

BOEM Environmental Studies Program

**Fiscal Years 2013-2015
Studies Development Plan
Pacific OCS Region**

**U.S. Department of the Interior
Bureau of Ocean Energy Management
Pacific OCS Region
Camarillo, CA
2012**

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ACRONYMS

AFB	Air Force Base
BAA	Broad Agency Announcement
BBLS	Barrels of Oil
BOEM	Bureau of Ocean Energy Management
CARE	California Artificial Reef Enhancement Program
CF	Cubic Feet of Gas
CFR	Code of Federal Regulations
DBMS	Database Management System
DOI	Department of the Interior
EIS	Environmental Impact Statement
EO	Executive Order
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
ESP	Environmental Studies Program (National Program)
FERC	Federal Energy Regulatory Commission
FY	Fiscal Year
GGARCH	Geophysical, Geological and Archaeological Guidelines
GIS	Geographic Information Systems
GLS	Global Location Service
GNOME	General NOAA Oil Modeling Environment
GPS	Global Positioning System
HECO	Hawaii Electric Energy Company
HIREP	Hawaii Interisland Renewable Energy Program
LNG	Liquefied Natural Gas
MHI	Main Hawaiian Islands
MMS	Minerals Management Service
MS	Microsoft
MW	Megawatt
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIS	Non-indigenous Species
NNMREC	Northwest National Marine Renewable Energy Center
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service

NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSL	National Studies List
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OWET	Oregon Wave Energy Trust
PAH	Polycyclic Aromatic Hydrocarbon
POCSR	Pacific Outer Continental Shelf Region
SCCWRP	Southern California Coastal Water Research Project
SPUE	Sightings per Unit Effort
SST	Sea Surface Temperature
UHF	Ultra High Frequency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction to the Region

The Environmental Studies Program (ESP) in the Pacific Outer Continental Shelf (OCS) Region (POCSR) started in 1973. The Program has evolved with change in the geographic areas of concern and study, in the emphasis of disciplines highlighted for research, with change in the status of the Region from a frontier to a mature oil and gas producing area (from prelease to postlease emphasis) and with change to a frontier area for renewable energy production. The Pacific OCS Region's responsibility now encompasses on-going oil and gas operations and potential renewable energy development utilizing both wave energy conversion and wind turbine generation in deepwater. The area of importance for the Pacific OCS Regions stretches from the United States-Mexico border to the U.S. border with Canada and extends westward to include the State of Hawaii. The Pacific ESP is evolving and expanding our area of study along with our new responsibilities for the OCS renewable energy program, and finally, with formation of Renewable Energy OCS Task Forces with the states of Oregon and Hawaii.

For the Fiscal Year 2013-2015 Study Development Plan, the Pacific Region reached out to over 30 major stakeholders for input. They included federal and state agencies and Tribal governments. The POCSR received 12 study ideas from external sources including the National Oceanic and Atmospheric Administration (NOAA), United States Geological Survey (USGS), National Park Service (NPS) and the states of Oregon, California and Hawaii. Several of these ideas formed the basis for study profiles included in this document.

Existing production and development activities on 43 producing oil and gas leases offshore southern California will continue. Annual production from these leases is currently over 24 million barrels (bbls) of oil and 47 billion cubic feet (cf) of natural gas. It is expected that production from the majority of these facilities will continue for many years. Operators have replaced pipelines, drilled new wells, repaired infrastructure and generally improved and increased production with long-term plans to continue. This plan reflects the Bureau of Ocean Energy Management (BOEM) Pacific OCS Region's need to continue to study environmental effects from on-going oil and gas production operations. The OCS activities section of this report discusses some of the projects occurring on producing leases.

This plan also explains the urgent need for information to regulate future renewable energy projects that may be proposed and implemented in the Pacific OCS Region. These energy projects require studying areas well outside the oil and gas production area of southern California as interest and resource potential for deepwater wind and wave energy facilities exist all along the Pacific Coast and offshore Hawaii. The interest for renewable energy along the Pacific is focused on wave energy conversion off Oregon and floating deepwater wind off the islands of Oahu and Hawaii. Hydrokinetic wave energy conversion devices are ready for testing offshore Oregon and the Pacific Region has received proposals for floating deepwater wind off Hawaii. Both states have expressed interest for offshore research leases. However interest for siting renewable energy is rapidly spreading to potential areas off California as

well. Several companies have met with BOEM to discuss their concepts for both wave and wind energy projects off California.

Alternate uses of existing platforms continue to be discussed. As the Region has matured, and as developed oil and gas field production has peaked and entered declines, new and innovative ideas for the use of traditional oil and gas platforms have emerged. For example, an international company is exploring options for the development of a grid-connected technology testing facility (“National Wave Energy Testing Center”) on the OCS close to Platform Irene offshore Central California. Their concept is to use the platform’s power cable for this project while the platform continues oil and gas activities. Once the oil and gas operations cease, the company would want the platform to remain as an alternate-use facility for renewable energy.

This document presents a strategy for the Pacific OCS Region. It applies to the entire Region, which stretches from the United States-Mexico border to the U.S. border with Canada and extends westward to encompass the State of Hawaii.

For renewable energy studies, this plan focuses on all Pacific OCS Planning Areas offshore Washington, Oregon and California, and includes the Hawaii OCS that might experience renewable energy projects. Studies related to oil and gas in the Southern California Planning Area support decisions for activities on existing producing leases.

The information obtained through these studies is important and relevant to decision making. This information fulfills the following criteria:

- The study provides significant new or additional information beyond what is already known.
- The identified study is within the time frames of the Offshore Program.
- The information provides insight into significant processes critical for understanding both natural and anthropogenic changes.
- The issue can be studied within science's present abilities or understanding of experimental methods to acquire the information.

The introduction of renewable energy projects and the level of future oil and gas activities offshore the Pacific OCS Region will dictate changes in the strategy. Findings from current or future research may also affect the strategy and cause other avenues of research to be incorporated.

If you have any questions regarding this Pacific OCS Region Environmental Studies Development Plan, please contact Dr. Ann Scarborough Bull, Pacific OCS Region, at (805) 389-7820. You can also view the BOEM and Pacific OCS Region home pages at www.boem.gov and <http://www.boem.gov/About-BOEM/BOEM-Regions/Pacific-Region/Index.aspx>, respectively, for additional information.

