

MIMS TODAY

Special Edition, 1999

Science Has No Boundaries

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Message from the Acting Director

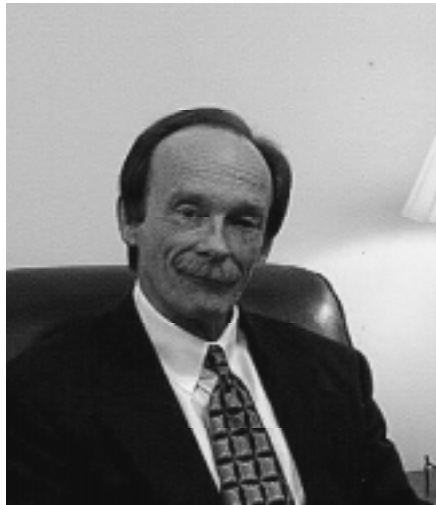
Though the youngest member of the Interior family, the Minerals Management Service plays a key role in managing America's offshore energy resources.

Established in 1982, the agency's mission is to manage the mineral resources on the Outer Continental Shelf in an environmentally sound and safe manner, and to collect and distribute revenues collected from companies that produce minerals from onshore and offshore Federal and Indian lands.

How we manage our energy resources now will determine how we live and work in the United States for decades to come. The decisions we make will affect many aspects of our daily lives and those of our children, like the availability of foods in the market, how we get to work, what goods are produced in our factories, and the quality of our environment.

As the nation's steward of offshore mineral resources, the agency is committed to achieving the proper balance between providing energy for the American people and protecting unique and sensitive coastal marine habitats.

Before exploration and development can begin, MMS conducts multifaceted environmental studies which generate the scientific re-



Thomas Kitsos

search essential to making sound leasing decisions.

In essence, we try to minimize the potential negative effects that offshore operations may have on marine habitats.

The results of our studies often don't stay within our walls. Information gained from our environmental studies program extends well beyond the Department's decisions concerning safe management of the mineral resources on the outer continental shelf. The agency has taken the lead in developing partnerships in scientific research. Examples include agreements with Coastal Marine Institutes in state universities close to OCS activities. A principal goal of these

partnerships is to have research conducted by those states most likely to be affected by offshore development.

MMS is also working closely with NOAA's National Marine Sanctuary Program to monitor the health of coral reefs in the Gulf of Mexico.

The focus of this issue is on the science and technology in which MMS engages. Science will continue to play a major role in every decision regarding our nation's offshore energy resources.

Jacques Cousteau once said that, "the future of civilization depends on water...you now have the duty, the time, to convince people."

As human populations grow so will the pressures on the marine environment. The MMS takes seriously the protection of that environment by continuing to develop new, regulatory measures, like our safety and environment management program, to ensure safe and clean offshore operations.

As we head into the next century, the agency will continue to keep pace with a changing world. We will always strive for new and better ways to do our job to better serve the American people.

Editor's Note

Special thanks to Tom Ahlfeld, Ken Turgeon, Gregory S. Boland and to all who helped make this issue possible.

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A Look at the Agency's Environmental Studies Program

Taking the Lead in Partnerships in Scientific Research

by Tom Ahlfeld and Walter Bonora

Just after midnight on March 24, 1989, the Exxon Valdez crashed into a reef in Prince William Sound. Eleven million gallons of crude oil poured into the sound's pristine waters, casting an oily shroud over hundreds of miles of shoreline. Television crews on the scene broadcast images of seabirds, otters, and sea lions, slicked back with oil. Those images alerted the world to the dangers of oil spills and led to many new laws and regulations designed to prevent another such tragedy.

Federal agencies, like the Department of Interior, have taken the lead in establishing programs, and regulations designed to protect endangered species and the environment, and establish methods of wise land use and resource management.

"We must balance needed development with a renewed emphasis on stewardship and conservation," said Interior Secretary Bruce Babbitt. "One of the ways this can be accomplished is through the improvement of, and reliance on science."

The Minerals Management Service, America's designated steward of mineral resources in federal waters, has long had an environmental studies program with far reaching results, and continues to follow Babbitt's lead.

Established in the 1970's, the agency's Environmental Studies Program (ESP) "is a highly focused program of marine and socioeconomic research designed to provide the information necessary for safe and sound management of mineral resources on the Outer Continental Shelf," said Larry Roberts, chief of the MMS Environmental Studies Pro-

gram. "The program not only supports decisions made within the Department of Interior, but also provides coastal states and local governments with information necessary to ensure that all stages of offshore energy and mineral activities are conducted in a manner to protect the human, marine, and coastal environment." On the following pages are current highlights of the agency's Environmental Studies Program.

