in the frontiers of Alaska is not for the faint of heart. There are numerous challenges associated with seasonal conditions such as sea ice and animal migrations, remote locations, and the needs of indigenous communities.*

Lease Sale 92 in 1988. The North Aleutian Basin could potentially hold large natural gas pools, and only one stratigraphic test well has been drilled in this area. The MMS estimates that the area could hold recoverable resources of 750 million barrels of oil and 8.6 trillion cubic feet of gas.

The Cook Inlet lies near the population centers in south central Alaska and has experienced oil and gas operations for 50 years. The first discovery on the Kenai Peninsula in what is now the Swanson River oil field in 1957 was an important reason that statehood was granted in 1959. Since then, oil and gas developments in the Upper Cook Inlet and adjacent onshore areas have produced 1.3 billion barrels of oil and 7.1 trillion cubic feet of gas. In addition to supporting heat and power for the local population, oil is refined for transportation fuels at the Tesoro refinery, and gas is converted to liquid natural gas and fertilizer products for export.

Federal tracts in the Lower Cook Inlet were leased in three OCS sales between 1977 and 1982; a total of 13 test wells were drilled without resulting in any commercial discoveries. The last



Beaufort Sea existing leases.

Cook Inlet OCS sale was held in 1997 and two leases were issued on an older discovery now called the Cosmopolitan Unit with adjacent State tracts. The MMS estimates that 1 billion barrels of oil and 1.2 trillion cubic feet of gas could be present in the Lower Cook Inlet OCS area.

Exploration and production in the frontiers of Alaska are not for the faint of heart. There are numerous challenges associated with seasonal conditions such as sea ice and

animal migrations, remote locations, and the needs of indigenous communities. Oil and gas companies must overcome the challenges to operations and the enormous economic costs. The MMS, in its role as steward of the ocean environment, will ensure that the companies have an opportunity to conduct successful operations while the environment is protected, thus allowing animals and the Native cultural heritage to thrive even as we strive to meet our Nation's energy needs.

#### FOR MORE INFORMATION:

#### Resource Assessment Reports and Lease Maps

Website: [www.mms.gov/alaska/re/reports/rereport.htm](http://www.mms.gov/alaska/re/reports/rereport.htm)

Website: [www.mms.gov/alaska/re/reports/2006Asmt/index.htm](http://www.mms.gov/alaska/re/reports/2006Asmt/index.htm)

Website: [www.mms.gov/alaska/Maps/current\\_leases\\_oct\\_2005.pdf](http://www.mms.gov/alaska/Maps/current_leases_oct_2005.pdf)

Website: [www.mms.gov/alaska/lease/hlease/aleasemapci.htm](http://www.mms.gov/alaska/lease/hlease/aleasemapci.htm)

# DEEPWATER INTEREST RENEWED IN THE GOM

**T**he Gulf of Mexico Energy Security Act of 2006 has opened new lease areas in Central and Eastern planning areas as interest in the deepwater Gulf intensifies. New frontiers in the Gulf of Mexico (GOM) are being explored with renewed vigor as unexplored areas are being opened up and old boundaries are being altered. At the end of 2006, over 120 projects in deepwater areas were producing. Over half of the approximately 7,855 active leases in the GOM are in deep water.

*Deepwater: 1,000 to 5,000 feet.*

This activity comes in spite of the enormous challenges required to explore and develop in deep water. The results of current wells drilled in the Lower Tertiary have

been extremely encouraging. British Petroleum's (BP) Kaskida prospect and Chevron's Jack and Jack #2 have helped drive the industry's interest in the area. The Lower Tertiary is thought to cover over 30,000 square miles. It lies around 25,000 feet deep under a thick canopy of salt.

Developers like BP and Chevron are being challenged in recovery efforts because of the depth of drilling (over 25,000 feet), the depth of the water (4,000 to 7,500 feet), and the possibility of high temperature and high pressure conditions. Special equipment is required to drill at this depth, resulting in high well costs and possible delays as adequate equipment is found. In addition, the infrastructure needed to deliver the deepwater production to market is only in the planning stages and will require hundreds of millions of dollars in capital expenditures to develop. But the rewards can far

outweigh the expense. The Lower Tertiary has the potential for high flow rates and large field sizes, giving oil and gas developers the promise of long-term revenue.

As the interest in deep water intensifies and new projects are developed, the Minerals Management Service is predicting that oil production in the GOM may reach 2.1 million barrels per day within 10 years. As exploration methods, drilling equipment, and recovery techniques continue to improve, that goal may well be within reach.