1.2 Maps of the Pacific OCS Region—Active Leases and Resource Potential for Renewable Energy

Figure 1. Active Oil and Gas Leases in Southern California

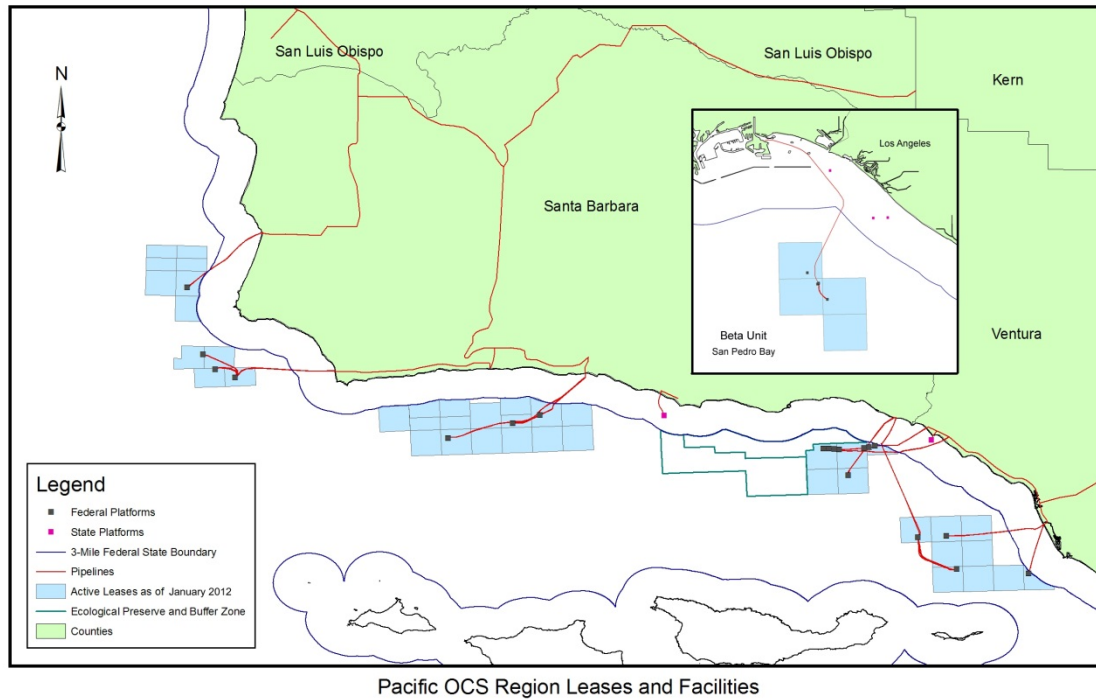


Figure 2. Resource Potential for Renewable Energy from Wave Power

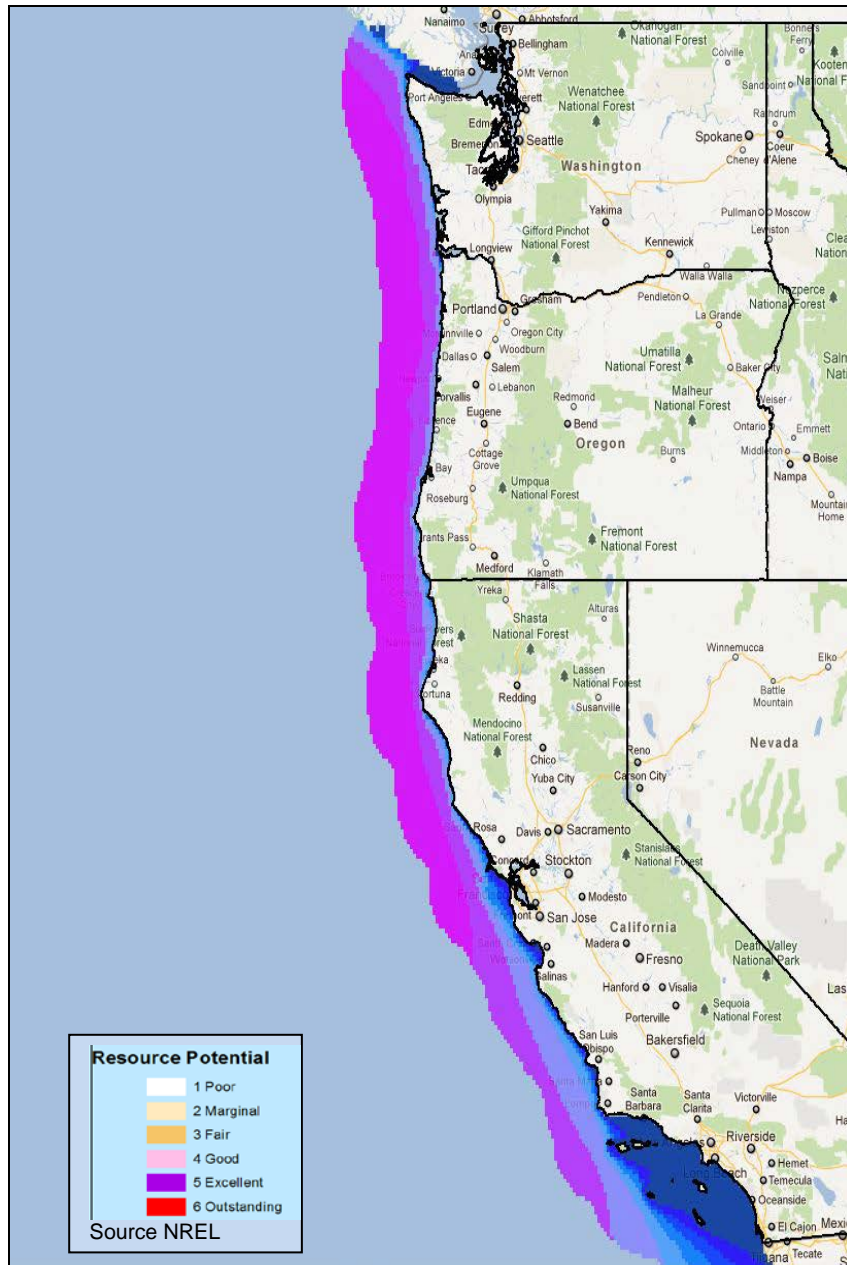
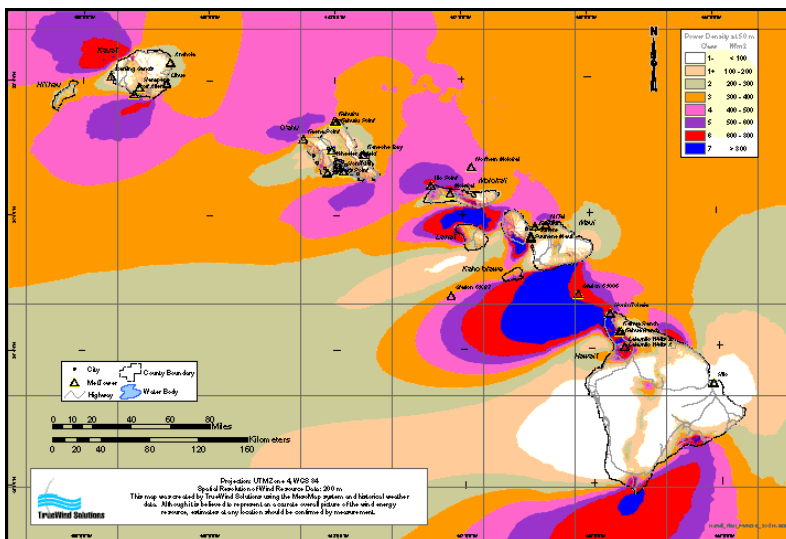


Figure 3. Resource Potential for Renewable Energy from Wind Power



1.3 Projected OCS Activities

The BOEM Environmental Studies Program supports BOEM decisions associated with leasing, exploration and development of oil and natural gas, marine minerals and renewable energy. Often, studies serves needs associated with all three programs.

Renewable Energy Activities and Alternate Use of OCS Facilities

The BOEM was delegated responsibility for implementing an OCS renewable energy program with the passage of the Energy Policy Act of 2005. Alternative use of existing OCS facilities is also authorized by this Act. Regulations implementing the Act were published in April 2009, and prospective developers of offshore deepwater wind and wave energy conversion devices have started to develop project proposals on the Pacific OCS. Leasing and permitting OCS renewable energy development, permitting power cables on the OCS associated with renewable energy and permitting repurposing of OCS facilities will involve new environmental considerations and, consequently, additional environmental studies. Several renewable energy developments for the Pacific Region occurred in Fiscal Years 2011 and 2012.

The Governor of Oregon, in a letter dated December 1, 2010, requested the formation of a BOEM-sponsored Federal-State task force with the State of Oregon to address the use of the ocean for renewable energy development. The Oregon-focused task force will support and enhance the regional planning that is taking place through the partnership that the three west coast states have with BOEM; this partnership is called the West Coast Governors' Alliance on Ocean Health. Secretary Salazar accepted the request on December 30, 2010. The Pacific Region finalized a charter outlining the purpose, membership and planned functions of the task force. Task Force meetings were held in March and August of 2011 and on April 12, 2012, in Portland, OR.

The BOEM Oregon Renewable Energy Task Force immediate focus is to discuss available information about energy and environmental resources and identify areas on the OCS with high renewable energy value and low use conflicts. The State of Oregon requested that BOEM hold a scientific marine renewable energy conference in 2012. The region is considering the meeting for November 2012 at Oregon State University in Corvallis. The Northwest National Marine Renewable Energy Center (NNMREC) at Oregon State University prepared a feasibility/suitability study for a grid-connected deepwater wave test facility offshore Oregon. The NNMREC has formed a consortium with Oregon Wave Energy Trust (OWET) and the National Renewable Energy Laboratory (NREL). Most of the sites under consideration are located on the OCS. The NNMREC completed the study in December 2011. The study indicates that all four sites under investigation are technically feasible for a wave energy test facility. The NNMREC began coastal community outreach in January 2012 in the vicinity of the four sites to assist their site selection process. An international company is conducting a feasibility study for a wave energy project offshore Camp Rilea (Warrenton, Oregon). The company feasibility study is expected to be completed by summer 2012. The potential project would support OCS wave energy devices that would

transmit up to 1-2 megawatts (MW) of electricity for use at Camp Rilea, an Armed Forces training facility maintained by the Oregon National Guard with U.S. Army involvement.

The Governor of Hawaii, in a letter dated May 9, 2011, requested the formation of a BOEM-sponsored Federal-State task force with the State of Hawaii to address the use of the ocean for renewable energy development. Secretary Salazar accepted the request on July 1, 2011. The Pacific Region has reached agreement with Hawaii on the draft charter, task force membership and planned functions of the task force. The first Task Force meeting was held on March 7, 2012, in Honolulu, HI.

Research leases are expected to be a significant focus of the initial BOEM-Hawaii Renewable Energy Task Force discussions. The University of Hawaii and the Natural Energy Laboratory of Hawaii have expressed written interest in obtaining OCS research leases offshore Oahu and the Big Island of Hawaii. Hawaiian Electric Company (HECO) is in the process of requesting proposals for 200+ MW renewable energy projects. The HECO is seeking proposals for an inter-island transmission cable system, interconnection facilities and other power transmission infrastructure to deliver power to Oahu. A Right-of-Way is required from BOEM for any portions of the cable in OCS waters outside of National Marine Sanctuaries. The BOEM is a Cooperating Agency in developing a programmatic environmental impact statement (EIS) for the "Hawaii Interisland Renewable Energy Program (HIREP): Wind" that includes analysis of a potential OCS subsea power cable for inter-island energy transmission. The HECO's draft request for renewable energy proposals is targeted was issued in March 2012 and specified that projects deliver renewable energy to the Oahu grid by the end of 2018. The BOEM Pacific Region received a draft unsolicited request for an OCS wind lease for a 400 MW floating wind project offshore Oahu on April 27, 2011. The Region provided review comments and met with the company. The company also met with Hawaii State official and is revising their request. A separate company informed the Pacific Region in January 2012 that they plan to file a formal request for an OCS commercial wind lease for a 400 MW offshore wind project offshore Oahu in the near future.

Offshore California, an international company is exploring options for the development of a grid-connected technology testing facility ("National Wave Energy Testing Center") on the OCS in the vicinity of federal Platform Irene offshore Central California. The company is coordinating with Sandia National Laboratories, Department of Energy, Department of Defense – Vandenberg Air Force Base (AFB), the Federal Energy Regulatory Commission (FERC), California Lt. Governor Gavin Newsom, the Electric Power Research Institute (EPRI) and the platform operator, Plains Exploration and Production, to develop a proposal. A meeting was held with the company, BOEM, Vandenberg AFB, Office of California Lt. Governor, the National Renewable Energy Laboratory and Sandia Laboratories on January 25, 2012, to discuss research lease requirements. A separate company has submitted an application for a wave project to FERC for a preliminary permit and intends to submit an OCS lease request. The project is proposed for 1 to 3.5 miles offshore Morro Bay, California (Central California). The City and County of San Francisco informed the Pacific Region on December 9, 2010, that they will submit a request for an OCS wave energy lease offshore San Francisco. To date, BOEM has not received a proposal; however, the City and County have completed a few site-specific environmental studies that will assist them in planning the

project and a preliminary technical design study is underway. They have a goal to generate 100 percent of the City's electricity from renewable sources by 2020.

Oil and Natural Gas

Typically, the OCS oil and gas management program is addressed as prelease and postlease. Prelease activities include development of a 5-year program in which oil and gas lease sales are scheduled. The Pacific Region has not been included in a 5-Year Oil and Natural Gas Leasing Program since 1987 as a result of repeated moratoria. On July 14, 2008, President George W. Bush lifted the executive withdrawal of OCS lands from consideration for oil and gas leasing. The President also called for Congress to lift the annual moratorium and enact legislation to allow states to determine what happens off their coast and provide for sharing of revenues with those states that want to proceed with development. On September 30, 2008, the long-running leasing moratoria enacted annually as part of the Department of the Interior's (DOI) appropriations legislation was discontinued by Congress. However, the Pacific OCS Region was not included for leasing in the Preliminary Revised Program for 2012-2017, which was announced by the President and the Secretary on March 31, 2010.

Postlease oil and gas activities are those associated with the development of the 43 producing leases in the Southern California Planning Area. Currently, 23 Federal oil and gas platforms produce over 24 million bbls of oil and 47 billion cf of natural gas per year. This rate could be sustained for the next several years, as Federal lessees continue to focus on the recovery of approximately 400 million barrels of oil in proven reserves. Studies identified in this regional plan highlight information gaps and are geared to allow BOEM to conduct analyses that support the BOEM mission of environmental review of new plans as well as environmental review for the Pacific Region Bureau of Safety and Environmental Enforcement permitting and regulation of the oil and gas industry's ongoing production projects. Continued production at these facilities may present new information needs during the coming decades in order to maintain environmentally safe operations with the existing infrastructure and certainly eventual decommissioning remains an active issue. Studies are needed to address and monitor the environment adjacent to the existing facilities. For example, information from environmental studies was used in the recent assessments of the environmental effects of the drilling of certain new wells, the installation of new pipelines and pipeline and power cable repair activities offshore Los Angeles and Santa Barbara counties. Environmental studies information was crucial to completion of National Environmental Policy Act (NEPA) documents for these activities.

Marine Minerals Other than Oil and Gas

Opportunities to explore for and develop OCS mineral resources other than oil and gas become increasingly attractive to developers as economic conditions improve. In the future, there may be a need to collect and analyze information in support of potential leasing and development of a marine mining program on the Pacific OCS.