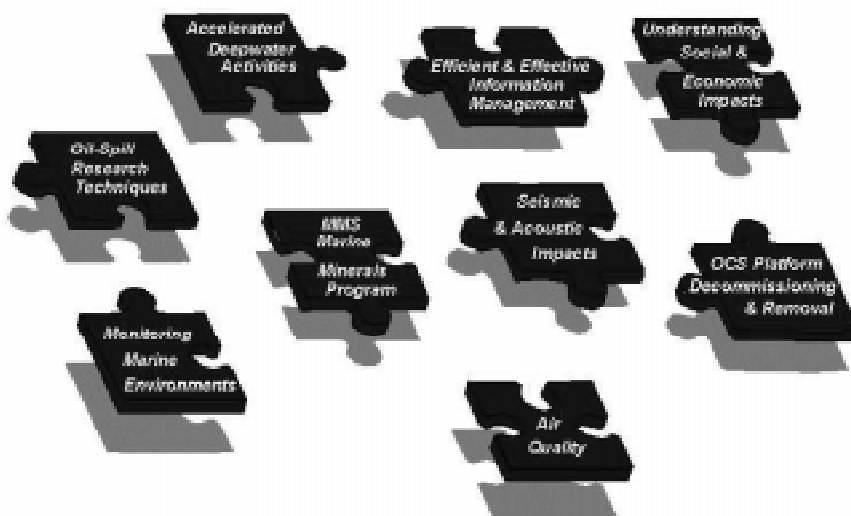
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Environmental Studies from Coast to Coast

National Strategic Plan

In 1998 the Environmental Studies Program (ESP) published the National Strategic Plan for 1998-2002. This plan provides direction and trends anticipated for the next 2-4 years in support of Outer Continental Shelf (OCS) leasing and lease management decisions. These decisions must, by law, accommodate the delicate balance of the Nation's search for offshore petroleum energy and marine minerals with the protection of the human, marine, and coastal environments. "This plan provides the policy direction and framework for the MMS regions to propose research through the annual studies planning process," said Roberts.

The nine themes shown as puzzle pieces in the figure at right, shape the direction, focus, and content of the Environmental Studies Program.



servations made during controlled subsea oil spill experiments performed by other groups.

Ultimately, the information will be used to build a model to assist in the development of oil spill response plans.

Marine Aggregate Mining Effects

The potential for negative biological and physical impacts of the extraction of sand and gravel from the Outer Continental Shelf is being studied. Information from these studies will be used to mitigate any adverse effects of mining on the physical composition and stability of coastline features, habitat and wildlife resources, and on the marine food webs upon which they depend.

National Social and Economic Planning Conference

This conference, planned for August 1999, will aid in the development of long-term regional and national planning strategies.



Safety on the high seas is of paramount importance to the agency.

National Highlights

Interaction with Biological Resources Division of USGS

MMS has drafted an agreement with the Biological Resources Division of the U.S. Geological Survey to establish the mechanisms for coordination and interaction between the two agencies for biological research.

Deepwater Spill Response

Field experiments of deep water subsea oil spills will begin in FY 1999. Development in deep water has led to concerns about oil released by accidents near the sea floor. This study will evaluate ob-

Alaska

Bowhead Whale Feeding Study

This study, which began in 1997, is combining science with traditional knowledge provided by Alaskan Natives on bowhead whale feeding activities in the eastern Alaskan Beaufort Sea. The Fall 1988 field season was successful due to open water conditions, an abundance of whales, and the participation of local whale hunters.

Collection of Traditional Knowledge of the Alaskan North Slope

Begun in 1997, this project has collected and organized traditional knowl-

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edge information associated with the North Slope of Alaska. It includes oral history, taped interviews, written transcripts, and video records. The final identification of key sources of traditional knowledge will be completed in 1999, and a final report will be prepared.

Modeling: Sea-Ice Formation and Ocean Circulation

In 1998, efforts continued to develop and improve a model of sea-ice formation and ocean circulation. Results of this study will include details of ice field motion and ocean currents that will be used in oil spill risk analysis.

Arctic Nearshore Impact Monitoring in Development Areas

Coastal indigenous peoples are concerned about the long-term effects of offshore developments. To evaluate the potential effects from such development, a long-term monitoring study will be initiated in 1999 along Alaska's North Slope in the areas of the Northstar and Liberty development projects.

