Environmental Studies Program: Ongoing Study

Title	California Deepwater Investigations and Groundtruthing (Cal DIG) II (PC-19-06)
Administered by	Pacific OCS Region
BOEM Contact(s)	Jeremy Potter (jeremy.potter@boem.gov); Lisa Gilbane (lisa.gilbane@boem.gov); Mark Mueller (mark.mueller@boem.gov)
Procurement Type(s)	Inter-agency Agreement (NOAA); Intra-agency Agreement (USGS)
Conducting Organizations(s)	National Oceanic and Atmospheric Administration (NOAA); U.S. Geological Survey (USGS)
Total BOEM Cost	$3,350,189 Note: BOEM funding is from the Environmental Studies Program ($2,675,000) and the Pacific OCS Office ($675,189).
Performance Period	NOAA: FY 2019–2024; USGS: FY 2019–2023
Final Report Due	NOAA: December 31, 2023; USGS: December 31, 2022
Date Revised	March 24, 2022
PICOC Summary	
Problem	Seafloor habitats and the commercially important fish and invertebrates that utilize these habitats could be affected by leasing activities offshore California.
Intervention	The solution is to understand what types of habitats exist near potential BOEM activities and how fish and invertebrate species utilize these habitats based on correlations to selected species and abundances.
Comparison	We will select areas that give us the broadest range and variability in habitats that could exist within a geographic area relevant to BOEM renewable energy activities.
Outcome	Benthic communities and commercially important species will be identified and correlated with specific features, habitats, and environmental conditions.
Context	Two Wind Energy Areas have been identified offshore Northern and Central California. Potential Call Areas offshore Oregon are now being discussed.

BOEM Information Need(s): BOEM needs basic, regional data on the geology and biological community structure and use of the seafloor in many parts of the California and Oregon OCS. The offshore of California has proven to be a region of competitive interest for the development of energy on the OCS. BOEM is working with the State of California in anticipation of a potential lease sale for floating wind energy development offshore both central California and northern California in the fall of 2022. BOEM and the State of Oregon are now at the initial stages of identifying potential lease areas offshore southern Oregon.

The seafloor in the two areas of potential development offshore California and Oregon are focused on 300–1,300 m depths and contain seafloor areas which are valuable to commercial fisheries, unique coral and chemosynthetic seeps, and potentially other sensitive areas, which BOEM will need to consider in its decisions regarding leasing. Results from this study are providing a regional understanding of sensitive areas and use by selected fish and invertebrate species. That regional context is needed to evaluate

future applicants' site-specific surveys. This research will enhance understanding of the structure and function of significant biological communities and help BOEM define and delineate unique seafloor areas offshore California. Biologically based habitat use and characterization information will aid both renewable and conventional energy needs through National Environmental Policy Act (NEPA) documents and supporting consultation and analysis requirements under the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and the National Historic Preservation Act.

Background: Fish associations with habitat, and specifically corals, give mixed responses dependent on species and locations (Tissot et al. 2006, Auster 2005, Hourigan et al. 2017). For much of the shelf off of California, this habitat has also been impacted by bottom trawling, with some of that area then conserved over ten years ago (Hixon and Tissot 2007, Lindholm et al. 2015). Few visual surveys are available for the proposed areas of interest. The Long Term Ecological Research project has supported and supplemented the long-standing California Cooperative Oceanic Fisheries Investigations surveys in the southern portion of the proposed area focusing offshore Point Conception on mid and surface water oceanography and biological sampling. Inshore, the State of California has supported video surveys to evaluate the effects of Marine Protected Areas (Ortiz and Tissot 2008; Starr et al. 2008). Surveys to the south and in National Marine Sanctuaries in the general bathymetric range of 300–1,000 m documented diverse and sensitive habitat types including statistically significant populations of high-relief hard bottom substrates, hard and soft deepwater corals (Greene et al. 2003), and canyon-wall areas with a high diversity habitats (Hixon, Tissot and Pearcy 1991). Fisheries landings and 300 m resolution soundings data suggest similar canyons and features that support corals and high diversity exist in the area of interest.