1.4 Identification of Information Needs

The main areas of information needs for Fiscal Year (FY) 2013-2015 fall into the following categories and support potential renewable energy leasing and/or existing oil and gas production activities:

Social and Economic Sciences for Renewable Energy Leasing:

With increasing interest in renewable energy resource development, particularly in areas outside the geographic extent developed for oil and gas, additional information needs will have to be addressed. An inventory and analysis of submerged cultural resources is on-going for the Pacific coast. The study “Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence near the Main Hawaiian Islands” focuses on the State of Hawaii where there is pressing interest in floating deepwater wind power installations off the islands of Oahu and Hawaii. The purpose of this study is to provide baseline information on submerged and terrestrial archaeological resources and traditional cultural properties. This information will be needed for environmental assessment and mitigation of potential adverse effects to these resources. This is required under Section 106 of the National Historic Preservation Act and Executive Order 11593, which require that Federal agencies must apply the National Register Criteria to properties that may be affected by an undertaking.

Biology and Habitat and Ecology for Renewable Energy Leasing and Existing Oil and Gas Production Activities:

The erection and operation of floating deepwater wind turbines and other renewable energy devices may have a variety of effects on seabirds, most of which will vary by species based on their behavior at sea. Since its inception, the Pacific Region has gathered a large amount of information on Pacific seabirds. Experience from U.S. onshore wind development and wind development offshore in Europe suggests that siting of facilities is an important consideration for minimizing impacts to bird species. Presently, there are extensive seabird databases for the Pacific OCS that provide relative density estimates and distributions at sea along fixed transects. However, species-specific distributions and estimates can be improved and extended to areas between transects or in non-surveyed areas by incorporating appropriate environmental and oceanographic covariates to model continuous density distributions. The study “Data Synthesis and High-Resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS” will provide detailed information linking varying environmental and oceanographic conditions to seabirds within the Pacific OCS and will help define habitat characteristics and identify mechanisms that aggregate seabirds. Thus, this study will use the most recent seabird distributional datasets combined with oceanographic habitat features in analytical models to predict occurrence and abundance of seabirds at sea.

Presently, there is increasing interest in research leases and commercial-scale projects offshore of Hawaii. Currently there is a lack of quantitative information that links distribution, movements and behaviors among seabirds with physical habitats in waters surrounding the main Hawaiian Islands. More information is needed by BOEM to evaluate potential environmental effects to seabirds and their oceanic habitats caused by installation of

new alternative energy infrastructure (i.e., hydrokinetic and wind-energy structures) within OCS waters off Hawaii. A recently approved FY12 Study Plan seeks to establish a ‘*Seabird Vulnerability Index*’ based on observations of seabirds at sea recorded from ships and archived in extensive historic databases. These data primarily are focused on the California Current and Eastern Tropical Pacific, and include much less information regarding seabirds in OCS waters off Hawaii. The USGS is currently acquiring behavioral data from seabirds in Hawaii and the California Current using sophisticated telemetry techniques that enable measurements of flight behaviors associated with ranging patterns, wind speed/direction and sea-state. Furthermore, USGS and collaborators have generated predictive models of fine-scale wind and wave fields for waters surrounding the main Hawaiian Islands. The study “Habitat Affinities and at-sea Ranging Behaviors among Main Hawaiian Island Seabirds” will provide additional detailed information linking abundant Hawaiian breeding seabirds with coastal and offshore habitat utilization surrounding the main Hawaiian Islands.

For the Southern California Planning Area, BOEM is responsible for plans involving ongoing operations and decommissioning of oil and gas facilities as well as future planning for renewable energy leasing. The BOEM’s planning efforts need to utilize information within the entire Southern California Planning Area for effective ecosystem management of seafloor fishes and invertebrates. Seafloor fish and invertebrate species form particular aggregations or communities that are known to indicate the relative health of an area. These aggregations change spatially and temporally with natural shifts in the environment and so geospatial integration of the entire region is necessary to understand how the aggregations near disturbed areas compare with undisturbed habitats. The BOEM does not have current information on seafloor communities and species abundances in the vicinity of existing Federal Platforms in the Pacific OCS because BOEM has not conducted or participated in ongoing southern California regional benthic assessments for over twenty years. However, this information is currently needed for environmental analysis of ongoing oil and gas operations. The study “Platform Impacts on Seafloor Communities in the Southern California Planning Area” will provide BOEM an understanding of the relative health of the seafloor communities near offshore oil and gas platforms at a regional scale, which is also useful to BOEM in light of future planning for global climate change, decommissioning and renewable energy leasing.

Interdisciplinary for Renewable Energy Leasing:

There are currently no marine renewable energy arrays operating on a commercial scale in United States waters. This compromises the ability to understand, predict, manage and mitigate potential impacts of proposed marine renewable energy projects. To perform timely environmental review, data from ongoing projects and activities (surrogates) with stressors and receptors similar to those expected from marine renewable energy projects can be analyzed to reduce the uncertainty in the range of outcomes and intensity of environmental consequences. The purpose of the study “Using On-going Activities as Surrogates to Predict Potential Ecological Impacts from Marine Renewable Energy” is to identify and analyze available data from ongoing projects or activities (surrogates) with stressors and receptors similar to those expected from marine renewable energy projects. Examples of unanalyzed data for stressor-receptor pairs that are known to exist and may be particularly useful to analyze from surrogates include (1) effects of electromagnetic fields from operating power

cables as impediments on migration of marine mammals and anadromous fishes (salmonids and green sturgeon) and (2) mooring configurations of offshore aquaculture facilities and oceanographic buoys as entanglement hazards for marine mammals. The BOEM will use results from this study for impact assessments contained within NEPA documents, and also in consultations required by the Endangered Species Act and the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

Fates and Effects for Existing Oil and Gas Production Activities:

Artificial substrate in the marine environment may facilitate the establishment and spread of non-indigenous species (NIS) by providing novel habitats where native species fail to have a competitive advantage over recent arrivals. Some of these NIS may subsequently invade natural habitats and displace or change native biological communities. The BOEM requires information to elucidate the role that offshore platforms may have in affecting biological communities and to comply with the duties of Federal agencies that are outlined in Section 2 of Executive Order 13112 (Invasive Species). The purpose of the study “Understanding the Role of Offshore Structures in Managing Potential *Watersipora subtorquata* Invasions” is to describe the distribution, abundance and life history of the bryozoan *Watersipora subtorquata*, which is a NIS known to exist on offshore oil and gas platforms and has the potential to become invasive and affect native biological communities. Using these ecological data, this study will assess the effectiveness of potential mitigation measures to prevent further colonization on uninhabited substrate. The BOEM will use study results for environmental reviews concerning ongoing operations and decommissioning alternatives of offshore oil and gas platforms and potential marine renewable energy facilities.

Physical Oceanography for Renewable Energy Leasing and Existing Oil and Gas Production Activities:

To perform environmental analyses, BOEM requires information about the sensitivity and resilience of biological habitats to disturbance. Because little is known about how activities related to wave energy conversion devices on the outer continental shelf might affect nearshore habitats, numerous scientific reviews rank this information gap as a priority for future research. Some nearshore coastal marine communities are sensitive to wave energy, most notably kelp forests. The purpose of the study “Predicting the Consequences of Wave Energy Absorption from Marine Renewable Energy Facilities on Nearshore Ecosystems” is to develop a statistical model that predicts the potential effects of wave energy absorption from marine renewable energy facilities on nearshore ecosystems. The need for this information is to predict which siting alternatives of proposed wave energy facilities may generate detectable changes in nearshore ecosystems, especially kelp forests. BOEM will use results from this study for impact assessments contained within NEPA documents, and also in essential fish habitat coordination and consultation requirements established by the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

The General NOAA Oil Modeling Environment (GNOME) that BOEM Pacific Region currently uses to conduct oil spill risk analyses are restricted to geographic areas very near active oil and gas development locations in southern California. As a result, environmental

analysts in the Pacific Region are limited in the geographic area and to short time periods over which they can model oil spill trajectories. The data input to the model needs to be updated and expanded to provide more accurate information to fulfill our responsibility to conduct offshore oil and gas risk analyses over a wider geographic area and longer time periods. The study “Expansion of West Coast Oceanographic Modeling Capability” will allow BOEM analysts to conduct more accurate offshore oil and gas risk analyses.

Information Management for Renewable Energy Leasing:

There is increasing interest in the development of offshore renewable energy projects off the coast of the Main Hawaiian Islands (MHI). The University of Hawaii and the Natural Energy Laboratory of Hawaii have expressed interest in obtaining OCS research leases offshore Oahu and the Hawaii and BOEM has received unsolicited requests for wind leases offshore of Oahu. The BOEM needs baseline information on a variety of biological and physical resources offshore of the MHI to determine knowledge gaps, conduct environmental analyses and inform the decision making process for the review of offshore renewable energy project submittals. Biogeography is the study of the spatial and temporal distribution of organisms, their associated habitats, and the historical and biological factors that influence species’ distributions. The purpose of the study “A Biogeographic Assessment of the Main Hawaiian Islands” is to define biogeographic patterns throughout the MHI; an effective way to synthesize the known information about biological and physical resources off the MHI. A biogeographic assessment will compile and synthesize readily available georeferenced data describing the physical oceanography, and the distribution and abundance of benthic habitats, cetaceans, seals, seabirds and fish and corals on the OCS of the MHI. Collectively, these datasets (in a Geographic Information System (GIS) format) would be used by BOEM to better characterize the marine resources found within state and federal waters, and potentially support renewable energy siting and development in and around the MHI.

1.5 BOEM Pacific Region New Starts for FY 2012 and Ongoing Studies Table

The following table contains the list of New Starts and Ongoing Studies managed by the Pacific OCS Region. Descriptions of Ongoing Studies may be found on the web at <http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies/Current-Environmental-Studies.aspx>. A list of significant completed studies by the Pacific OCS Region may be found at <http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Completed-Environmental-Studies.aspx> and a discussion of highlights and accomplishments of the Pacific Environmental Studies Program is available at <http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies-Highlights-and-Accomplishments.aspx>.