Gulf of Mexico

Flower Garden Banks Monitoring In 1998, MMS continued a cooperative study with the NOAA National Marine Sanctuary Program to monitor the environmental conditions and health of the coral reefs at the Flower Garden Banks National Marine Sanctuary. (see article page 12)

Deep Water Chemosynthetic Communities and "Ice Worms"

In the early 1980's, MMS-funded researchers discovered the existence of unique communities of bottom-dwelling animals associated with petroleum seeps on the upper continental slope in the northern Gulf of Mexico. In 1998, a second program was completed on the stability and change in these chemosynthetic communities. A major biological discovery was also made through this study with the observation and collection of a new species of polychaete, now popularly called the "ice worm", found inhabiting burrows in gas hydrates on the sea floor at depths of 500-800 meters.



Alaska Region photo

Whitefish, seen here drying on a rack, are an important subsistence food for Alaskan natives. Traditional knowledge and Western science are used when making decisions affecting wise use of resources in Alaska.

Gulf of Mexico Marine Mammal Studies

Two Gulf Marine Mammal Studies (GULFCET I and II) completed field work in 1998. In 1996, GULFCET II expanded the area of study from the central to the eastern Gulf of Mexico. Distribution and abundance of marine

mammals in the deep water areas of the Gulf and the environmental factors affecting their behavior and distribution were investigated. The GULFCET surveys have shown that the sperm whale is the only large whale with a resident population in the Gulf of Mexico and Bryde's whale is the only baleen whale seen consistently in the Gulf.



Gulf Region photo

Members of the MMS dive team enter the waters of the Gulf of Mexico, to continue their monitoring of the marine environment.

Trans-Gulf Migratory Birds

A study of the interaction of migratory birds with Gulf of Mexico offshore oil and gas production platforms is being conducted through the MMS Coastal Marine Institute Program at Louisiana State University. To date, scientists have noted that platforms may benefit the migratory birds as refuge sites from storms and as rest areas.

Gulf of Mexico Physical Oceanography Programs

Results of the recently completed Louisiana/Texas (LATEX) studies document the effects of winds and rivers on coastal jets, the exchange of flows on the continental shelf, intrusions of the Loop Cur-

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For additional information on most of the following stories, visit our website at: <http://www.mms.gov>.

Searching for Shipwrecks in Alaska's Chukchi Sea

by Robin Cacy

In early September of 1871, a fleet of whalers from New Bedford, Mass, dallied in the Chukchi Sea off the northwest coast of Alaska. The ships were nearing the end of their whaling season, carrying cargoes of whale oil and baleen, and the crews were eager to fill their holds before the Arctic winter set in.

Normally, during this time of year, floating ice that forms in the Chukchi is blown out to sea, allowing the whalers to work the waters closer to shore until well into September. But this year, the winds blew in from the ocean, forcing the ice towards shore, trapping the ships between the ice and the rocky coastline.

On September 12, the captains of the doomed fleet agreed to abandon their 32 ships, leaving be-



Artist's rendition of the doomed New Bedford Whaling Fleet

hind their prized cargo, in order to get their crews to safety. They were eventually picked up by passing whalers. But the ships were crushed by the ice flows and sunk.

It was one of the greatest maritime losses off the coast of Alaska, where more than 1,100 ships have wrecked in the past 200 years.

In the summer of 1998, the first scientific survey of shipwrecks in Alaskan waters got under way. Its first mission was to locate the sunken New Bedford whaling fleet, reportedly located in 25-50

feet of water. Dubbed the *Jeremy Project*, the survey was made up of scientists from MMS, NASA, Ames Research Center, and Santa Clara University in California. The work was conducted with the help of the U.S. Coast Guard, and the U.S. Navy.

"Using one of the Coast Guard's icebreakers, *Polar Star*, the team worked from late August to early September during the area's open water season," said Michele Hope, an MMS Alaska region archaeologist who served as team archaeologist for the mission. Her role, as manager of archaeological resources on the Alaska outer continental shelf, is to ensure that any planned exploration or development of that area doesn't have an adverse impact on archaeological sites.

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35 States Receive Their Share of Federal Mineral Revenues

RMP staff

More than \$559 million was distributed to 35 states by the Minerals Management Service during 1998 as their cumulative share of revenues collected for mineral production on federal lands located within their borders and from certain federal offshore oil and gas tracts adjacent to their shores.

"This money is distributed directly to state treasuries for use as the states deem necessary, without federal oversight," said MMS Act-

ing Director Thomas Kitsos. "Oftentimes, it is used for schools, roads and other public works within the individual states,"

States are entitled to shares of mineral revenues collected from federal lands located within their boundaries. For the majority of federal lands, states and the federal government share the revenues: 50 percent to the state, 40 percent to the Reclamation Fund for water projects, and 10 percent to the U.S. Treasury. One excep-

tion, Alaska, gets a 90-percent share.