FOR MORE INFORMATION:

### Expansion Into Deepwater Gulf of Mexico

Website: [www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070501.pdf](http://www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070501.pdf)

Website: [www.gomr.mms.gov/pdfs/2007/2007-021.pdf](http://www.gomr.mms.gov/pdfs/2007/2007-021.pdf)



The *Cajun Express* rig used for the Jack #2 well production test. Photo courtesy of Chevron.



## INVERTEBRATES THRIVE UNDER PLATFORMS

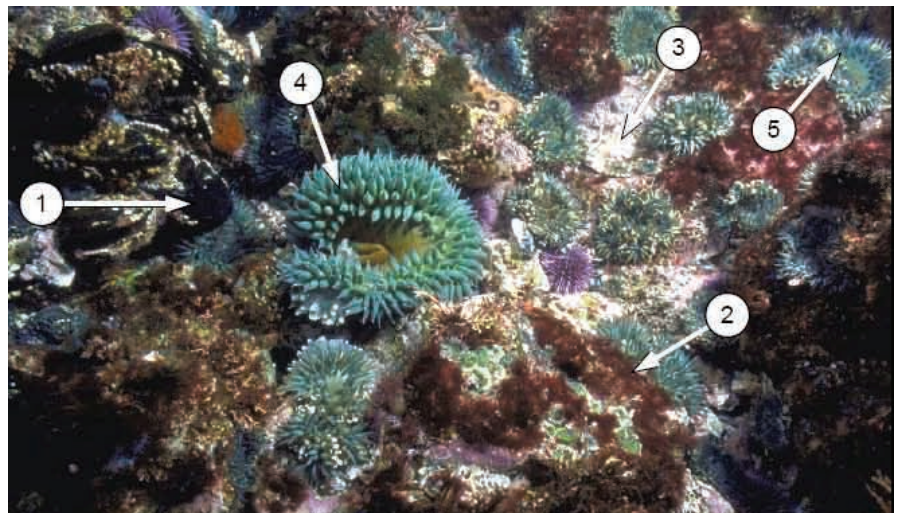
**T**he Minerals Management Service (MMS), as steward of the ecosystems and resources on the Outer Continental Shelf (OCS), is keenly interested in ascertaining the importance of the platforms to the ecosystems of the Pacific coast. A recently completed study of the invertebrate communities associated with the platforms is a step toward understanding that importance.

Scientists conducting the study analyzed video and transparent slides collected by remotely operated vehicles and divers to identify the abundance, density, and distribution of invertebrates below the platforms. They identified three general zones:

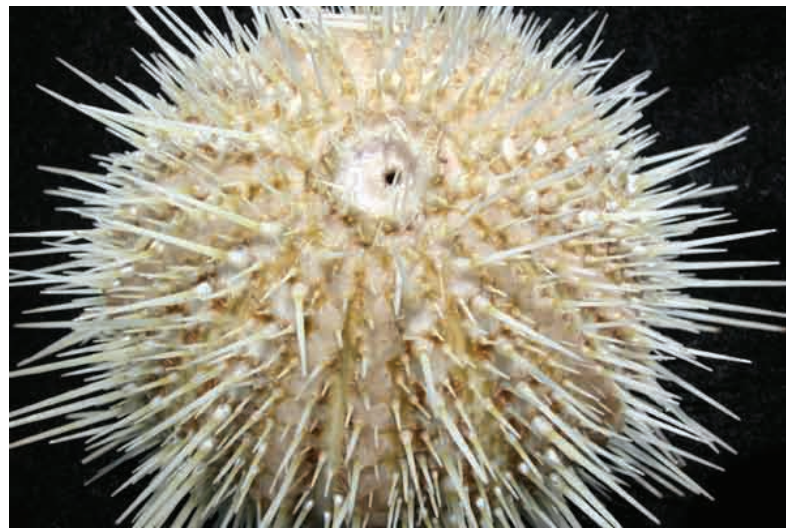
1. Upper Zone ranges from the tidal zone to depths of 60-85 feet, which includes mussels, anemones, and red and green algae;
2. Mid Zone from 60-85 feet to depths of 250 feet includes mussels and barnacles; and
3. Lower Zone below 250 feet, which includes worm tubes, among other species.

Scientists identified 173 different species from the analysis of the slides. One hundred and thirty species typically not seen in photographs were identified from scrapings taken from the mussel and barnacle zones of a platform harvest. The greatest density of species was noted in the Upper Zone, but Mid and Lower Zones also held considerable variety.

This study confirms the presence of a thriving invertebrate



1.) *Mytilus californianus*, 2.) filamentous red algae, 3.) an encrusting alga (*Lithothamnion*), 4.) *Anthopleura xanthogrammica*, and 5.) *A. elegantissima* at -8 m (-25 ft), Diablo Rock.