Table 1. Pacific Region New Starts for FY 2012 and Ongoing Studies

NSL #	Study Title	Planning Area (s)	Start FY	Partners
New Starts				
Fates and Effects				
PC-12-04	Nocturnal Surveys for Ashy Storm-Petrels and Xantus's Murrelets at Offshore Oil Production Platforms, Southern California	SC	2012	
Habitat and Ecology				
PC-12-02	Biological Productivity of Fish Associated with Offshore Oil and Gas Structures on the Pacific OCS	SC	2012	UCSB/CESU
PC-12-07	Analysis of Fish Populations at Platforms off Summerland California	SC	2012	UCSB/CESU
Marine Mammals and Protected Species				
PC-12-01	Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS	All	2012	USGS/BRD
PC-12-06	Characterizing and Quantifying Sea Lion and Seal Use of Offshore Man-made Structures in California	SC	2012	NMFS
PC-12-x11	Oregon Marine Renewable Energy Science Conference	WA/OR/NC	2012	OSU/CESU
<i>*Note: The procurement of any study is contingent upon availability of funding</i>				
Ongoing Studies				
Fates and Effects				
PC-08-07	Investigation of PCB and PAH Contaminants in Samples of Platform Resident Fish	SC	2008	USGS/BRD
PC-11-03	Renewable Energy <i>in situ</i> Power Cable Observation	SC	2011	UCSB/CESU
Habitat and Ecology				
PC-10-01	Regional Importance of Manmade Structures as Rockfish Nurseries	SC	2010	USGS/BRD
PC-10-02	MMS MARINE – Multiagency Rocky Intertidal Network	NC/CC/SC	2010	UCSC
PC-10-03	Completion of Fish Assemblage Surveys around Manmade Structures and Natural Reefs off California	SC	2010	UCSB

NSL #	Study Title	Planning Area (s)	Start FY	Partners
PC-10-04	Multibeam Survey of the Eastern Santa Barbara Channel	SC	2010	USGS/BRD
PC-10-07	Survey of Benthic Communities near Potential Renewable Energy sites Offshore Oregon and Washington	OR/WA	2010	OSU/CESU
PC-11-02	DOI Partnership: Distinguishing Between Human and Natural Causes of Changes in Nearshore Ecosystems Using Long-term Data from DOI Monitoring Programs	SC	2011	NPS/USGS/CESU
PC-12-03	PRISM – Pacific Rocky Intertidal Survey and Monitoring	SC	2012	
Information Management				
PC 10-x13	Bayesian Integration for Marine Spatial Planning and Renewable Energy Siting	WA/OR/NC	2010	BAA/NOPP
Marine Mammals and Protected Species				
PC-07-05	Shoreline Survey of Coastal Birds in Ventura County	SC	2007	CSUCI
PC-10-05	Seabird and Marine Mammal Surveys off the Northern California, Oregon and Washington Coasts	WA/OR/NC	2010	USGS/BRD
PC-11-04	Southern Sea Otter Range Expansion and Habitat Use and Interaction with Manmade Structures (BOEM/USGS OCS funded)	SC	2011	USGS/BRD
Social and Economic Sciences				
PC-10-08a & b	Renewable Energy Visual Evaluations	All	2010	BAA/NOPP
PC-11-01	Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific OCS	All	2011	
Interdisciplinary				
PC-07-01	Environmental Mitigation Monitoring	SC	2007	
PC 10-x12 a, b & c	Protocols for Baseline Studies and Monitoring for Ocean Renewable Energy	WA/OR/NC	2010	BAA/NOPP
<p>Planning Area Codes Southern California = SC Central California = CC Northern California = NC Oregon = OR Washington = WA All = NC/CC/SC/OR/WA/Hawaii http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Pacific-Studies.aspx</p>				

Partner Codes

BAA/NOPP = Broad Agency Announcement/National Oceanographic Partnership Program

CESU = Cooperative Ecosystem Studies Unit

CSUCI = California State University Channel Islands

NMFS = National Marine Fisheries Service

NPS = National Park Service Channel Islands National Park

OSU = Oregon State University

UCSB = University of California Santa Barbara

UCSC = University of California Santa Cruz

USGS/BRD = U.S. Geological Survey/Biological Resources Division

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SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

A list of significant recently completed studies by the Pacific OCS Region may be found at <http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies/Completed-Studies.aspx> and a discussion of highlights and accomplishments of the Pacific Environmental Studies Program is available at <http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies-Highlights-and-Accomplishments.aspx>.

Renewable Energy and Oil and Gas Operations Support Studies:

Nine new studies supporting potential and ongoing activities are proposed for FY 2013. These studies are:

Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence near the Main Hawaiian Islands

Using Ongoing Activities as Surrogates to Predict Potential Ecological Impacts from Marine Renewable Energy

Data Synthesis and High-Resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS

Understanding the Role of Offshore Structures in Managing Potential *Watersipora subtorquata* Invasions

Predicting the Consequences of Wave Energy Absorption from Marine Renewable Energy Facilities on Nearshore Ecosystems

Habitat Affinities and At-Sea Ranging Behaviors among Main Hawaiian Island Seabirds

A Biogeographic Assessment of the Main Hawaiian Islands

Expansion of West Coast Oceanographic Modeling Capability

Platform Impacts on Seafloor Communities in the Southern California Planning Area

2.2 FY 2013 Table

Table 2. BOEM Pacific OCS Region Studies Proposed for the Fiscal Year 2013 NSL

Page #	Discipline	Title	Rank
19	SE	Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence near the Main Hawaiian Islands	1
21	IN	Using Ongoing Activities as Surrogates to Predict Potential Ecological Impacts from Marine Renewable Energy	2
23	HE/MM	Data Synthesis and High-Resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS	3
25	FE	Understanding the Role of Offshore Structures in Managing Potential <i>Watersipora subtorquata</i> Invasions	4
27	PO	Predicting the Consequences of Wave Energy Absorption from Marine Renewable Energy Facilities on Nearshore Ecosystems	5
29	HE/MM	Habitat Affinities and At-Sea Ranging Behaviors among Main Hawaiian Island Seabirds	6
31	IM	A Biogeographic Assessment of the Main Hawaiian Islands	7
33	PO	Expansion of West Coast Oceanographic Modeling Capability	8
35	HE	Platform Impacts on Seafloor Communities in the Southern California Planning Area	9
AQ = Air Quality		FE = Fates and Effects	
HE = Habitat and Ecology		IM = Information Management	
IN = Interdisciplinary		MM = Marine Mammals and Protected Species	
PO = Physical Oceanography		SE = Social and Economic Sciences	

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013–2015

Region: Pacific Region

Planning Area(s): Hawaii

Title: Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence near the Main Hawaiian Islands

BOEM Information Need(s) to be Addressed: The State of Hawaii has mandated a goal of achieving 70% clean energy by 2030. In order to meet this goal, development of offshore renewable energy resources and construction of inter-island transmission cables will be necessary. With passage of the Energy Policy Act of 2005, BOEM has assumed jurisdiction for some types of renewable energy development on the OCS, and is required under multiple statutes (Outer Continental Shelf Lands Act (OCSLA), NEPA and National Historic Preservation Act (NHPA)) to take into consideration the impacts of OCS activities on cultural and archaeological resources and traditional cultural properties. To achieve compliance with these laws, BOEM has developed regulations and guidance documents directing lease and permit holders to avoid impacting any archaeological resources identified during the survey or development of their leases (e.g., BOEM Geophysical, Geological and Archaeological Guidelines (GGARCH) 21 April 2011). While it is possible to avoid impacting known cultural resources on the seafloor, it is not always possible to avoid visual impacts to coastal historic or traditional cultural properties. The purpose of this study is to provide baseline information on submerged and terrestrial archaeological resources and traditional cultural properties. This information is necessary under Section 106 of the NHPA, which requires that federal agencies must apply the National Register Criteria to properties that may be affected by a federal undertaking. The information will also be used to support reviews under NEPA and other federal laws.

Cost Range: (in thousands) \$720-\$1,080

Period of Performance: FY 2013-2015

Description:

Background: The BOEM has completed, or is in the process of completing, baseline studies of known and reported submerged cultural and archaeological resources in each OCS Region off the contiguous U.S.; however, no such baseline study has ever been completed off the main Hawaiian Islands for any federal agency. As a result, there is very limited information currently available regarding potential submerged cultural resources off the main Hawaiian Islands.

While remote sensing surveys will be required of permittees for all offshore activities within areas of potential effect, an inventory of known and potential archaeological resources developed by the proposed study will help guide decision makers in developing appropriate mitigation strategies and best management strategies for targets located by remote sensing; the development of an effective survey strategy is contingent upon knowing the nature of these resources and where they most likely may be located.

The main Hawaiian Islands also contain numerous historic properties on land that could potentially be impacted visually by offshore siting. Determining whether a property may be adversely impacted is a requirement of Section 106 of the NHPA. The basis for making the determination of whether a property is adversely impacted depends upon the description within the property listing or the archaeological and historic assessment of the property. If, within the description, the rationale for listing the property or its potential eligibility includes the visual aspects of its surroundings, then the property may be adversely impacted by visual disruption. Native Hawaiian Organizations may also have ceremonial or religious ties to certain areas that could be impacted from offshore renewable energy development. An analysis of the potential for visual impacts from offshore energy development to coastal historic and traditional cultural properties that are either listed on, or eligible for listing on the National Register of Historic Places (NRHP) has never been conducted for the main Hawaiian Islands. These properties can include historic structures, historic archaeological sites, prehistoric archaeological sites, sacred sites and traditional use areas.

There is a critical need to complete a baseline study of historic properties and potential properties, develop a digital database of known and reported submerged cultural resources, conduct ethnographic interviews with Native Hawaiian Organizations, and develop a digital database of coastal historic properties and property types within the region of the main Hawaiian Islands. This information will provide valuable information for completing NHPA Section 106 reviews.

Objectives:

The primary objectives of this study are:

- Accumulate baseline information on submerged and terrestrial cultural and archaeological sites and site types;
- Develop a geo-referenced database of known, reported and potential historic shipwrecks on the Pacific OCS off the main Hawaiian Islands emphasizing the use of primary sources;
- Identify and develop a database of coastal historic properties and property types that could be adversely impacted by the alteration of the view of the ocean.

Methods: The proposed study will collect information from archival and secondary sources of known, reported and potential archaeological sites on the Pacific OCS off the main Hawaiian Islands and synthesize this information into a Microsoft Access database; collect information from archival and secondary sources to develop an MS Access database of coastal properties listed, and potentially eligible for listing, on the NRHP; collect ethnographic information from Native Hawaiian Organizations regarding traditional use and traditional cultural properties that could be impacted by offshore development; identify protocols for incorporating traditional knowledge into NHPA and NEPA analysis; and prepare a final report of findings that details the efforts to compile the databases and provides an historic context of site types that can be expected in the project area. Digital versions of predictive maps and uncertainty will be delivered in a format that is compatible with the BOEM Multipurpose Marine Cadastre and similar BOEM data sets.