Of the \$559 million, more than \$39 million was derived from offshore leases. Certain coastal states with federal offshore tracts adjacent to their seaward boundaries receive 27 percent of those mineral royalties as well. Remaining offshore revenues are deposited in special accounts of the U.S. Treasury, including the General Fund, the Land and Water Conservation Fund and the Historic Preservation Fund.

Ocean Drifters

by Walter Bonora

Early Phoenician seaman could have developed the first notion of ocean drifters by tossing coconuts into the ocean to determine surface water speeds. Much later, in the first expedition to study the world's oceans, British scientists aboard the *R.M.S. Challenger* used a float specifically designed to drift passively with the flow of the water. The 1872 expedition had one significant problem, though. The path of the drifter had to be observed by an accompanying boat, making the effort time consuming.

Technology has improved dramatically since then, and today's ocean drifters are tracked by satellites to reveal ocean currents.

Constructed like a buoy with underwater drogues, or sails, the drifters are mounted with sensors and radio transmitters that send signals to orbiting satellites relaying their positions. The drifter positions are then used by oceanographers to track eddies and other ocean currents. This information can also be used to determine the flow of pollutants dumped into the sea.

"By simulating the transport of spilled oil," said Larry Roberts, chief of the agency's Environmental Studies Program, "the drifters have proven to be a valuable tool in helping the agency develop and refine our oil spill risk analysis."

Over the past few years, scientists with the Minerals Management Service have deployed several hundred drifters in the



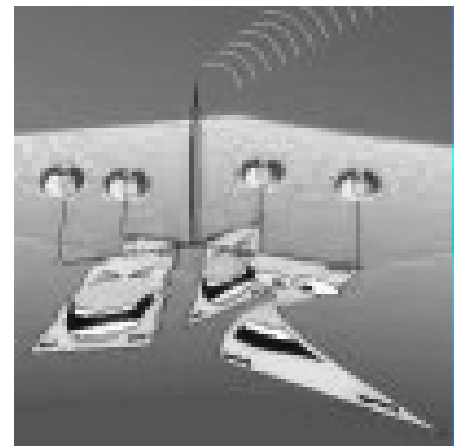
staff photo

Oceanographer Walt Johnson deploys an ocean drifter in the Gulf of Mexico.

coastal waters of the Gulf of Mexico to gain a better understanding of surface water speeds and the flow of spilled oil thereby determining the vulnerability of natural resources to contact with an oil spill.

"Some of the drifters actually simulate the movement of an oil spill by floating with half of their superstructure above water and half below the surface," said MMS oceanographer Jim Price. "The combined effect of wind and drag in the water creates a drifter motion similar to that of an oil slick on the ocean surface. This knowledge helps in clean-up operations as well as with environment impact assessment."

But the information collected by MMS-deployed drifters does not stay within the walls of MMS. "Our information is used by other scientists studying ocean currents, and sea level elevations," said Walt Johnson. "Drifter data can also be used to verify information from satellites regarding sea surface temperatures and ocean color in regions like the Gulf of Mexico."



graphic of an ocean drifter

Johnson, an oceanographer with MMS, stressed that many leasing decisions affecting offshore mineral development rely on data collected by oceanographers. The shipping industry also relies on information about near shore currents for safe navigation.

Ocean drifters are yet another component in the machinery used to manage the development of offshore mineral resources in a safe and environmentally sound manner.

The Environmental Studies Program Roots

Dedicated to protecting the marine and human environment

by Bill King

“You have to understand. Those were exciting times,” said Piet deWitt, BLM studies chief from 1978-80. “Studies were a critical component of a booming program. . . . Dealing with the environmental impacts of offshore drilling on Georges Bank: That was pure excitement.”

From its inception in 1973, the Environmental Studies Program has been shaped by the need to design studies relevant to decisionmaking and ensure the scientific credibility of the resulting research. The program carried out studies in marine biology, physical oceanography, endangered species, marine chemistry, socioeconomics, and air quality.

A National Research Council (NRC) evaluation questioned the wisdom of the large baseline studies that characterized the early program. The report recommended greater emphasis on impacts, more relevance to policy decisions, and better procedures to assure scientifically sound and useful results.

Soon thereafter, the Bureau of Land Management created a scientific committee to advise the Secretary on the studies program. The initial committee consisted of many of the nation’s most renowned marine scientists, who agreed with the NRC’s findings and lent their considerable prestige to implementation of the report’s recommendations. The scientific committee has provided MMS



photo by Walter Bonora

A rocky shoreline along California’s central coast.

with vital guidance in designing studies that combine policy relevance with scientific credibility.

