### Environmental Studies Program: Ongoing Study

<table>
<thead>
<tr>
<th>Title</th>
<th>BOEM-MARINe (Multi-Agency Rocky Intertidal Network) (NSL #PC-15-02)</th>
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<tr>
<td>Administered by</td>
<td>Pacific OCS Region</td>
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<tr>
<td>Total BOEM Cost</td>
<td>$2,152,000</td>
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<td>Performance Period</td>
<td>FY 2015–2020</td>
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<tr>
<td>Final Report Due</td>
<td>April 30, 2020</td>
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<td>Date Revised</td>
<td>January 16, 2020</td>
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<td>PICOC Summary</td>
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#### Problem
Active oil and gas operations can significantly impact rocky intertidal resources. Many sectors of the public visit and care strongly about rocky shorelines as sensitive habitat, home to a diversity of species, including the endangered black abalone.

#### Intervention
Monitoring rocky shores annually is a statistically robust way to determine if there are impacts caused from OCS operations and to be able to understand the cumulative impacts to this sensitive habitat. Additional site-wide protocols are conducted to understand changes among sites.

#### Comparison
This program can only make regional comparisons by relying on monitoring outside of OCS activity areas, which is done with identical methods and funded by our 40 universities and agency partners. Temporal comparisons are very sensitive because there are 20 years of data. These data were utilized in BACI-based analyses of non-OCS oil spills, water pollution, and marine protected area assessments.

#### Outcome
Prior efforts indicate that OCS oil and gas-related activities are not a primary impacting factor and that can be distinguished against several other anthropogenic effects. Trends impacting rocky shore species, such as human trampling and disease, are expected to intensify along with continued oil and gas production. We will continue to monitor community metrics as well as the abundance and size-structure of protected species and key physical factors inside and outside of potential OCS-related impact areas. The public engagement with this program will continue to be strong and results will directly inform NEPA and ESA consultations as well as significantly benefit the State of California.

#### Context
Southern California, Central California, Washington-Oregon

**BOEM Information Need(s):** Ongoing monitoring of rocky intertidal sites adjacent to OCS production facilities allows BOEM to directly assess potential and/or real impacts to the coastline from OCS operations. With these data, BOEM can directly assess impacts to shoreline resources from OCS activities by differentiating between
naturally caused impacts and other anthropogenic impacts, including impacts from OCS oil and gas production and accidental oil spills. The study implements BOEM’s OCS Lands Act mandate to monitor the marine and coastal environment adjacent to OCS operations.

**Background:** Potential impacts to the shoreline are of particular concern in the Pacific OCS Region because OCS operations are located very close to shore. Public concern with these impacts has a considerable effect on the program. BOEM and its 40 partners in MARINe biannually monitor over 100 established shoreline rocky intertidal sites using a targeted assemblage protocol from California to British Columbia. MARINe partners also use a biodiversity protocol to sample an additional 100 plus sites from Alaska to Mexico on a periodic basis. MARINe employs standardized field protocols and a shared database ([www.pacificrockvintertidal.org](http://www.pacificrockvintertidal.org)). This study provides funding to monitor 32 BOEM long-term monitoring sites adjacent to OCS operations, including 8 sites off the Oregon coast where potential OCS offshore wave and wind energy facilities are planned. BOEM continues to participate actively in the management and oversight of MARINe, to access the data critical to our ongoing operations, and to fulfill our responsibility to monitor OCS platforms and pipeline operations.

**Objectives:** This study provides for the continued monitoring of 32 rocky intertidal sites on the mainland shore immediately adjacent to OCS oil and gas and potential wind and wave facilities. Information generated will provide the basis for evaluating impacts to the shoreline from OCS activities, especially accidental oil spills, and nearshore wave-energy-related effects. A web-based trend analysis of BOEM-funded sites in combination with other MARINe sites in the shared database, along with coordination of MARINe and database tasks are included so that BOEM has access to data needed for management decisions. A vouchering effort is ongoing in coordination with the Smithsonian to archive species.

**Methods:** Sites are monitored by six teams of field biologists, including the BOEM Pacific Rocky Intertidal Survey and Monitoring (PRISM) team. Barnacles, mussels, seastars, black abalone, surfgrass, limpets, turf weed, rock weed, and other algae are either photographed in fixed plots in the field, or measured and counted in irregular, circular, or band plots. This protocol provides a high confidence for detecting a small amount of change in abundances of targeted species. Based on analyses of two decades of continuous monitoring data twice a year, sampling was reduced to once a year starting in fall 2015. In February 2016, teams combined to complete biodiversity or community sampling at four sites, which is a more intensive sampling completed on a five-year rotation. The biodiversity sampling allows BOEM to evaluate species changes across the site, identify rare species, and provide clues to climate change such as movement of species in relation to elevation and temperature. It has proved especially valuable, in combination with other protocols, in assessing oil spill injury, chronic effects from water pollution, and community changes in response to shoreline protection. The sampling protocols are standardized across MARINe and are used by all MARINe field teams. Work collecting and archiving specimens for submission to the Smithsonian will also be continued during FY 2015-2020.
Data are placed in a common database and are accessible through graphing, downloads, and map visualizations, as well as through specific requests to the database manager.

**Specific Research Question(s):**

1. **What is the trend over time (in percent cover or counts sampled once a year) for selected species and communities in fixed plots at 32 sites along the U.S. West Coast?**
2. **What is the species diversity at a site and how do community metrics vary among sites?**
3. **How does the size-structure (as a proxy for age class) of black abalone, owl limpets, and sea stars change over time and in response to an impact?**
4. **How do communities and selected species differ among sites that are near to and away from OCS activities in California and Oregon? Evaluate the cumulative impacts to this resource.**

**Current Status:** The BOEM-UCSC cooperative agreement was awarded on May 1, 2015 and is in Year 5. In June 2016, the U.S. Navy contributed funds to BOEM to support the management and updates of the MARINe database. The 2019 MARINe Annual Meeting was canceled because of the government shutdown. The report will be finalized in April 2020.

**Publications Completed:**


**Affiliated WWW Sites:**

[https://marinecadastre.gov/espis/#!/search/study/100090](https://marinecadastre.gov/espis/#!/search/study/100090)
[http://www.pacificrockyintertidal.org](http://www.pacificrockyintertidal.org)

**References:** None