

Environmental Studies Program: Studies Development Plan | FY 2022–2023

Title	Seamount Benthic Mapping and Characterization for Deep-Sea Corals, Benthic Ecosystems, and Critical Minerals and of the Aleutian Islands (MM-21-04)
Administered by	Marine Minerals Program and Alaska OCS Region
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Procurement Type(s)	Inter-agency agreement with anticipated NOPP sponsorship
Conducting Organization(s)	USGS, NOAA
Total BOEM Cost	TBD
Performance Period	FY 2021–2024
Final Report Due	TBD
Date Revised	4 March, 2020
PICOC Summary	
<i><u>Problem</u></i>	Seafloor areas along the Aleutian Islands are likely to contain seamounts with hydrothermal activity and associated benthic endemic populations. These hydrothermal systems are co-located with populations of deep-sea coral or other sensitive benthic species and are as yet unmapped. Hydrothermal systems in this region may be rich in critical minerals defined essential to the economic and national security of the United States in E.O. 13817.
<i><u>Intervention</u></i>	BOEM, USGS, and NOAA, will work together on an initial mapping and follow-on characterization mission to collect baseline information on benthic ecosystems and seafloor mineral deposits. BOEM proposes to map and evaluate the occurrence of seamounts to identify targets for benthic species and hydrothermal activity survey. The follow-on mission will return for direct observation to quantify both biological communities and mineral occurrence.
<i><u>Comparison</u></i>	This study would allow for comparison of the biodiversity and community composition associated with critical minerals in the Aleutian Arc and help facilitate evaluation of differences between areas with and without critical mineral deposits.
<i><u>Outcome</u></i>	The study aims to provide baseline and exploratory seafloor observations in areas of the OCS in the Aleutian Arc to aid in evaluation of biological communities and in discovery of marine minerals. These data, including bathymetry, seafloor acoustic and optical imagery, and direct sampling (initially CTD samples followed by ROV grab and suction and fluid samples), will inform NEPA-required analysis for potential future lease sales related to Aleutian Islands hydrothermal systems.

Context

This proposed work pertains to the Aleutian Arc regions within the Alaska OCS, which contains permissive regions for marine mineral types that are of interest for base (Zn, Cu), critical (Co, Mn, REE, Sb, Te) and precious (Au, Ag, Pt) elements.

BOEM Information Need(s): Executive Order 13817 and associated “Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals” requires “...increasing activity at all levels of the supply chain, including exploration, mining, concentration, separation, alloying, recycling, and reprocessing.” This study would help implement this directive by providing baseline and exploratory seafloor observations in targeted areas of Alaska in the Aleutian Arc that hold potential marine minerals. Scientific understanding of the seamount communities and benthic ecosystems would be enhanced and would help inform NEPA-required analyses related to potential future lease sales, Exploration Plans, and Development and Production Plans.

Background: A recent Presidential Memorandum "Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska" directs federal agencies to draft a Strategy to map the entire US EEZ. BOEM is already funding an ongoing IAA with USGS to identify critical mineral areas in Alaska which will help inform the target areas for this proposal. Within the OCS, the Aleutian Islands are a significant unmapped, ice-free priority region for critical mineral exploration. Mapping of target areas in the Aleutian Islands is of high importance in fulfilling both the requirements of both E.O 13817 and the Presidential Memorandum.

The Aleutian Islands are the only oceanic-arc subduction zone in the OCS, this type of plate boundary is highly permissive for critical minerals at seafloor hydrothermal systems. Seafloor hydrothermal fields in volcanic arcs may be particularly rich in antimony, an element important for corrosion resistance in alloys and batteries.

BOEM will partner with the USGS Coastal and Marine Hazards and Resources Program, a world leader in seafloor mineral science and mapping. Through this study, BOEM would build on this collaboration, with USGS providing in-kind contributions of data acquisition, sample processing, and personnel.

We will also partner with the NOAA Office of Ocean Exploration and Research to leverage its significant experience exploring similar environments along the Pacific ring of fire. NOAA’s Deep-Sea Coral Research and Technology Program is also hosting an Alaska Initiative planning virtual workshop in May of 2020 with BOEM participation that will inform this study. NOAA OER intends to provide matching funds for mapping and anticipates additional matching NOAA NOPP funding for new autonomous mapping systems.

Objectives:

- Identify the location and distribution of seamounts and associated hydrothermal activity in priority regions of the Aleutian Arc.
- Subsequent investigation will explore benthic communities including deep sea corals and sponges and whether any are endemic to critical mineral habitats.

- Provide baseline biological/geological/chemical information regarding benthic habitats, endemic species, and critical minerals needed to evaluate the potential environmental impacts associated with seabed mining.

Methods: This study will visit up to six unexplored or poorly explored sites along the Aleutian Arc. The sites span a wide range of depths (100m-3600m) and extend 700 miles along the Aleutians from Kagamil Island in the east to Buldir Island in the west. The proposed project will begin with mapping and water column investigation using multibeam sonar collecting both water column and seafloor backscatter. Once seamounts are located the mission will use a continuous CTD deployment, or 'tow-yo,' to search for any neutrally buoyant hydrothermal plume. CTD instrumentation will include a transmissometer and methane sensor, and possible deployment of NOAA Miniature Autonomous Plume Recorders (MAPRs) along the CTD cable.

Where hydrothermal activity is located, the follow-on study will progress to direct seafloor observation and sampling from an ROV or human-occupied submersible. Observation will include video and acoustic recordings; sampling will include ROV biology and geology grab samples, push-cores, biology suction samples, hydrothermal fluid samples, and seawater samples appropriate for chemical and biological assessment.

This study is designed to potentially exploit new autonomous assets for multibeam mapping as these systems become available. Candidate systems include the iXblue DriX or Saildrone Surveyor Autonomous Surface Vessels. Either platform could provide a low-mobilization and lower risk survey option to collect multibeam in these remote locations. Any use of such assets will be in close collaboration with NOAA OER and Office of Coast Survey, with anticipated funding through NOAA NOPP matching contribution.

Specific Research Question(s):

1. Are there undiscovered inter-Island seamounts along the Aleutian Arc?
2. Are those seamounts host to seafloor mineral deposits? What types?
3. What types of biological communities exist at or near seafloor mineral deposits?
4. Are there specific biological communities endemic to the seafloor mineral deposits- and do they seem abundant throughout the region? Can any unique or unusual relationships be discerned?
5. What are some of the fauna that could potentially be impacted by marine mineral mining in these areas and what further information needs could be noted for follow up studies?