From its inception, the MMS pursued research with other Federal agencies, states, and other entities. The initial Alaskan studies program was managed through an agreement with NOAA. And at times, collecting information for the program was not without some danger.

Dean Yoesting, a former sociologist with BLM, tells of flying from St. Paul to St. George in the Pribilof Islands of Alaska. The pilot, flying below a low ceiling, kept looking down at the waves. Suddenly he pulled back on the yoke and climbed into the cloud bank.

“Now you know why God provides waves for pilots,” said the pilot. He had been watching for a change in the wave pattern that signaled approaching land and pulled up just in time to avoid crashing into a 400-foot cliff hidden in the mist at the island’s coastline. They landed safely, but

the pilot died in a plane crash 6 months later.

Close calls notwithstanding, the ESP has met with many successes through the years. A relatively recent innovation of the program is the creation of Coastal Marine Institutes (CMI’s) in state universities close to areas of offshore minerals development activity.



photo Mieke Mahi

An offshore platform in the Gulf of Mexico.

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These institutes serve a dual role. They pursue relatively long-term research well-suited to university environments on topics with implications for OCS policy decisions, and with relatively flexible funding arrangements, they are able to aid MMS when the need arises.

Through the years the managers and technical staff of the environmental studies program have responded creatively to the need to complete credible scientific research. In partnership with other federal agencies, university faculty, and private consultants, MMS has sought to close the information gaps remaining in our understanding of program im-



photo by Max MacKenzie

pacts and related issues. There is always more to learn and better ways to protect both the natural and human environments. The Environmental Studies Program is

dedicated to learning those facts and finding those ways.

Agency Committed to Ocean Partnership

by Ken Turgeon

A milestone in the United States' world of oceanography occurred in September, 1996 when Congress passed, and President Clinton signed into law, the National Oceanographic Partnership Program (NOPP) Act. The legislation recognizes the value of the oceans and ocean resources to the people of the United States of America. It promotes the importance of oceanographic knowledge to the nation's economic development, quality of life, science education and national security. The legislation also fosters the need for partnerships between government, academia and industry to ensure optimal use of our oceans and ocean resources.

Another important aspect of the Act is that it created the National Ocean Research Leadership Council composed of top level administrators from 12 Federal agencies with major ocean research, and national security responsibilities.

The Minerals Management Service (MMS), by virtue of its mission to manage the development of natural gas and oil on the outer continental shelf, is designated in the Act as a leader in ocean research, and the MMS Director is one of the 12 members on the council.

"It is an honor to be recognized by Congress and the Administration as an ocean leader in the Act," said Thomas Kitsos, MMS acting

director. "The agency has been heavily involved in the competitive selection of ocean research projects to be funded under the Act, and has been very active in ocean partnership efforts over the past two years."

Additionally the agency has been involved in an educational ocean drifter program for teachers and students; the development of a national virtual oceanographic data center; development of a plan for a coordinated U.S. ocean observing system; and the feasibility of the Navy's underwater subma-

see OCEAN page 10



Protecting a Fragile Ecosystem

by Robert M. Rogers, Gregory S. Boland, and Ken J.P. Deslarzes

photos by Gregory S. Boland

Lying at the edge of the Northern Gulf of Mexico's continental shelf, a pair of submarine banks rise from the dark, cold depths to the light-bathed surface waters. This unique blend of light and clear blue waters provides a haven for tropical marine organisms in the northern Gulf of Mexico. The re-

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rine listening system for civilian oceanography.

To date the NOPP has proven to be a success story. Congress, the Administration and the oceanographic community are pleased with the partnership research projects supported under its umbrella and the direction the NOPP is taking as it looks to the future.

The NOPP should continue to be an ocean research and education success story for years to come -- one that the federal government, the ocean community and the nation can be proud of. "These are exciting times for ocean research and resource management," said John Danzig,

former secretary of the Navy and chair of the National Ocean Research Leadership Council. "The Minerals Management Service is an integral component of the NOPP partnership and has contributed significantly to its success. I look forward to MMS's continued participation in NOPP and on the Council as we work towards the common goal of improving our knowledge of the ocean realm for the benefit of the American people."

The other agencies represented on the Council are the Navy, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, United States Coast

Guard, United States Geological Survey, Environmental Protection Agency, Department of Energy, National Science Foundation, Defense Advanced Research Projects Agency, and the White House's Office of Science and Technology Policy and Office of Management and Budget.