Sea urchin. Photo courtesy of NOAA

community among the platforms of the Pacific. This and other studies recently completed are providing a basis for MMS, as a steward of the ocean environment, to make more informed decisions about the fate of the aging platforms slated for decommissioning.

FOR MORE INFORMATION:

### Southern California OCS Study

Website: [www.mms.gov/omm/pacific/enviro/MMS-2005-070.pdf](http://www.mms.gov/omm/pacific/enviro/MMS-2005-070.pdf)

# COOL NEW PROJECTS FOR ALASKA



In the 1970s, the Technology & Assessment Research Program (TAR) was established as a part of the Minerals Management Service (MMS) to ensure that industry operations on the Outer Continental Shelf (OCS) use the Best Available and Safest Technologies (BAST). Through contracts with universities, private firms, and government laboratories, TAR works to gather research for offshore safety and engineering, oil spills, and various other assessment projects. Currently, TAR has approximately 600 projects sponsored by MMS, with several new research projects for the Alaska frontier areas. Here are some of the recent projects for 2007:

## Design Options for Offshore Pipelines in the U.S. Beaufort and Chukchi Seas

- ▶ The objective of this study is to provide design options for pipelines with regard to Arctic hazards such as strudel scour, upheaval buckling, and ice gouging in the Beaufort and Chukchi

Seas. Design issues include construction, operations, integrity management, maintenance, and intervention.

## Arctic Offshore Technology Assessment of Exploration and Production Options for Cold Regions of the U.S. Outer Continental Shelf

- ▶ The study objective is to conduct a technology assessment for U.S. OCS oil and gas operations in cold regions to determine what may be technically feasible in ice-covered and open-water conditions.

## Sea Spray Icing of Drilling and Production Platforms

- ▶ The objective of this research project is to develop methods for quantifying the occurrence and severity of sea spray icing on oil exploration and drill rigs in the Chukchi and Beaufort Seas. The goal is to provide algorithms for processing

weather data to determine sea spray icing severity on offshore structures.

## Assessment of Superstructure Ice Protection as Applied to Offshore Oil Operations Safety

- ▶ This research project assesses potential methods for improving safety on drilling and production vessels and platforms operating in the Chukchi and Beaufort Seas, including those experiencing superstructure icing.

## Seabed Scour and Buried-Pipeline Deformation Due to Ice Ridges

- ▶ The objective of this study is to study factors affecting soil and pipeline deformation below scouring ice ridges in the Arctic environment.

FOR MORE INFORMATION:

### TAR Projects

Website: [www.mms.gov/tarprojects](http://www.mms.gov/tarprojects)



**W**ith the expansion of oil transport, exploration, and production in cold regions, the International Oil & Ice Workshop in Anchorage, Alaska, October 10-11, 2007, will emphasize recent advances in working in Arctic climates. The goal of the workshop is to share international progress in Arctic oil-spill research, operations, and program development, including presentations by experts from the U.S., Canada, Finland, Germany, and Norway.

As a designated steward of the ocean environment, the Minerals Management Service (MMS) initiated the Oil & Ice Workshop to help provide environmental protection through new technology. Of the 21 presentations on the agenda, six are from MMS-funded oil-spill response research, including:

- ✓ Developments with Ground Penetrating Radar to Detect and Map Oil Trapped under Ice
- ✓ Behavior and Weathering of Oil Spills under Arctic Conditions and Implications for Response
- ✓ Oleophilic Skimmer Advances
- ✓ Using Herding Surfactants to Thicken Oil Slicks in Pack Ice for In-Situ Burning
- ✓ Dispersants in Cold Water
- ✓ In-Situ Burning in Ice

As interest in the Arctic grows, protecting the area extends beyond that of oil transportation and production issues to also include topics concerning shipping risks, regulatory issues, and experiments in and under ice. The MMS has partnered with many other organizations for this effort to share international research resources, including sponsorship from Alaska Clean Seas, Alaska Department of Environmental Conservation,



## COLD REGION RESEARCH

Tests to determine the limits of in-situ burning of thin oil slicks in brash and frazil ice. Photo courtesy of D. Dickens.

Cook Inlet Spill Prevention and Response, Prince William Sound Oil Spill Recovery Institute, and the U.S. Coast Guard. Through partnerships with these agencies, the workshop creates an international

forum to share current data as well as to direct further studies through collaboration of common interests.

