Environmental Studies Program: Studies Development Plan | FY 2023–2024

Title	Minerals and Ecosystems of the Remote Pacific (MM-23-02)
Administered by	Marine Minerals Program (MMP) and Pacific Outer Continental Shelf (OCS) Region
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Procurement Type(s)	Intra-agency Agreement; Cooperative Agreement
Conducting Organization(s)	U.S. Geological Survey (USGS); Academic Institution TBD
Total BOEM Cost	TBD
Performance Period	FY 2023–2026
Final Report Due	TBD
Date Revised	March 31, 2022
PICOC Summary	
Problem	Baseline environmental data are required to support BOEM analyses and decision-making as the marine critical minerals industry develops. For example, there is interest in mining polymetallic nodules on the abyssal plain south of the Hawaiian Islands, an area for which very limited environmental data exist.
Intervention	The MMP and Pacific OCS Region are funding USGS to evaluate critical mineral resources. There is opportunity to leverage this partnership for baseline environmental data collection, using a boxcore and potentially an autonomous underwater vehicle (AUV).
Comparison	This study will provide necessary baseline environmental data in areas for which industry interest in critical minerals is anticipated Exclusive Economic Zone (EEZ), south of the Hawaiian Islands.
Outcome	These data will provide essential information on the benthic habitats associated with critical mineral deposits to support BOEM analyses and decision-making, as well as USGS critical minerals prospectivity models.
Context	U.S. EEZ south of the Hawaiian Islands, other areas in the U.S. EEZ anticipated to have high critical mineral resource potential

BOEM Information Need(s): BOEM needs baseline environmental data in areas of anticipated seabed mining industry interest to inform required analyses under regulations such as the National Environmental Protection Act and the Magnuson-Stevens Fishery Conservation and Management Act (i.e., Essential Fish Habitat). Results from this study will provide initial characterization of benthic habitats associated with critical mineral deposits and significantly add to our knowledge base of potentially targeted areas. Specifically, geological, physical, chemical, and biological information will be collected at a polymetallic nodule field south of the Hawaiian Islands, as well as other areas of opportunity anticipated to have high resource potential for critical minerals. These data are crucial to assess the potential impacts of critical mineral mining on the marine environment. Additionally, resulting information will inform USGS prospectivity models to better predict critical mineral deposits and support sustainable development of the OCS in other areas.

Background: MMP and Pacific OCS Region are co-funding a USGS-led resource evaluation expedition to evaluate critical minerals resource potential for areas in the Pacific. In addition to resource evaluation, BOEM needs baseline environmental data for its analyses and regulatory requirements. This profile is intended to complement the BOEM-funded resource evaluation effort and provide funding for an environmental component designed to leverage the high cost of deep-water expeditions.

Polymetallic nodule fields lie on abyssal plains (4,000–6,000-m water depth) underneath oligotrophic waters with extremely slow sedimentation rates that allow for nodule formation (Dutkiewicz et al. 2020). The Clarion-Clipperton Zone is a 4.5 million km^2 abyssal plain in close proximity to the southern Hawaiian OCS which contains trillions of nodules. Polymetallic nodules contain high amounts of Ni, Cu, Co, Mo, Zr, Li, Y, and rare-earth elements that are valuable for technology and energy applications (Hein et al. 2013). These vast nodule fields play an important role in global ocean health (e.g., the marine carbon cycle; Smith et al. 2008), host a diverse community of organisms (Amon et al. 2016; Laroche et al. 2020), and provide a myriad of ecosystem services (Armstrong et al. 2012). Benthic habitats associated with polymetallic nodules have shown limited capacity to recover from disturbance within several decades (Simon-Lledó et al. 2019; Vonnahme et al. 2020; see Investigation of an Historic Seabed Mining Site on the Blake Plateau). Although many studies have been conducted in the Hawaiian Islands area, studies have been limited to the upper 2,000-m water depth, which is much shallower than where nodule mining would occur.

Objectives: This study will inform BOEM environmental analyses and USGS models to better evaluate potential impacts of the critical minerals industry in the U.S. EEZ. It leverages existing planned cruises and targets multiple high-priority areas of interest for critical minerals. This specific funding will contribute to the following environmental objectives:

- Measure environmental parameters (e.g., dissolved oxygen, turbidity, nutrients) to assess the oceanographic regime associated with critical mineral occurrences (i.e., funded cruise to HI, additional opportunistic cruises TBD).
- Characterize the diversity and distribution of biological communities, including any sensitive or important habitats, in relation to critical mineral occurrences.

Methods: BOEM is partnering with USGS and academic institutions to conduct resource evaluation and environmental investigations, respectively. These combined cruises will use a boxcore and AUV (on the Hawaii expedition, potentially on opportunistic cruises as well) to collect measurements and samples at areas of mutual interest to BOEM and USGS. BOEM has a general area of interest and USGS is working to refine their models to predict where, within that general area, has the highest probability of nodule resources. The AUV will be deployed close to the seafloor to collect multibeam echosounder and backscatter data for high-resolution bathymetry maps, as well as imagery (e.g., megafauna diversity and abundance, lebenspurren) and baseline oceanographic measurements (e.g., dissolved oxygen, turbidity) to characterize the near-bottom environment. Based on remote-sensing surveys, the boxcore will be deployed at areas with highest mineral resource potential to obtain physical sediment samples for geological (e.g., nodules, sediment composition, grain size) and biological (e.g., epifaunal and infaunal diversity, abundance, distribution, meiofauna, genetic) analyses. By collecting baseline environmental data in tandem with resource evaluation, BOEM can begin to characterize habitats associated with critical mineral deposits, which will be essential to analyzing potential impacts from resource recovery. A potential National Oceanic and Atmospheric Administration multibeam effort to map the area in advance of this resource evaluation cruise is being explored. These data would be used to help inform deployment of the AUV and boxcore.

Specific Research Question(s):

1. What seafloor and sub-seafloor features exist throughout the nodule field, or other critical mineral occurrence?
2. What environmental structures and processes are characteristic of the prospective nodule area?
3. What are the diversity, abundance, and distribution of the benthic biological community, including infauna? Are there indicator taxa and/or sensitive habitat, e.g., corals, sponges?

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

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