In addition to its membership on the Council, MMS is also represented on the partnership's Interagency Work Group which is composed of senior scientists from the 12 NOPP federal partners.

rent and eddies on the continental slope, and seasonal variations of shelf circulation. The Coastal Ocean Modeling Study, completed in 1998, used many of the LATEX field observations to provide MMS with an improved capability to estimate oil spill trajectories on the Gulf of Mexico outer continental shelf. Additionally, several parallel studies are underway in the northeast Gulf to investigate the effects of Loop Current and eddy intrusions on the continental shelf circulation, wind driven coastal currents, and the effects of winds and rivers on the flows across the inner and mid-shelf. The second year of field data collection was completed in the DeSoto Canyon Study with excellent data recovery from moored instruments which included a time series through two hurricanes, Earl and George.

Increased Emphasis on Socioeconomic Research

In response to deepwater-driven growth in the Gulf of Mexico offshore oil and gas industry, MMS initiated several studies to address the socioeconomic implications of deepwater development. One study is examining the direct effects of deepwater development on state and regional economies. Other projects include the study of the benefits and burdens of offshore oil and gas activities on selected communities and local public institutions and an analysis of offshore activities on ports and surrounding areas. A study analyzing port expansion at Port Fourchon, Louisiana is nearly complete.

Continental Slope Habitats and Sea Floor Ecology

A major study will begin in 1999 to collect information on continental slope sea floor communities, re-examine and synthesize deep-sea ecological information, and catalog deep-sea organisms. The study will complement existing information and will be designed with a recognition of new topographic and geochemical data. There will be some emphasis on energy flow, trophic relationships, and animal functional relationships, with attempts to explain some apparent Gulf anomalies in benthic community structure.

Physical Processes Over the Continental Slope and Rise. The interaction between eddies and the continental slope are being modeled to study the dynamics of three-dimensional, physical and oceanographic processes. This model will aid in MMS' oil spill risk analysis by estimating subsurface oil spill transport.

Pacific



photo by Walter Bonora

MMS biologist Herb Leedy monitors the health of **rocky intertidal beds** in coastal California.

Ecology - Platform Removal Issues

An understanding of the relationship between oil and gas platform-associated marine life with the general ecology of the southern California continental shelf is required for future decisions regarding the decommissioning of platforms in the Santa Barbara Channel and Santa Maria Basin. A three-year study of invertebrates and algae living on platforms was initiated in 1998. A related study of the ecological role of natural reefs and offshore platforms for southern California rocky reef fishes completed a third year of field data collection. Preliminary results of this study show considerable differences in fish communities around platforms compared to natural reefs. Fish communities at some platforms were richer than at many natural reefs.

Intertidal Monitoring Studies

The inhouse study of rocky intertidal communities of abalone, mussels, sea stars, and other life forms along the California coast continued in 1998 with a seventh year of field sampling. Data collected from these studies is used to monitor changes in habitat and determine what measures are needed to protect the species and their environment if they are found to be in jeopardy.

MMS also took the lead in developing a database for the Multi-Agency Rocky Intertidal Network which will include field measurements and supporting data contributed by intertidal scientists from several federal and local agencies and private organizations.

California Offshore Oil and Gas Energy Resources (COOGER)

This study of development scenarios and onshore constraints in the tri-county area of San Luis Obispo, Santa Barbara, and Ventura began in 1995 and is scheduled for completion during 1999. The emphasis of this project is on providing a comprehensive answer to the development potential of the existing undeveloped leases and the constraints of developing those leases off the tri-county coast.

Santa Barbara Channel-Santa Maria Basin Circulation Study - Numerical Modeling

MMS will continue efforts in 1999 to develop a numerical model of currents in the Santa Barbara Channel and Santa Maria Basin area. Once constructed, this model will aid in the primary form of risk assessment, that is the assessment of probable paths and fates of oil spills in the areas of active leases.

Mitigating Acoustic Impacts on Marine Mammals

In recognition of the potential risks of seismic operations to the hearing of certain marine mammals, a study will be conducted in 1999 to determine the effectiveness of a procedure used to moderate those risks.

Space-Age Technology Used to Find Shipwrecks

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State-of-the-art equipment, originally developed by NASA's Ames Research Center for the Mars Pathfinder Project, was used to search for the wrecks. The team used Mars Pathfinder mapping programs, originally designed to map and analyze geological features of dry, planetary surfaces, to map shipwreck sites.

The first wreck was found by accident while testing a special, remotely operated underwater vehicle (TROV) with mounted cam-

eras that produce three-dimensional pictures of an object. The remainder of the two-week expedition was spent investigating that site. While Navy divers were videotaping the first site, a second wreck was found.

Shipwrecks are considered an archaeological site protected by federal agencies under the National Environmental Protection Act process.