Revised Date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area(s): All

Title: Using Ongoing Activities as Surrogates to Predict Potential Ecological Impacts from Marine Renewable Energy

BOEM Information Need(s) to be Addressed: The purpose of this study is to identify and analyze available data from ongoing projects or activities (surrogates) with stressors and receptors similar to those expected from marine renewable energy projects. Stressor-receptor pairs that may be particularly useful to analyze from surrogates include: (1) electromagnetic fields from operating power cables as impediments to migration of marine mammals and anadromous fishes (salmonids and green sturgeon), and (2) mooring configurations of offshore aquaculture facilities and oceanographic buoys as entanglement hazards for marine mammals. Given that no current marine renewable energy facilities exist, and because BOEM may receive applications for renewable energy projects in the near future, analyzing data from surrogates will provide some of the best available and most timely information to make informed decisions regarding project permitting and guide future research efforts. BOEM will use results from this study for impact assessments contained within NEPA documents, and also in consultations required by the Endangered Species Act and the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

Cost Range: (in thousands) \$240-\$360

Period of Performance: FY 2013-2014

Description:

Background: There are currently no marine renewable energy arrays operating on a commercial scale in United States waters. This compromises the ability to understand, predict, manage and mitigate potential impacts of proposed marine renewable energy projects. To perform timely environmental review, data from ongoing projects and activities (surrogates) with stressors and receptors similar to those expected from marine renewable energy projects can be analyzed to reduce the uncertainty in the range of outcomes and intensity of environmental consequences. Stressor-receptor pairs that may be particularly useful to analyze from surrogates include: (1) electromagnetic fields from operating power cables as impediments to migration of marine mammals and anadromous fishes (salmonids and green sturgeon), and (2) mooring configurations of offshore aquaculture facilities and oceanographic buoys as entanglement hazards for marine mammals. Other useful stressor-receptor pairs from appropriate surrogates may be identified.

Objective: The objective of this study is to analyze existing data from surrogate projects to predict the ecological consequences of proposed marine renewable energy facilities.

Methods: To meet the study objective, a Broad Agency Announcement (BAA) will be used to solicit proposals with varying technical/scientific approaches (per 48 CFR 35.016(a)). One to three projects will be funded under this BAA, with each project receiving a maximum of

\$100,000 in funding. Given the need for timely review, each proposed project must complete the final report within one year of the initial financial award. No new data are to be collected as part of this study; proposed work shall analyze information already available.

Revised date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013–2015

Region: Pacific OCS Region

Planning Area(s): California, Oregon and Washington

Title: Data Synthesis and High-Resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS

BOEM Information Need(s) to be Addressed: With the passage of the Energy Policy Act of 2005, BOEM acquired responsibilities for renewable energy activities on the OCS, including wind, wave and offshore current power development. As part of this responsibility, BOEM will conduct detailed environmental analyses of renewable energy projects proposed for development. The potential direct, indirect and cumulative impacts on the human, coastal and marine environments must be evaluated in order for BOEM to make environmentally sound decisions about managing renewable energy activities and developing mitigation measures to avoid or minimize impacts. Experience from onshore wind development and wind development offshore in Europe suggests that siting of facilities is an important consideration for minimizing impacts to bird species. Presently, there are extensive seabird databases for the Pacific OCS that provide relative density estimates and distributions at sea along fixed transects. However, species-specific distributions and estimates can be improved and extended to areas between transects or in non-surveyed areas by incorporating appropriate environmental and oceanographic covariates to model continuous density distributions.

Cost Range: (in thousands) \$440-\$660

Period of Performance: FY 2013-2015

Description:

Background: The proposed study will provide detailed information linking varying environmental and oceanographic conditions to seabirds within the Pacific OCS and will help define habitat characteristics and identify mechanisms that aggregate seabirds. Thus, this study will use the most recent seabird distributional datasets combined with oceanographic habitat features in analytical models to predict occurrence and abundance of seabirds at sea. This information is needed by BOEM in order to predict and evaluate potential environmental effects of management actions and project approvals (i.e., Liquefied Natural Gas (LNG) facilities, renewable energy structures) throughout the Pacific OCS.

Maps of seabird distribution and uncertainty in knowledge of distribution are a basic information need to assess impacts of offshore development on marine birds. Discussions during the U.S. Fish and Wildlife Service (USFWS) Marine Bird Science and Offshore Wind Workshop and the BOEM Wind Energy Workshop in 2011 emphasized the importance of identifying areas of persistent aggregations of birds (a.k.a. “hotspots”) that may be threatened by offshore wind energy development. Conversely, the identification of “coldspots” or areas where birds do not aggregate is equally important.

Sampling of the marine environment is inherently difficult due to weather and the logistics of access; and so approaches such as predictive population modeling have been recommended to provide guidance to agencies in assessing the potential impacts of development on wildlife.

Objectives: Increase BOEM's understanding of marine bird distribution on the Pacific OCS by: 1) collating existing data from surveys conducted over the last 50 years; 2) predictively modeling marine bird distribution on the Pacific OCS, taking into account all available data and relationships with environmental variables; and 3) mapping the predictive distribution of marine birds to identify areas of persistent aggregation and persistent avoidance ("hotspots" and "coldspots").

Methods: The proposed study will identify, collect and synthesize all available quantitative scientific seabird survey data for the Pacific OCS off California, Oregon and Washington and merge these in a common database. This will entail researching the history of datasets, making appropriate contacts, forming partnerships and developing metadata. Sightings will be extracted from databases by species to identify species and groups of interest, combine species into functional groups where necessary, develop standardized effort metrics and relative indices of occurrence and abundance, and develop dataset and taxa-specific uncertainty estimates/weights. Environmental and oceanographic predictors will be identified, collected, formatted and processed for the Pacific OCS. Exploratory data analysis will be conducted and modeling methods chosen that account for multiple datasets with different levels of confidence and measurement error; account for different spatial and temporal support; and adapt existing methods that have been successfully applied in other regions. Model methods will be refined to maximize predictive performance for application to the Pacific OCS.

Predictive modeling will produce continuous, high resolution (~1 kilometer (km) horizontal grid) predictive maps of presence probability and sightings per unit effort (SPUE) for bird species and groups of interest, including maps of seasonal climatological means and quantiles that are integrated to produce annual climatologies and uncertainty maps. Model predictions will be provided for presence probability and SPUE within BOEM lease blocks or similar sets of polygonal planning areas provided by planning bodies by performing spatial simulation and calculating ensemble statistics for each lease block. Predictive maps will be combined across species and groups to identify hotspots and coldspots of abundance and diversity and/or occurrence of multi-species assemblages of interest with a limited, targeted effort based on guidance from BOEM, USFWS, USGS and other interested parties on multi-species patterns of interest

A final report will be produced and delivered that presents the predictive modeling methods and results. Digital versions of predictive maps and uncertainty will be delivered in a format that is compatible with the BOEM Multipurpose Marine Cadastre and similar BOEM data sets. Results from this study will be provided in scientific presentations and peer reviewed scientific papers.

Revised Date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area(s): All

Title: Understanding the Role of Offshore Structures in Managing Potential *Watersipora subtorquata* Invasions

BOEM Information Need(s) to be Addressed: The purpose of this study is to describe the distribution, abundance and life history of the bryozoan *Watersipora subtorquata*, which is a non-indigenous species (NIS) known to exist on offshore oil and gas platforms and has the potential to negatively affect native biological communities. Using these ecological data, this study will assess the effectiveness of potential mitigation measures to prevent further colonization on uninhabited substrate. The need for this information is to elucidate the role that offshore artificial structures may have in affecting biological communities and to comply with the duties of federal agencies that are outlined in Section 2 of Executive Order (EO) 13112 (Invasive Species). The BOEM will use study results for environmental reviews concerning ongoing operations and decommissioning alternatives of offshore oil and gas platforms, and potential marine renewable energy facilities.

Cost Range: (in thousands) \$580-\$870

Period of Performance: FY 2013-2016

Description:

Background: Artificial substrate in the marine environment may facilitate the establishment and spread of NIS by providing novel habitats where native species fail to have a competitive advantage over recent arrivals. Some of these NIS may subsequently invade natural habitats and displace or change native biological communities. In southern California, biologists documented the first appearance of the non-indigenous bryozoan *Watersipora subtorquata* in 1963 at an artificial oil island located in State waters. Carlton (2000) states that the origin of this species is offshore the Pacific coast of Asia. In the decades following its first appearance, *Watersipora* has successfully colonized many bays and harbors along the California coast and a few offshore oil and gas platforms and natural reefs located in the Southern California Bight, and it is now found as far north as Yaquina Bay, Oregon. Due to its resistance to copper-based anti-fouling paints, it is commonly found on ship hulls; marine vessel traffic acts as the primary vector for translocating this species to new habitat. In other biogeographic regimes, this bryozoan has been recorded in the waters off Hawaii and in various locations in the Gulf of Mexico and western Atlantic Ocean. Under certain conditions and water depths, *Watersipora* covers virtually 100% of the available substrate and therefore experts recognize that this species has the potential to become quite destructive to native communities. Because it has been found on some oil and gas platforms located in federal waters, a report released in 2010 by the California Ocean Science Trust identified NIS as a priority information gap needed to evaluate future rigs-to-reefs proposals.

In addition to providing BOEM with needed information and the ability to comply with Executive Order 13112, study findings will directly benefit state government agencies that have key roles in managing invasive species and those that evaluate or comment on OCS activities (including rigs-to-reefs proposals and marine renewable energy projects) such as the California Department of Fish and Game, State Lands Commission, Coastal Commission and Ocean Protection Council, and the Oregon Department of State Lands and Department of Fish and Wildlife.

Objective: The overall objective of this study is to understand the role of offshore structures in managing potential *Watersipora subtorquata* invasions, and to incorporate this information into environmental reviews regarding ongoing operations and decommissioning of oil and gas platforms and potential renewable energy facilities.

Methods: To meet the overall study objectives, three tasks will be performed.

(1) *Quantify the existing distribution and abundance of Watersipora subtorquata.* Scuba divers shall use underwater transects and photographic samples to document the relative abundance and geographic and depth distribution of *Watersipora* and other prominent NIS on (a) oil and gas platforms, (b) marine vessels used to service oil and gas platforms, (c) harbors and moorings used by these service vessels, and (d) nearby natural reefs. Voucher specimens that enable species identification and future genetic analyses (if any) will be collected, preserved and archived.

(2) *Document the seasonality of Watersipora settlement at platforms and in harbors.* Over a two-year period, this study will use settlement plates to detail the reproductive seasonality of *Watersipora*. Along with published information on oceanographic currents and seafloor maps, information from tasks 1 and 2 will be used to generate a model of potential vector pathways to and from oil and gas platforms, and identify vulnerable steps in the bryozoan's life history that can be used to manage future colonization risk (see task 3).

(3) *Assess the effectiveness of mitigation measures that would prevent establishment of Watersipora in uncolonized habitats.* Once the biological data have been collected and synthesized with other available information, the study will evaluate a number of simple mitigation measures that may be employed to manage NIS. Such measures may include (a) adjusting the schedule of either marine vessel hull cleaning or platform maintenance operations that remove biofouling on submerged portions of the jacket so that they coincide with seasons not sensitive to NIS establishment, (b) growth abatement devices, and (c) vector management and other potential actions. If applicable, the study will propose a monitoring plan for early detection and response for high-risk areas. Finally, the study will determine if a partial removal option in a rigs-to reefs proposal affects the risk of NIS establishment to natural habitats.

Once completed, study results will be published as a BOEM OCS Study Report and in peer-reviewed journals.

