

Environmental Studies Program: Ongoing Study

Title	Data Gap: Characterizing the Seafloor in the Mesophotic Zone (GM-20-02)
Administered by	Gulf of Mexico OCS Region
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Procurement Type(s)	Cooperative Agreement
Conducting Organization(s)	University of Rhode Island and Woods Hole Oceanographic Institution
Total BOEM Cost	\$598,744
Performance Period	FY 2020–2024
Final Report Due	04/18/2023
Date Revised	02/01/2021
PICOC Summary	
<i><u>Problem</u></i>	The mesophotic zone (40–150 m) represents a data gap in marine science at BOEM. The Bureau has a clear need to characterize seafloor features and their ecological role to develop proper management and avoidance strategies based upon ecological community structure in a high-energy environment.
<i><u>Intervention</u></i>	Five to six seafloor features, including hardbottom sites, artificial reefs, and shipwrecks will be selected for biological characterization, documentation, and mapping using photogrammetry or other acceptable methods. This will allow for proper recordation of hardbottom and cultural features as well as sessile benthic organisms inhabiting them. Where possible, mobile species information will be captured.
<i><u>Comparison</u></i>	Comparison of sessile benthic assemblages amongst natural reef habitats and man-made habitats (sanctioned artificial reefs, shipwrecks, etc.) will be examined to identify factors contributing to community structure and habitat suitability. Comparisons could also be made of the habitats among different light zones (higher light shallow and lower light data).
<i><u>Outcome</u></i>	Study results will contribute to resolving a data gap for mitigating potential seafloor features in high-energy environments. Also, characterization of biological assemblages inhabiting the de facto hard bottom habitat of artificial reefs and man-made structures such as shipwrecks will improve our understanding of mesophotic community diversity and distribution on the OCS. Study results will inform adaptive management strategies and mitigations.
<i><u>Context</u></i>	Seafloor features in the Gulf of Mexico, between 40–150 meters.

BOEM Information Need(s): With limited data on seafloor features in the mesophotic zone (medium light; 40-150 m), including site patterning and essential defining characteristics, subject matter experts are left with lacking data to determine if avoidance measures intended to mitigate impacts to benthic and cultural resources employed in these water depths are sufficient. The mesophotic zone is a high-energy environment both in terms of storm-induced wave activity and currents, but also from the relatively high rate of industry activity, high density of pipelines (and their movements), marine minerals activities, and frequent anchor deployments from operations under BOEM purview. The program needs

to prioritize multi-disciplinary scientific observations in the mesophotic zone to ensure the Agency's current mitigation strategies are appropriate. This information will directly inform Pre-Lease and programmatic NEPA analysis and Post-Lease mitigation applications and provide mission-critical site modeling that will directly inform Gulf of Mexico operations as well as forthcoming Atlantic management regimes.

Background: Few direct observations have been made of seafloor features in the mesophotic zone of the Gulf of Mexico. To date, research in the Gulf of Mexico has primarily focused on sites either in depths accessible by divers (<40 meters) or by ROVs in depths > 200 meters, leaving a significant data gap.

Objectives: This study will document and map five to six seafloor features in the mesophotic zone in order to identify variability in overall site condition. There are over 175 potential sites in BOEM's databases identified with side-scan sonar within the mesophotic zone. The protocols for the mapping task will allow for the characterization of sessile benthic communities, including spatial distribution relative to the available substrate. Comparison of sessile benthic assemblages found on natural and anthropogenic reef habitats in similar environments (region, water depth, etc.) will be examined to identify factors contributing to community structure and habitat suitability for observed species. The final report will include management and avoidance recommendations based on these analyses.

Methods: The specific methodology to achieve the objectives of this research will be developed by the cooperative parties as an integral part of this research. Potential methods include using video transect methodologies developed for photogrammetry mapping in deepwater. Such methods can be applied at this depth range with modification to account for sediment turbidity at and near the seafloor. Modeling will be performed by BOEM staff in-house. 3D Models of the sites and ortho-rectified mosaics will be generated for each of the sites utilizing ROV-acquired high-definition video. These models and maps will be made available to the public and scientific community via BOEM's website.

Specific Research Question(s):

1. What benthic species inhabit natural and anthropogenic sites in the mesophotic zone? What is the relative abundance and distribution of constituent species?
2. How do community structures found on man-made structures compare and contrast with those observed on nearby natural hard-bottom habitats?

Current Status: Site selection is now complete for the research effort. Cruise planning is now underway with an initial proposed date planned for July 2021.