The Jeremy team hopes that this project will serve as a stepping stone for future scientists to learn



MMS archaeologist Michele Hope, left, and Coast Guard senior chief Parks on the Jeremy Project.

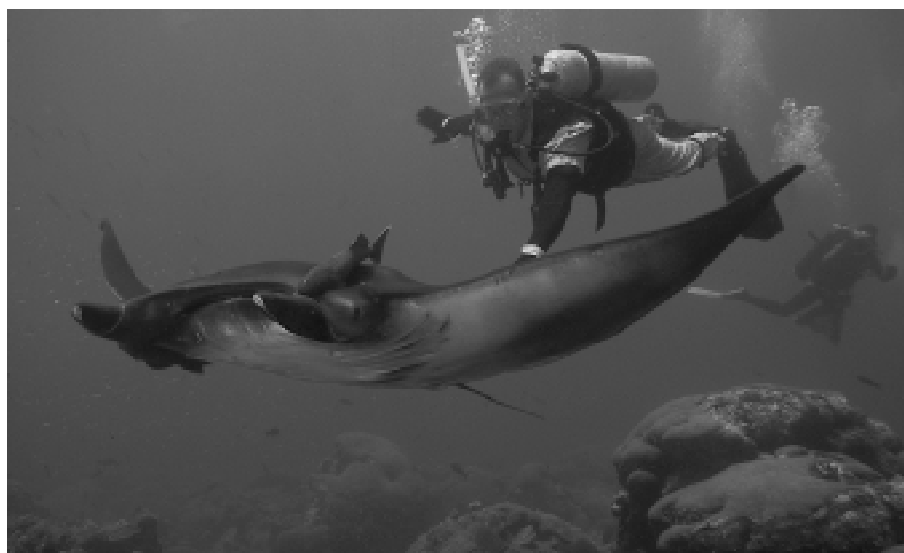
about our past and continuing relationship with the sea.

Monitoring the Flower Gardens

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sult is a coral reef habitat of astounding beauty known as the Flower Garden Banks, and located 110 miles off the Texas-Louisiana coast.

In the late 1800's, fishermen named these snapper and grouper fishing banks after their colorful catch and underwater sightings. We know today that the Flower Gardens are home to over 175 species of fish, 21 coral species, and 250 reef invertebrates. The coral reefs spread over an area equivalent to 406 football fields. The "gardens" are a collection of massive mounds of limestone adorned with a rainbow of green, brown, orange, purple, red, and yellow hues. This underwater realm displays a wealth of nature's



Divers take a break from their work to enjoy leisure time with a giant manta ray.

wonders and occurrences including the mass spawning of corals, the schooling of hammerhead sharks and eagle rays, and migrating whale sharks and manta rays. Here, small creatures consort with large ones.

Underlying this coral reef paradise is a geological framework harboring abundant reservoirs of oil and gas. In the early 1970's, the Minerals Management Service

began investigating the potential conflict between hydrocarbon development and natural resource protection. These investigations began with a series of environmental studies to describe the banks and later to investigate biological, chemical, and geological processes.

see **GARDENS** next page

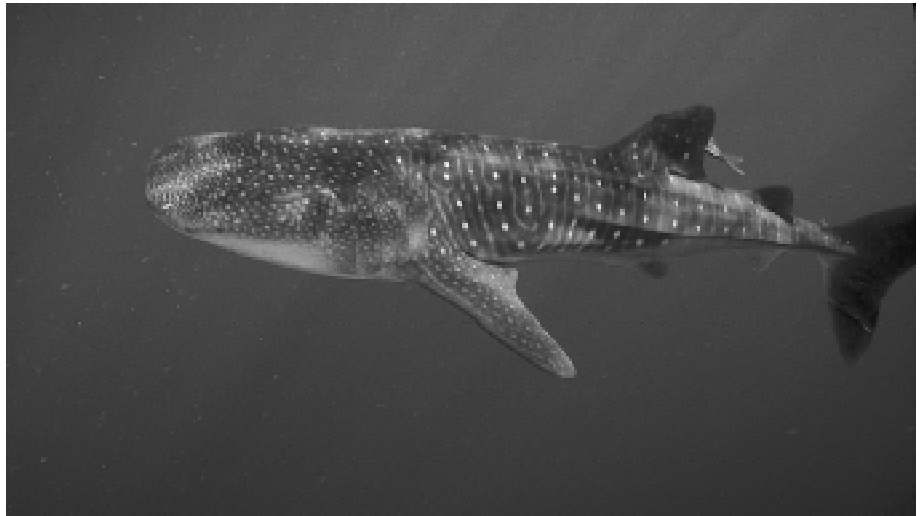
At all steps of this process, the MMS has coordinated closely with the numerous stakeholders at the Flower Gardens, including industry representatives, recreational fishermen and divers, other Federal agencies, academic researchers, and private consultants.