Revised date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area(s): All

Title: Predicting the Consequences of Wave Energy Absorption from Marine Renewable Energy Facilities on Nearshore Ecosystems

BOEM Information Need(s) to be Addressed: The purpose of this study is to develop a statistical model that predicts the potential effects of wave energy absorption from marine renewable energy facilities on nearshore ecosystems. The need for this information is to predict which siting alternatives of proposed wave energy facilities may generate detectable changes in nearshore ecosystems, especially kelp forests. The BOEM will use results from this study for impact assessments contained within NEPA documents, and also in essential fish habitat coordination and consultation requirements established by the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

Cost Range: (in thousands) \$240-\$360

Period of Performance: FY 2013-2015

Description:

Background: To perform environmental analyses, BOEM requires information about the sensitivity and resilience of biological habitats to disturbance. Because little is known about how activities related to wave energy conversion devices on the outer continental shelf might affect nearshore habitats, numerous scientific reviews rank this information gap as a priority for future research. Some nearshore coastal marine communities are sensitive to wave energy, most notably kelp forests. Kelp forests provide a number of important ecosystem services and have been identified as habitat areas of particular concern (a subset of essential fish habitat) by the Pacific Fisheries Management Council. Thus, it is important to assess how reductions in wave energy might affect these habitats.

Objective: The objective of this study is to use existing data to build a statistical model that describes how wave energy may structure nearshore communities, and to use this information to predict the ecological consequences of various siting options for proposed marine renewable energy facilities.

Methods: To meet the study objective, three tasks will be performed.

(1) Determine the distribution of wave period and amplitude across the study region. The Pacific Coast includes a number of very exposed and very protected locations, including offshore islands. Using historical buoy data and oceanographic wave models, data will be generated and developed through use of GIS to show the distribution of nearshore wave energy throughout the study region. The maps will indicate the natural variation in exposure experienced by nearshore communities, helping to put into context potential human alterations to wave dynamics. The maps will also provide inputs needed for building a model of how nearshore communities respond to variation in wave exposure. The Coastal Data

Information Program will provide algorithms that compute wave energy as a function of swell direction, amplitude and period for each point along the coastline of the study region. This program has been supported by BOEM and its oceanic swell data come from sensors on Pacific Platform Harvest. By parameterizing the algorithms with historical data from Harvest, monthly plots will be made for maximum, average, and cumulative wave heights for the duration of the available data. This will indicate annual, seasonal and spatial variation in wave exposure in the study region.

(2) *Determine how wave model predictions relate to empirical observations along a depth gradient.* Wave models are coarse in their predictions and not fine-tuned to smaller spatial scales where species interact, and they do not indicate wave energy at different depths. The physics of breaking waves leads to attenuation of force and turbulence with depth. To extrapolate wave model predictions to forces acting on specific subtidal sites in marine communities, one must measure wave energy in the field at different depths and compare this to model predictions. Real time wave energy sensors will be deployed in the field to sites with a known variation in wave exposure (e.g., Pt. Conception) to determine the relationship between buoy projections, depth and wave forces that create environmental disturbances such as displacing kelp. The resulting model will express wave disturbance as a function of depth and wave period and amplitude.

(3) *Determine how marine communities respond to variation in wave exposure.* Kelp forests are sensitive to wave exposure and we presume that they are adapted to average conditions in the region. Wave action could affect various ecological factors, such as recovery rates from disturbance, productivity and biodiversity. Examining the sensitivity of these factors to wave exposure requires a long data set where community time series can be analyzed at several different sites. These long-term data sets exist and are presently being organized and analyzed by the BOEM-funded *DOI Partnership: Distinguishing Between Human and Natural Causes of Changes in Kelp Forests Using Long-term Data from DOI Monitoring Programs*. Wave energy will vary both in time and space, and allow the creation of statistical models that express nearshore communities as a function of wave energy in time and space. In this case, wave energy will be estimated from wave models as in task 1, and adjusted according to site depth as in task 2. With such statistical models, it will be possible to estimate a change in community state that might result from a change in wave energy state. For instance, one could predict changes to the nearshore community that would result if a renewable energy facility reduced the average amplitude of waves on shore by 10%. Due to non-linearities in the response of communities to waves, these models could predict where renewable energy facilities would lead to significant changes and whether these changes were considered positive or negative in terms of ecosystem services. Generalized linear models will be used to express how wave disturbance, as identified in task 2, affects temporal and spatial variation in the biodiversity, productivity and resilience of nearshore ecosystems using data derived from the *DOI Partnership* study.

Revised date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area: Hawaii

Title: Habitat Affinities and At-Sea Ranging Behaviors among Main Hawaiian Island Seabirds

BOEM Information Need(s) to be Addressed: The BOEM and the state of Hawaii likely will receive proposals to develop offshore renewable energy related projects within state and federal waters surrounding the main Hawaiian Islands (MHI) and both agencies are developing a renewable energy taskforce. Presently, there is increasing interest in research leases and commercial-scale projects offshore the MHI. For example, the state is planning an inter-island power cable to transmit electricity from renewable energy projects (wind) between the islands of Lanai and Molokai to load centers on Oahu and possibly Maui. In addition to future infrastructure, such cable-laying operations (especially lighted operations at sea), pose a ship-strike or grounding risk to free-ranging seabirds that are prone to light attraction. Such risk is expected to vary according to species, time of year and environmental conditions. Currently there is a lack of quantitative information that links distribution, movements and behaviors among seabirds with physical habitats in waters surrounding the MHI. More information is needed by BOEM to evaluate potential environmental effects to seabirds and their oceanic habitats caused by installation of new renewable energy infrastructure (i.e., hydrokinetic and wind-energy structures) within OCS waters off Hawaii. A recently approved FY12 Study Plan seeks to establish a ‘*Seabird Vulnerability Index*’ based on observations of seabirds at sea recorded from ships and archived in extensive historic databases. These data primarily are focused on the California Current and Eastern Tropical Pacific, and include much less information regarding seabirds in OCS waters off Hawaii. The USGS is currently acquiring behavioral data from seabirds in Hawaii and the California Current using sophisticated telemetry techniques that enable measurements of flight behaviors associated with ranging patterns, wind speed/direction and sea-state. Furthermore, USGS and collaborators have generated predictive models of fine-scale wind and wave fields for waters surrounding the MHI. This proposed study will provide additional detailed information linking abundant Hawaiian breeding seabirds with coastal and offshore habitat utilization surrounding the MHI and help link surface wind and wave direction data with proposed *in situ* seabird bird telemetry data.

Cost Range: (in thousands) \$720-\$1,080

Period of Performance: FY 2013-2015

Description:

Background: The MHI and associated offshore islets (i.e., Mokumanu, Kaula, Lehua, Manana and Molokini) provide substantial breeding habitat for more than a dozen seabird species including shearwaters, albatrosses, petrels, frigatebirds, boobies, tropicbirds and terns. Two main island species, the Newell’s Shearwater and Hawaiian Petrel are listed under the Endangered Species Act (ESA) as threatened and endangered, respectively. Presently, very little is known about breeding population sizes and trends, breeding biology and foraging

ecology among MHI seabirds. The suite of seabirds that comprise the Hawaiian community are uniquely adapted to relatively low productivity waters and patchy prey resources. Several species co-depend on schooling predatory fishes and odontocete cetaceans to locate and make available important forage fishes and squids, and therefore, certain Hawaiian seabirds can be used to identify ocean regions of important community-level food-web interactions and trophic transfer of energy. Furthermore, certain Hawaiian seabirds have adapted ranging behaviors, morphologies and flight characteristics that capitalize on energy associated with predominant wind patterns and wave energy. Hawaiian seabirds face increasing threats at sea including competition with fisheries, pollution and marine climate change. Increasing interest in ocean-based renewable energy and certain activities associated with development of these energy resources pose additional risks for seabirds. For example, there is increasing documentation of seabird interactions with wind-turbine structures, lighted facilities, and elevated power lines on land and lighted ships at sea within OCS waters off Hawaii. Risk depends on seabird behavior at sea (e.g., time per area, soaring flight behavior associated with wind speed/direction and wave height/direction).

Objectives: Increase BOEM's understanding of at-sea habitat utilization and ranging behaviors for seabirds breeding within the MHI by: 1) Conducting multi-species and multi-scale quantifications of at-sea habitat utilization and ranging behaviors for seabirds breeding within the MHI; and 2) compiling and providing an analysis of remotely-sensed and model-derived habitat data (e.g., chlorophyll concentrations, sea surface temperature (SST), sea surface height, sea level pressure and wind speed/direction) to examine habitat relationships that can be used to predict species' distributions and improve spatial vulnerability maps.

Methods: 1) Existing recent USGS telemetry-based information on at-sea utilization and behavior (albatrosses, petrels) will be combined with new measurements of at-sea habitat utilization (Global Positioning System (GPS), Ultra High Frequency (UHF) and Global Location Service (GLS)-based telemetry and archival sensors) among the most abundant (and multi-species, seabird/tuna/dolphin-affiliated), near-island foraging species (e.g., Wedge-tailed Shearwater). For species that frequent MHI waters (e.g., Great Frigatebird), tracking deployments will be targeted at significant roosting areas (e.g., Molokini off Maui Nui); 2) spatially-explicit habitat modeling will be used to combine seabird utilization with oceanographic habitat to generate mapped species probability distributions and multi-species data will be combined to delineate community-level hotspot areas; and 3) numerical models will be generated that relate flight behavior with fine-scale (2-6 km) winds and waves to evaluate 3-dimensional risk

Results will include: 1) raster-based maps of species distributions within State and Federal waters adjacent to the MHI, and 2) a numerical model that relates wind speed and direction to seabird flight speed, direction and altitude above the sea surface. Results will be provided in scientific presentations, peer reviewed scientific papers, and in a readily accessible, comprehensive marine GIS package that will be delivered in a format that is compatible with the BOEM Multipurpose Marine Cadastre and similar BOEM data sets.

Revised date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013–2015

Region: Pacific OCS

Planning Area(s): Hawaii

Title: A Biogeographic Assessment of the Main Hawaiian Islands

BOEM Information Need(s) to be Addressed: There is increasing interest in the development of offshore renewable energy projects off the coast of the main Hawaiian Islands (MHI). The University of Hawaii and the Natural Energy Laboratory of Hawaii have expressed interest in obtaining OCS research leases offshore Oahu and Hawaii, and BOEM has received unsolicited requests for wind leases offshore of Oahu. In addition, BOEM is developing a programmatic EIS for the “Hawaii Interisland Renewable Energy Program (HIREP): Wind” that includes analysis of a potential OCS subsea power cable for inter-island energy transmission. The BOEM needs baseline information on a variety of biological and physical resources offshore of the MHI to determine knowledge gaps, conduct environmental analyses and inform the decision making process for the review of offshore renewable energy project submittals. A biogeographic assessment of the MHI will expand BOEM’s assessment capabilities and contribute greatly toward ecosystem-based management of the marine resources of the MHI.