Through the prior Cal DIG I effort, BOEM and the U.S. Geological Survey (USGS) completed geophysical surveys in the area of south-central California (20–35 mi offshore, 500–1,200 m water depth). That effort assessed regional hazards and created habitat maps by collecting regional bathymetry (10 m resolution) and reflectivity of the seabed, as well as ground truth-related sampling. Cal DIG I data informed subsequent biological surveys for this proposed study. To the north, USGS is collecting geophysical data that is needed to select habitat type for visual transect surveys. The deepwater environment offshore California is large and one cruise cannot yield the final answer to the question of seafloor use and ecology by commercially important fishes. However, the currently funded acquisition of sensor data, along with commitments to partner from USGS, NOAA, and the Monterey Bay Aquarium Research Institute (MBARI) make this the ideal time to define habitats and link those habitats with fish use and abundance, for an area that will inform BOEM decisions.

Objectives: This study is providing BOEM with a regional level characterization and relative use of seafloor (benthic) habitats to selected fish and invertebrate communities in anticipation of commercial energy installations.

1. Identify and map major geologic features and habitats of the seafloor.
2. Identify the distribution and abundance of benthic communities and selected commercially important fish and invertebrate species, which could include areas of fish refugia, deepwater coral communities, chemosynthetic areas, and historic properties (shipwrecks).
3. Assess relative habitat use and sensitivity of selected areas by comparing food-web ecology, coral age-structure, and genetic diversity across depths and environmental gradients.

Methods: BOEM will collaborate with NOAA and USGS scientists and managers to prioritize areas for mapping and targeted habitat characterization. The interagency effort will stretch BOEM dollars and

ensure that data and information addresses multiple objectives. Multibeam/backscatter surveys will fill in a subset of remaining mapping gaps. Biological and limited physical sampling will be conducted using remotely operated vehicles (ROVs) capable of performing high-definition visual surveys and sampling between approximately 300–1,100 m. Physical measurements at the seafloor will include temperature, bottom sediment type, grain size, and currents, if possible. Multiple survey transects will be conducted to quantify invertebrate and demersal fish assemblages with the surficial geology (Blanchard et al. 2008). The ROV will collect limited samples of coral and sponge species for taxonomic, genetic identification, isotopic testing, and submission to the Smithsonian Institution under an existing BOEM Agreement. Invertebrates in soft-bottom areas will be collected by grabs to identify rare or unique species assemblages. To the extent possible, archaeological investigation(s) will be conducted on potential historic shipwrecks encountered during the Cal DIG I surveys. Shipwreck encounters are a possibility because this was, and is, a frequent route to San Francisco from points south.

Substantial work is ongoing to process, analyze, and interpret collected data. Video will be viewed multiple times to quantify biological species, unique seafloor features, and possible historic properties. Species will be identified to appropriate taxonomic units and analyzed using statistical and multivariate analyses. A subset of species groups will inform Coastal and Marine Ecological Classification Standard Biota mapping classifications and existing habitat suitability models to create geospatial maps. End products will include community and distribution analysis of invertebrates and fishes, geospatial maps of biological habitats across the whole region, and identification of unique seafloor features. The contractor will produce a final written report that summarizes the analysis and interpretation as well as provide associated maps and databases.

Specific Research Question(s):

1. What are the major features and habitats of the seafloor relative to OCS leasing areas?
2. How do benthic communities and selected commercially important fishes utilize the seafloor habitat?
3. What is the relative connectivity of selected seafloor associated communities and start to assess their vulnerability to disturbance?

Current Status: The two Cal DIG II inter/intra-agency agreements have contributed to four field efforts off the west coast to date. Progress has been hampered due to COVID, but field work and analysis activities started ramping up again in summer 2021. Success of the fall 2021 multibeam surveying work with USGS and NOAA was impeded by weather and mechanical issues. Follow-up work is planned in spring 2022. NOAA is leading a major tri-agency benthic habitats survey effort offshore Oregon and northern California in September 2022.

Publications Completed: None

Affiliated WWW Sites: https://marinecadastre.gov/espis/#/search/study/100246

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