

Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Seamount Benthic Mapping and Characterization for Deep-Sea Corals, Benthic Ecosystems, and Critical Minerals of the Aleutian Islands (MM-21-04)
Administered by	Marine Minerals Program and Alaska OCS Region
BOEM Contact(s)	Paul Knorr (paul.knorr@boem.gov), Mark Mueller (mark.mueller@boem.gov), Christina Bonsell (christina.bonsell@boem.gov)
Procurement Type(s)	Interagency Agreements
Conducting Organization(s)	National Oceanographic and Atmospheric Administration (NOAA); United States Geological Survey (USGS)
Total BOEM Cost	\$1,370,000
Performance Period	FY 2024–2027
Final Report Due	September, 2027
Date Revised	October 27, 2023
Problem	Seafloor areas along the Aleutian Islands are likely to contain seamounts with hydrothermal activity and associated benthic communities including sensitive chemosynthetic species known to occur at vents and abundant deep-sea corals in other areas. This region may be rich in critical minerals (defined as essential to the economic and national security of the United States, E.O. 13817) and has also been identified as a NOMECS geographic priority area, yet remain poorly mapped, explored, and characterized.
Intervention	Guided by a multi-phase interagency study plan and a 2022 initial mapping mission, BOEM, USGS, and NOAA will continue collaborating via this exploration and characterization mission focused on submersible dives and sample collections. The work will improve baseline information about benthic ecosystems and seafloor mineral deposits in specific areas of interest.
Comparison	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.
Outcome	Focused observations in areas of the Alaska OCS that will aid in evaluation of biological communities in the context of marine critical minerals, seamounts and natural hydrothermal vents. The collected data—including seafloor acoustic and optical imagery and direct sampling (e.g., eDNA, sediment, soundscape, and water chemistry)—will inform BOEM management needs including NEPA-required analyses for potential future lease sales.
Context	The Aleutian Arc within the Alaska OCS, which is thought to contain permissive regions for marine mineral types that are of interest for hard (Zn, Cu), critical (Co, Mn, REE, Sb, Te) and precious (Au, Ag, Pt) elements.

BOEM Information Need(s): Executive Order 13817 and the 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.” Subsequent Executive Orders including 13990 *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 2021*; 14017 *America’s Supply Chains*; and 13953 *Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries* further emphasize the government’s focus on addressing the need to identify additional critical mineral resources. 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 2019 Presidential Memorandum “Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska” directed federal agencies to create and work to implement a Strategy to map the entire US EEZ and identify priority areas for exploration and characterization. The 2023 National Defense Authorization Act (in Title CIII “National Ocean Exploration”¹) codified the organizational structure including the National Ocean Mapping, Exploration, and Characterization (NOMECE) Council and Interagency Working Group on Ocean Exploration and Characterization and mandated continued implementation of the established National Strategy² to map the ocean throughout the U.S. EEZ, identify priority areas, and explore and characterize these priority areas and to regularly report progress to Congress. The Strategy and Implementation Plan³ calls on all federal agencies with ocean interests (including BOEM) to leverage the expertise and resources of multi-sector partnerships and collaboration across federal agencies and non-U.S. Government entities.

A 2022 NOMECE report (NOMECE OEC Priorities Report) identified the Aleutian Arc as a top priority geography. BOEM is already funding an ongoing IAA with USGS to identify critical mineral areas in Alaska which will help inform the target areas that are the focus of this study. 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 NOMECE, which identified the Aleutians as high priority. The Aleutian Islands are the only oceanic-arc subduction zone in the continental OCS, a type of plate boundary that is highly permissive for critical minerals associated with 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 continue to partner with USGS Programs, particularly the Coastal and Marine Hazards and Resources Program, a world leader in seafloor mineral science and mapping. Through this study, BOEM will build on this collaboration, with USGS providing substantial in-kind contributions of data acquisition, sample processing, and personnel. We will also continue to partner with the NOAA Office of Ocean Exploration and Research to leverage its significant experience exploring similar environments along the Pacific ring of fire. These partnerships have already delivered over 6,200 squares miles of bathymetric

¹ <https://www.congress.gov/bill/117th-congress/house-bill/7776/text>

² <https://www.noaa.gov/sites/default/files/2022-07/NOMECEStrategy.pdf>

³ <https://www.noaa.gov/sites/default/files/2021-11/210107-FINALNOMECEImplementationPlan-Clean.pdf>

and oceanographic data through the Sairdron Surveyor mapping project, conducted in 2022 and lauded by NOMECE as a “Flagship” project. NOAA’s Deep-Sea Coral Research and Technology Program is also an engaged partner, providing expertise and making use of the coral data to inform regional fisheries management. NOAA OER provided matching funds for ship and submersible time for this project’s upcoming fieldwork.

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, hydrothermal vent communities, and sponges, including whether any are endemic to critical mineral-related 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 13 unexplored or poorly explored sites along the Aleutian Arc. The project vessel will likely be the R/V Atlantis and the Alvin HOV although other capable assets may be substituted. The sites span a wide range of depths (200m-2460m) and extend 1,370 km along the Aleutians from Unalaska in the east to the Attu Islands in the west. In addition to the completed Sairdron Surveyor seafloor mapping data, the proposed ship/submersible expedition will conduct further seafloor mapping and water column investigation using multibeam sonar whenever possible (e.g., during transits). The general location of dive sites will be informed by existing and contemporaneous bathymetric and oceanographic data.

CTD and rosette sampling will be deployed at dive sites and other locations. CTD instrumentation will include a transmissometer and methane sensor, and possible deployment of NOAA Miniature Autonomous Plume Recorders (MAPRs) along the CTD cable. Operations will include ship-based multibeam bathymetry to fill mapping data gaps, submersible video transects, and targeted specimen, sediment, and water sampling. Observations will include video and acoustic recordings; sampling will include submersible-collected biology and geology grab samples, push-cores, biology suction samples, hydrothermal fluid samples, and seawater samples appropriate for chemical and biological assessment including eDNA and nutrient profiles.

Specific Research Question(s):

1. Are there undiscovered seamounts and/or vents along the Aleutian Arc?
2. Are those seamounts/vents 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 if so, 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 extraction in these areas?

6. What further information needs could be noted to inform follow up studies including in other geographic areas?

Current Status: NOAA ship & submersible time component in procurement; USGS science component in development for anticipated FY24 award.

Publications Completed: None

Affiliated WWW Sites: None

References: None