Through time, industry-monitoring of sites near the Flower Garden Banks indicated no impacts on the banks and monitoring was relaxed. The MMS has continued monitoring at the reef crests themselves, implementing an ongoing, scientifically credible program in 1988 through cooperation with the National Oceanic and Atmospheric Administration (NOAA), academia, and private consultants.

With the designation of the Flower Gardens as a marine sanctuary in 1992, the MMS has continued its stewardship. In addition to the ongoing monitoring program, MMS has worked closely with the sanctuary on dive programs, developing agreements on seismic exploration, oil spill response drills, and pipeline sitings, and serving on advisory boards.

The present reef monitoring program of the reefs began in July 1998 with a team of scientists from Texas A&M University completing their first monitoring cruise in September. Another cruise is scheduled for September 1999. The effort assesses the health of the coral reefs and evaluates changes in coral population, coral and algae cover, growth rates, and other community characteristics.

The study monitors the growth rate of corals by measuring coral growth rings and making visual as-



Whale Shark: One of the visitors to the Flower Garden Banks.

sessments of the population density of large-bodied fishes and sea urchins. Supportive information is also gathered to determine the effects of long-term temperature, contaminants, and decreasing light with increasing depth on the coral. Photographs measure and assess the growth, diversity, percent cover, and incidence of bleaching and disease of corals. Additionally, surveys of tiny mollusks are being carried out below the coral cap. Results of past monitoring efforts have indicated that the dominant corals of the Flower Garden reef ecosystem continue to grow at rates consistent with past measurements.

Because of the agency's involvement, the Flower Gardens have been the focus of over 140 publications. This extensive database has been used to develop numerous National Environmental Policy Act documents, including environmental impact statements, lease stipulations, and the designation of no-activity zones.

Because of over twenty years of successful efforts to protect the unique offshore coral reef environments at the Flower Gardens, the



A **research diver** in the Flower Garden Banks photographs an area that will be used by scientists to monitor the health of the reef.

agency was presented the Flower Garden Banks National Marine Sanctuary Environmental Stewardship award in 1994, and recognized by the Council on Environmental Quality and the National Association of Environmental Professionals with a Federal Environmental Quality Award in 1996. These protective measures have ensured compatibility between an active program of oil and gas development near the banks, and the health of this sensitive biological habitat and national treasure.

Environmental Research in Pictures

Scientists, at right, use "bigeye" binoculars to observe marine mammals for the MMS study GULFCET.



photo by Jim Nammens

A breaching humpback whale.



MMS staff photo

Dolphins swimming in the Gulf of Mexico.



Willetts hunting for food on a Ventura beach

MMS is committed to achieving the proper balance between providing energy for the American people and protecting sensitive coastal marine habitats.



Polar bears are protected under the Marine Mammal Act and their safety is taken into account when planning a lease sale.

Recent Gulf Region Publications

MMS 98-0022: Workshop on Environmental Issues Surrounding Deepwater Oil and Gas Development, Final Report

MMS 98-0032: Estimated Prove and Unproved Oil and Gas Reserves, Gulf of Mexico Outer Continental Shelf, December 31, 1996

MMS 98-0021: Environmental and Safety Risks of an Expanding Role for Independents on the Gulf of Mexico OCS

as of 10/1/98

MMS 97-0042: Satellite Oceanography Study and Oceanic Atlas Project, Northeastern Gulf of Mexico, Final Report

MMS 98-0035 & -0036: Texas-Louisiana Shelf Circulation and Transport Processes Study: Synthesis Report; Vol. I, Technical Report, & Vol. II, Appendices

MMS 98-0010: The Flower Garden Banks (northwest Gulf of Mexico): Environmental Characteristics and Human Interaction

MMS 98-0034: Stability and Change in Gulf of Mexico Chemosynthetic Communities, Interim Report

MMS 98-0039: Long-term Effects of Contaminants from OCS Produced-water Discharges at Pelican Island Facility, Louisiana

MMS 98-0050: A Critical Review of Four Types of Air Quality Models Pertinent to MMS Regulatory and Environmental Assessment Missions

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MMS 98-0051: Northeastern Gulf of Mexico Physical Oceanography Program: Eddy Monitoring and Remote Sensing; First Annual Report

MMS 98-0043: Meteorology of the Northeastern Gulf of Mexico, Interim Report

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