According to the *Advancing Oil Spill Response in Ice-Covered Waters* report, more than 60 ideas and research concepts for the advancement of oil-spill response were generated from the last Oil & Ice Workshop, held in April 2000. This upcoming workshop will help guide future research and development programs towards areas of interest to international stakeholders.



A response vessel recovers oil from ice during an actual spill in the Baltic Sea. Photo courtesy of Finnish Environment Institute.

### FOR MORE INFORMATION:

#### Oil & Ice Workshop

Website: [www.slross.com/OII2007/OII2007main.htm](http://www.slross.com/OII2007/OII2007main.htm)

Website: [www.mms.gov/tarprojects/587.htm](http://www.mms.gov/tarprojects/587.htm)

Website: [www.arctic.gov/files/OilInIceReport.pdf](http://www.arctic.gov/files/OilInIceReport.pdf)

# EXPEDITION TO THE DEEP SLOPE 2007



Bosun Group Leader Dave Owen gazes back at the NOAA ship, the *Ron Brown*, while piloting the ship's RHIB. Image courtesy of NOAA/Expedition to the Deep Slope 2007.

In 2006, a team of scientists funded by the Minerals Management Service (MMS) and the NOAA Office of Ocean Exploration (OE) embarked on a mission in the Gulf of Mexico (GOM) that would reach new depths in the exploration of the hydrocarbon seep communities. At depths of over 3,281 feet (1,000 meters), these scientists visited 10 sites to learn about deep GOM cold seeps and coral communities. In June 2007, the latest crew set out for the “Expedition to

the Deep Slope 2007” to collect further essential information on the ecology and biodiversity of deep-sea communities.

This year’s mission had two main objectives. The first was to revisit about half of the sites discovered last year to complete characterization of the sites and collect time series data for information on how fast seep animals grow and how the deep communities change over time. The second objective was to explore three to five new areas and

characterize any new sites and communities discovered.

Why were these locations chosen? The deepwater sites that were studied are in areas where energy companies could soon begin to drill for oil and gas. Through exploration, scientists can provide important information on the ecology and biodiversity of the deep-sea communities to regulatory agencies as the search for oil moves farther into deepwater. Identifying the location

## Gulf of Mexico Deepwater Facts

- ◆ The Gulf of Mexico Outer Continental Shelf (OCS) provides about 14 percent of our domestic natural gas and 25 percent of our domestic oil.
- ◆ 50 percent of leased acreage in the Gulf of Mexico OCS is in deep water (greater than 1,000 feet).
- ◆ 3.9 seconds of OCS production would allow a car to travel around Earth at its equator (25,000 miles).
- ◆ The world's first exploratory well in over 10,000 feet of water has been drilled in the Gulf of Mexico.



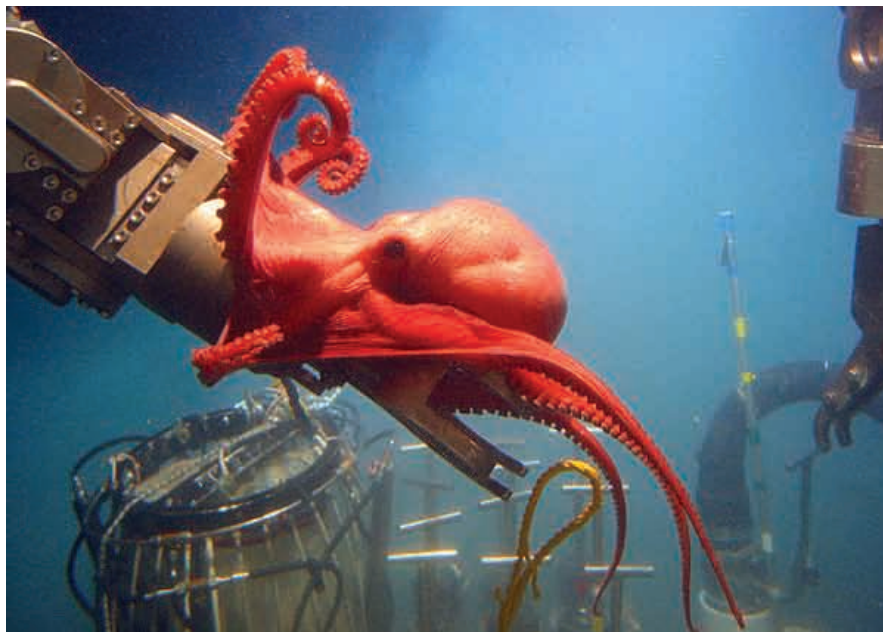
and distribution of these sensitive areas is vital so oil exploration can continue without disturbance of these deep-sea communities.