Cost Range: (in thousands) \$400-\$600

Period of Performance: FY 2013-2015

Description:

Background: Defining biogeographic patterns throughout the MHI is an effective way to synthesize existing information about biological and physical resources off the MHI. Biogeography is the study of the spatial and temporal distribution of organisms, their associated habitats, and the historical and biological factors that influence species’ distributions. A biogeographic assessment will compile and synthesize readily available georeferenced data describing the physical oceanography, and the distribution and abundance of benthic habitats, cetaceans, seals, seabirds, fish and invertebrates (including corals) in the MHI. Collectively, these datasets (in a Geographic Information System [GIS] format) would be used by BOEM to better characterize the marine resources found within state and federal waters, and potentially support renewable energy siting and development in and around the MHI.

The study will include characterization of the physical and biological environments (e.g., oceanography and benthic habitats) that structure the spatial and temporal distribution of living marine resources off the coast of the MHI. Readily available information on the distribution of living marine resources, including key species of interest identified by BOEM staff, will be integrated with available biophysical information using various spatial analysis techniques. Where possible and readily available, the study will integrate existing human use information related to the MHI.

Objectives: Questions to be addressed in this study include:

- How are trophic groups, families and species distributed spatially & temporally in the MHI?
- Where are ecologically unique and productive habitats located in the MHI?
- How are ecologically important areas being utilized by living marine resources?
- Where can offshore renewable energy projects (e.g., wind farms) be located to maximize energy production and minimize potential impacts to the marine environment?
- What significant gaps exist in our knowledge about of the physical, biological and ecological characteristics of the MHI?

Methods: The specific tasks for this project include: 1) identification and acquisition of existing relevant, readily-available physical, biological and ecological datasets for the study area including information about benthic habitats, cetaceans, seals, seabirds, fish and invertebrates (including corals); 2) organization of data into a common spatial framework within GIS, and identification of information gaps in existing datasets and research activities; 3) synthesis of GIS data and development of maps depicting the spatial distribution of physical, biological and ecological data sets for the study area; 4) biogeographic analysis of available data to identify ecologically significant regions, based on species distributions, abundances, associated benthic habitats and other datasets if appropriate; and 5) preparation of a report summarizing methods and key findings, including relevant maps, figures, tables and appendices. Readily available data on physical, biological and ecological data sets will be obtained from groups actively working in the region (i.e., academic, government, consulting, nonprofit and other groups). Relevant datasets will be formatted and organized into a preliminary database management system (DBMS) to assess their quality and content. All data acquired and used for the assessment will be standardized into a common spatial projection within a GIS. With the DBMS and GIS in place, the extent and quality of data will be evaluated, important information gaps will be identified, and appropriate analytical techniques will be selected given the quality and spatial extent of the data collected and the desired products. Once the datasets have been formatted and organized, maps will be developed depicting the spatial distribution of the physical, biological and ecological data. If the data allows, species abundances will also be mapped. The GIS data used to create these maps will be delivered to BOEM, along with metadata describing source, derivation and limitations of each GIS data layer, when possible. The quality of the final maps will depend on the quality, quantity and availability of data for analysis. Key ecologically important areas will be identified based on the following criteria: 1) the availability, completeness and limitations associated with specific datasets; 2) maps denoting the distribution and abundance of specific species; and 3) the distribution of bio-physical habitats. All data will be integrated into a spatially-explicit index in an attempt to evaluate overall spatial patterns. A final report will be prepared describing key ecological patterns, linkages and locations highlighted by the project's quantitative and qualitative analyses. All data sets and GIS products will be delivered in a format that is compatible with the BOEM Multipurpose Marine Cadastre and similar BOEM data sets.

Revised Date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area(s): Southern, Central, and Northern California

Title: Expansion of West Coast Oceanographic Modeling Capability

BOEM Information Need(s) to be Addressed: Analysts in the Pacific Region are limited in the geographic area where they can model oil spill trajectories. Data input to the model needs to be updated to enable a finer spatial and temporal resolution. Expanding the geographic range and data precision will allow BOEM analysts to conduct more accurate offshore oil and gas risk analyses. Expanding oceanographic modeling capability for oil and gas across southern California would meet the needs of BOEM Pacific Region's offshore oil and gas program.

Cost Range: (in thousands) \$160-\$240

Period of Performance: FY 2013-2015

Description:

Background: The oil spill model, General NOAA Oil Modeling Environment (GNOME), which BOEM Pacific Region currently uses to conduct oil spill risk analyses, is limited in geographic area to active oil and gas development locations in southern California. The data input to the model needs to be updated and expanded to provide more accurate information to fulfill our responsibility to conduct offshore oil and gas risk analyses over a wider geographic area. The Integrated Ocean Observing Systems along the west coast of the United States maintain and enable real-time data of wind, waves and currents offshore coastal California. These data are typically stored in a format that can be brought into oceanographic models. Conducting a re-analysis or hindcast of the available oceanographic data would enable analysts and decision makers to see how wind, waves and currents vary seasonally and yearly. Broadening the geographic range of available data and acquiring, compiling and converting real-time data into a format to run in oil spill models will improve BOEM Pacific Region's ability to conduct oil spill risk analysis in southern California.

Objectives:

- Expand the geographic area that BOEM Pacific Region is able to examine for oil and gas risk analyses;
- Provide more up-to-date and accurate data for oil spill models.

Methods: This project will run a multi-year hindcast, or re-analysis of winds, waves and currents along the coast of California. This will be accomplished through acquiring and converting existing data, incorporating the data into oceanographic models, running these models and interpreting the results. The project would be completed in three sub-systems. 1) Winds would be calculated at high horizontal and temporal resolution and validated using existing data sets; 2) A wave model would be forced by the wind model results and be validated through in situ measurements; 3) The ocean model would be run at high resolution and include temperature, salinity and currents, assimilate in situ data and be forced by the

hindcast wind model results. This three phase analysis will provide a more accurate representation of processes driving oceanographic conditions. The end products will be 1) data products that can be incorporated into NOAA's GNOME model for oil spill risk analysis; 2) visual outputs of oceanographic conditions along the coast of California; 3) assembled products and data that will be publicly available and can be incorporated into oceanographic models for future analyses; 4) information that will be in a format compatible with other BOEM analysis requirements (e.g., Multipurpose Marine Cadastre and Environmental Studies Program Information System)

Revised date: April 30, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2013-2015

Region: Pacific OCS Region

Planning Area(s): Southern California

Title: Platform Impacts on Seafloor Communities in the Southern California Planning Area

BOEM Information Need(s) to be Addressed: The BOEM's planning efforts need to be based on current scientific information. Plans involving Federal platforms need to consider the seafloor animals impacted by past and ongoing operations near these platforms. Information on seafloor invertebrate species and abundances in the vicinity of existing federal platforms in the Pacific OCS is outdated and was last collected over 17 years ago. The proposed study will collect seafloor invertebrates near platforms and analyze these data against an existing, extensive regional dataset. Results of this study will enable BOEM to evaluate the impact to seafloor communities exposed to very different types of platform discharges and use this information in all environmentally-based planning, from current platform level operations to regional level decommissioning decisions.

Cost Range: (in thousands) \$360-\$540

Period of Performance: FY 2013-2018

Description:

Background: Benthic (seafloor) invertebrates are often used to assess sediment quality because they live in sediments and adapt to site-specific conditions. They integrate the biological effects of multiple co-occurring contaminants and multiple stressors over time. A well-established method for evaluating impacts from offshore drilling and mud cutting discharges is to conduct community-level analysis of the benthic invertebrates near and far from the discharge source. Studies have typically shown that the invertebrate community within one to two km of a platform (i.e., where the bulk of the discharge has landed) is distinct from a more distant and un-impacted community. Some studies, however, did not find this pattern and could not detect impacts to invertebrate communities, which has been attributed to factors such as depth, the amount of discharged material, and the toxicity of the material.

The Southern California Planning Area represents a unique opportunity to evaluate the impact from drilling discharges across a range of all three of these factors; depth, volume of discharged material, and toxicity of material. In fact, the only two studies within this area to examine impacts from drilling discharges to invertebrates living in soft-bottom habitats have demonstrated this range of results. A platform installed before 1965 in shallow waters contained a clearly impacted seafloor community while a study of active discharging in 1995 concluded that no impacts occurred to soft bottom invertebrate communities. Another key benefit to conducting this study in the Southern California Planning Area is that this region already has a robust and well-defined understanding of what is "normal" or considered un-impacted. The southern California planning area supports more than 5,000 invertebrate species. Interpreting impacts to benthic infaunal assemblages is challenging because

hundreds of species and thousands of individuals are often found in one square meter of sediment. Resource managers across many agencies in this area have developed a single interpretive tool to remove this complexity by converting the complex biological information to a single number that ranks sites on a scale from “good” to “bad”. The BOEM can then use this tool, along with other multivariate analyses, to prioritize impacted sites, track trends over time, or correlate benthic biological responses with data about stressors, such as chemical contaminant concentrations. Identifying the type of chemical or if the change to a community is caused by grain size changes, is important for predicting the recovery time of a community and developing effective mitigations. Many people involved with decommissioning in California assume that large areas of the seafloor surrounding all Federal platforms are impacted. Testing that assumption across platforms with different drilling histories and depths will inform future decommissioning efforts as well as improve current environmental analysis.

Objectives: The objective of this study is to determine the extent that platforms and discharges from platforms may have altered seafloor infauna and epibenthic invertebrate communities. More specifically, this study will compare the community structure of invertebrates near platforms to un-impacted samples collected within the same region to determine if communities near platforms are distinct. Secondly, if communities near platforms are distinct, than invertebrate communities near platforms can be analyzed further to determine if communities near platforms have been impacted differently. To determine if habitat changes (i.e., grain size) or toxicity changes are driving community changes near to platforms, community abundance data can be correlated to physical and chemical parameters.

Methods: To meet the study objective, field sampling, analyses, and reporting are necessary. Box core and trawl samples will be collected of soft-bottom infaunal and megabenthic invertebrates at platforms representing a range of depths and drilling histories in the summer of 2013. The sampling design near to the platform is intended to detect the maximal impact; therefore box core samples will be collected outside any debris formed from cleaning jacket legs (e.g., shell mound) yet within 1 km of the platform. Trawl samples will be taken at the closest distance that is safe, which will be consistent among platforms with similar depths. At least one sample will be taken in the direction of predominant currents as determined by existing videos of shell mound shape and other available oceanographic information. An additional sample will be taken at the same time and location to assess physical and chemical parameters. Collection and laboratory methods will follow established protocols for this area in order to be compared to existing and concurrent sampling events. This sampling will also be subject to the same robust quality assurance protocols as prior regional sampling to ensure that results can be fully integrated with all other past and 2013 sampling events. Analyses will utilize multivariate statistical testing and the Benthic Response Index to test for differences in invertebrate communities near to platforms compared with samples in similar habitats. If differences are found, analyses will test for differences among platforms and for strong correlations with physical and chemical parameters. A report will be written that describes the analysis and makes conclusions as to the degree and extent of impact to invertebrate communities near Federal platforms in the Pacific OCS.