Some of the organisms studied are important to the protection of the habitat for whole communities of animals. For example, tubeworms and mussels create habitat for many animals found only at seep sites. Deepwater corals also support large associated communities and may be rare in the deep GOM, thus warranting special protection of these habitats.

To complete the expedition, the team of scientists who have led the study of the GOM cold seeps for the last 20 years, alongside international seep scientists from Germany, France, and Austria, will supply MMS with results that will be utilized to create or modify existing regulatory policies through an adaptive management approach. And with almost 20 million barrels of oil being used in America per day to fuel automobiles and

airplanes, power factories, and generate electricity to heat and cool homes, the research provided by the "Expedition to the Deep Slope" is critical to both industry

stakeholders and to MMS in its role to protect the environment while managing the Nation's energy and minerals resources on the Outer Continental Shelf.



This stunning octopus, *Benthoctopus sp.*, seemed quite interested in ALVIN's port manipulator arm. Those inside the sub were surprised by the octopus's inquisitive behavior. Image courtesy of NOAA/Bruce Strickrott, Expedition to the Deep Slope 2007.

## MMS PROJECTS HIGH PRODUCTION NUMBER IN GOM

**N**ew discoveries in deepwater zones have lead the Minerals Management Service (MMS) to project high production of oil and gas in the Gulf of Mexico (GOM) in the next 10 years. The MMS estimates that oil production in the GOM may reach 2.1 million barrels of oil per day. After several years of declining interest and production, gas supplies are expected to reach over 8 billion cubic feet of gas per day.

Sixteen new deepwater projects are expected to be producing by the end of 2007, accounting for a large portion of the new production forecast. Anticipation about new exploration and possible resources in the deepwater Lower Tertiary has also contributed to the forecast.

The Independence Hub facility began producing natural gas in July 2007. The hub is a consortium of five independent exploration and production companies

and one energy company. The group is developing multiple ultra-deepwater discoveries in the GOM. The facility will allow increased gas production and is the primary reason for an increased gas supply forecast.

As new discoveries are made in the deep and ultra-deepwater zones, the GOM will continue to be the largest area of production of oil and gas supplies in the United States.

FOR MORE INFORMATION:

### Gulf of Mexico Oil Production

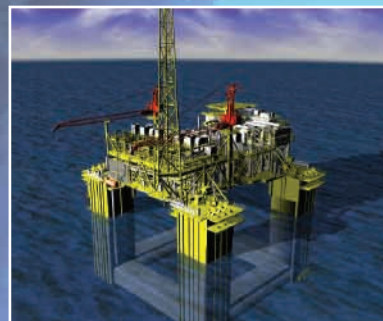
Website: [www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070501a.pdf](http://www.gomr.mms.gov/homepg/whatsnew/newsreal/2007/070501a.pdf)

### Independence Hub

Website: [www.gomr.mms.gov/homepg/offshore/egom/independence\\_hub.html](http://www.gomr.mms.gov/homepg/offshore/egom/independence_hub.html)

# MMS

## A steward of the ocean environment



Independence Hub

# NEW WAVES

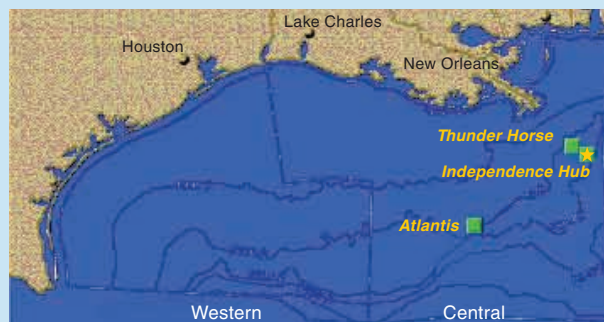
## Late-breaking News & Information

### *Independence Hub Begins Natural Gas Production*

In July 2007, the first of 15 subsea wells began flowing from the new Independence Hub facility in the Gulf of Mexico. According to Chris Oynes, Associate Director of Offshore Minerals Management, the project is a “major accomplishment for the offshore program... this represents a major milestone.”

Located about 123 miles southeast of Biloxi, Mississippi, in Mississippi Canyon Block 920, the Independence Hub will produce gas at a water depth of approximately 8,000 feet. The hub, operated by the Anadarko Petroleum Company, has demonstrated a very speedy first production, and 10 separate fields are being gathered to produce at this facility, creating an ability to accommodate future discoveries in this deepwater area.

With favorable seafloor conditions and proximity to nine anchor gas fields, the production capacity of the Independence Hub is expected to attain 1 billion cubic feet of natural gas per day. At capacity, this will amount to about 12 percent of the Gulf of Mexico offshore gas production.



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