Revised date: April 9, 2012

2.3 FY 2014 Table

Table 3. BOEM Pacific OCS Region Studies Proposed for the Fiscal Year 2014 NSL

Page #	Discipline	Title
39	HE	Influence of Pacific Offshore Platforms on Marine Fish Ecology
41	MM	Nearshore Marine Bird Surveys from Southern California Points and Beaches: Baseline for Offshore Renewable Energy and Post-lease Oil and Gas Projects
AQ = Air Quality		FE = Fates and Effects
HE = Habitat and Ecology		IM = Information Management
IN = Interdisciplinary		MM = Marine Mammals and Protected Species
PO = Physical Oceanography		SE = Social and Economic Sciences

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2014–2016

Region: Pacific OCS Region

Planning Area(s): Southern California

Title: Influence of Pacific Offshore Platforms on Marine Fish Ecology

BOEM Information Need(s) to be Addressed: The long-term fate of offshore platforms off California continues to be a subject of considerable debate and 15 years of scientific surveys funded by BOEM. Much of this work has been focused on the potential importance of the fish populations at offshore platforms. All 23 Federal and one State platform have been surveyed at least once, and many over 10 times. In addition, site-fidelity and transplantation acoustic studies have been completed for fish at several Federal platforms. The BOEM needs to have the resulting peer-reviewed BOEM OCS reports, various USGS reports, and scientific literature material compiled in a single source, professionally published reference, to support environmental reviews associated with decommissioning and for public outreach purposes.

Cost Range: (in thousands) \$140-\$210

Period of Performance: FY 2014-2016

Description:

Background: Since 1995, USGS, BOEM and the California Artificial Reef Enhancement Program (CARE) have provided funding to conduct research on the fishes that live around the platforms and on natural rock outcrops of central and southern California. To our knowledge, over the past 15 years, DOI is the only public agency (Federal or State) that has funded research at the offshore platforms. The study proposed for FY 2012, *Biological Productivity of Offshore Oil and Gas Structures in the Pacific OCS*, if approved and funded, will be completed before the start of this project and from that study we expect a manuscript submittal and work *in press* to a scientific journal well within time to be included in this present effort. The BOEM needs to have the resulting peer-reviewed BOEM OCS reports, various USGS reports and scientific literature material compiled into a single, professionally published reference to support environmental reviews associated with decommissioning and for public outreach purposes. There are many peer-reviewed papers and reports. The goal is to publish a book or special issue of a respected peer-reviewed journal on the influence of Pacific offshore platforms on marine fish ecology based on information obtained through these studies. An identical effort in the Gulf of Mexico resulted in a 2003 special publication from the American Fisheries Society titled “Fisheries, Reefs, and Offshore Development,” which addressed the influence of Gulf of Mexico platforms on marine fish (see <http://www.afsbooks.org/x54036xm>). Permission was requested and received from multiple sources to reprint and compile published peer-reviewed literature.

Objectives: Publish a reference book containing peer-reviewed literature, summaries of BOEM OCS reports, various USGS reports, and other scientific literature material pertaining to OCS platforms in southern California.

Methods: Methods include forming an editorial review board, collecting and compiling the peer-reviewed papers and BOEM and USGS reports, as appropriate, and choosing and working with a publisher such as the California University Press, the American Fisheries Society, or a journal such as the Bulletin of Marine Science.

Revised date: April 9, 2012

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2014-2016

Region: Pacific OCS Region

Planning Area(s): Southern California

Title: Nearshore Marine Bird Surveys from Southern California Points and Beaches: Baseline for Offshore Renewable Energy and Post-lease Oil and Gas Projects

BOEM Information Need(s) to be Addressed: The BOEM regulates post-lease oil and gas activities on platforms off the southern California coast. In addition, BOEM will likely receive renewable energy proposals within this area. The proposed study will provide up-to-date information on species composition, distribution, abundance and seasonal variation of nearshore marine birds along this section of coast. The data generated will be used for environmental review of both renewable energy and oil and gas projects proposed in the area.

Cost Range: (in thousands) \$200-\$300

Period of Performance: FY 2013-2015

Description:

Background: The BOEM funded aerial seabird surveys offshore southern California from 1999-2002. The results of that study were published (Mason et al. 2007), comparing the results to those obtained 20 years earlier by Briggs et al. (1987). In addition, BOEM funded shorebird surveys on Ventura County beaches from 1994-1997 (McCrary and Pierson 2002) and again from 2007-2010, report pending. While these surveys provide valuable information regarding the status and distribution of birds at-sea and on local beaches, little information has been collected regarding species composition and abundance of marine birds in the nearshore environment where platforms exist and renewable energy facilities will be installed.

The shoreline of Los Angeles, Ventura and Santa Barbara Counties in California is closest to the oil platforms off southern California and most likely to be affected by a spill. In addition, these waters are expected to attract renewable energy proposals due to their proximity to urban centers. The birds found in nearshore areas (including loons, grebes, scoters, pelicans, cormorants, etc.) are among the birds most affected by oil spills in California and species that could be affected by offshore renewable energy development. There are anecdotal indications that the distribution and abundance of some of these species has changed over the past decade.

The proposed study will provide up-to-date information and establish a more robust data set from which to draw on for marine spatial planning, environmental analyses and oil spill responses. Shore-based surveys, with the possibility of being supplemented by small-boat or aerial surveys, will provide a more thorough assessment of bird distribution and abundance than previous aerial surveys including the ability to detect migration movements along the coast. The latter will be valuable for assessing the placement of offshore wind turbines and hydrokinetic devices. Marbled Murrelets have been observed off the Ventura County coast during recent National Audubon Society Christmas Bird Counts and the proposed surveys

may help refine the status of this federally threatened species where it is poorly known south of its regular range.

Objectives: 1) To observe and characterize the distribution, abundance and migratory passage of nearshore marine birds along the mainland coast of Los Angeles, Ventura and Santa Barbara Counties in California; 2) to characterize the current marine bird diversity, distribution, abundance and migratory movements within the study area; and 3) to refine the status of the Marbled Murrelet in the study area.

Methods: Monthly surveys will be conducted over a 3-year period. Surveys will be taken from shore-based observation sites using binoculars and spotting scopes and possibly supplemented with some small-boat or aerial surveys. Survey sites will include coastal promontories and other areas that provide sufficient visibility to survey areas up to 500 m from shore. Known shore-based seabird watching locations will be used for the surveys including Point Fermin, Point Dume, Mugu Rock, Pitas Point and Goleta Point.

To ensure that the coast is adequately surveyed, additional survey sites will be established by reviewing historical information and consulting with local experts on nearshore bird distribution, migratory pathways and sites that provide an elevated and wide view of the coast. Access to Naval Base Ventura County and Vandenberg Air Force Base may be necessary to survey key points along large expanses of coastline under military ownership.

Survey methodologies from similar studies will be reviewed and modified, as necessary, to account for site-specific considerations and equipment availability. The exact methodology will be determined later, but will be similar to other land-based survey methodologies and incorporate the most applicable protocol. Examples of applicable protocols include:

The Puget Sound Seabird Survey protocol:

http://www.seattleaudubon.org/sas/Portals/0/Science/Puget_Sound_Seabird_Survey/PSSS_Protocol_10-11.pdf

The nearshore distribution of terns and other seabirds in relation to EnCana's Deep Panuke natural gas pipeline construction in Stormont Bay, Nova Scotia:

<http://www.bsc-eoc.org/organization/images/news/ternrpt.pdf>

The survey results and data analysis will be published in a report to BOEM. Compiled data will be in a format compatible with other BOEM database requirements (e.g., Multipurpose Marine Cadastre and Environmental Studies Program Information System).

Revised date: April 9, 2012

SECTION 3.0 TOPICAL AREAS for FISCAL YEAR 2015

Renewable Energy and Alternate Use

Implementation of the BOEM Renewable Energy and Alternate Use Program from offshore wind and wave facilities remains a priority for the Pacific Region. Each of the Pacific Coast States has adopted renewable portfolio standards, and the OCS will likely be one area that will be tagged for contributing to the States' renewable energy goals. Studies are currently being performed to gather information for future projects along the Pacific Coast – to assess new technology opportunities for offshore California, Oregon, Washington and Hawaii; identify suitable areas and conditions; and examine regional environmental effects. These include marine mammal and seabird surveys, benthic surveys offshore potential renewable energy sites, and updated marine archaeological and cultural sites digitized databases. Additional studies will be needed as renewable energy and alternate use activities increase. Future studies will be needed to consider the impacting agents of proposed deepwater wind and wave energy devices, to identify suitable areas and conditions, and to examine environmental effects for the entire Pacific OCS Region of Washington, Oregon, California and Hawaii.

Shorebird Surveys of the Channel Islands off Ventura and Santa Barbara Counties

The ESP presently funds a cooperative agreement with California State University Channel Islands to survey shorebirds along the Ventura County coastline. This study provides a long-term data set of shorebird populations and allows BOEM to assess real or potential effects of adjacent existing or potential offshore energy operations on sensitive shorebird species and to better assess the effects of long-term climate change in the region. Similar information for the Channel Islands would be beneficial in the event of an oil spill, and the National Park Service has indicated an interest in partnering with BOEM on this effort.

Comprehensive Geodatabase and Geospatial Mapping of Seabird and Marine Mammal Data for the Pacific OCS

The Pacific Region has sponsored the collection of data on seabirds on the OCS for several decades. Recently, major strides have been made towards collecting seabird survey data in additional areas and in the form of improved survey design (e.g., Seabird and Marine Mammal Surveys off the Northern California, Oregon and Washington Coasts) with USGS and USFWS. As a result, we have a large collection of knowledge about seabirds and marine mammals and it continues to grow. Some projects are near completion (e.g., Shorebird Survey of Ventura County), or will complete field collection in about 2 years (e.g., Seabird and Marine Mammal Surveys off the Northern California, Oregon and Washington Coasts). A final compendium of information in the form of geodatabase expressed as geospatial mapping will augment our understanding of the seabird and shorebird and marine mammal species that are potentially at risk from offshore energy development and provide maps that illustrate the results in a way that is understandable to decisionmakers and the public. As new information becomes available, the data can be folded into the existing database once work is completed.

Decommissioning

The Pacific Region faces a variety of environmental information needs related to decommissioning and probable creation of artificial reefs from some oil and gas platforms. The focus of this topical area continues to be the study of potential environmental impacts due to decommissioning OCS facilities off California, many of which are in exceptional water depths. Review of the 2004 Proceedings of the Decommissioning Workshop (http://www.boemre.gov/omm/pacific/lease/Decommissioning/Summary_Recommendations_to_MMS.htm) and comparison to studies that have been accomplished since that time, show that most of the recommendations have been completed or are underway. The 2012 Studies Development Plan included two recommended studies from the workshop; one on productivity of platforms under two decommissioning options and one on sea lion use of offshore structures. However, a few issues related to marine mammals and onshore dismantlement, disposal and recycling remain. Specific areas of potential future studies may include assessment of removal and disposal of marine growth, development of criteria/factors in assessing potential onshore processing sites, and a review of the effects from the most current methods of severing platform legs applicable to Pacific Region platforms.

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