Title	Highly Migratory Fish Use of Shoal Habitat
Administered by	Marine Minerals Program
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Procurement Type(s)	T.B.D.
Performance Period	FY 2020–2023
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PICOC Summary	Write one or two sentences for each of the following elements, as appropriate.
Problem	Dredging activities affect the physical and biological features of Sandbridge Shoal, which may in turn affect highly migratory fish use of the shoal.
Intervention	If we better understand the environmental setting, we can improve our National Environmental Policy Act (NEPA) analyses of impacts, as well as consultations that recommend mitigations.
Comparison	This study aims to compare highly migratory species (HMS) use of the shoal relative to other surrounding areas to help identify habitat preferences.
Outcome	We expect to improve the understanding of shoal use by highly migratory fishes across seasons and years.
Context	The study area would include Sandbridge Shoal, an active borrow area used by multiple stakeholders under the Bureau of Ocean Energy Management's (BOEM's) jurisdiction.

BOEM Information Need(s): Better understanding of fishes' use of habitats and sand features in the mid-Atlantic is important for BOEM's Marine Minerals Program (MMP) to evaluate the use and management of potential sand borrow areas in Federal waters. Sandbridge Shoal is a borrow area off of Virginia that has been used by multiple stakeholders to rebuild beaches. It is also an important habitat feature for many fishes, including HMS such as tunas, sharks, swordfish, and billfish (NMFS 2017). The National Oceanic & Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) manages HMS as a group, though habitat preferences for many species and lifestages are still unknown. Because dredging is expected to continue at Sandbridge Shoal, research on biological activity, biophysical coupling, and geomorphology will complement the geophysical and geotechnical data, and strengthen NEPA analyses that consider the potential effects of dredging.

Background: BOEM continues to investigate the ecological function of Outer Continental Shelf (OCS) geomorphic features, especially as it relates to dredge-related disruptions. Sandbridge Shoal off of Virginia supports multiple beach nourishment projects, and is expected to continue to support nourishment events for years. It also serves as Essential Fish Habitat (EFH) for many fish species, including HMS. BOEM consults with NOAA Fisheries on potential impacts to EFH. In a 2018 consultation, NOAA NMFS provided Conservation Recommendations (CRs) to consider potential effects on HMS, including spawning and rearing, resulting from dredging Sandbridge

Shoal. Many HMS are important to recreational, charter, and commercial fishing industries.

Objectives: Goals include obtaining data on the diversity and abundance of HMS on Sandbridge Shoal and nearby areas. The study should monitor how a variety of species and lifestages distribute on and around Sandbridge Shoal, and how that changes depending on temporal and abiotic factors (*e.g.*, currents, temperature, dissolved oxygen). Investigations should aim to characterize the importance of Sandbridge Shoal habitat to the reproduction, rearing, and foraging of HMS. This study should also monitor behavior and movements at a regional level and in relation to other geomorphic features along the U.S. Atlantic Coast. To better understand HMS distribution, this study should also investigate trophic interactions and prey preferences of HMS. If dredging occurs during the study, efforts should attempt to track behavior and distribution in response to construction.

The overarching hypotheses are that:

- Sandbridge Shoal is preferential habitat relative to other geomorphic features, and supports HMS throughout the year, though composition and abundance varies temporally;

- Atlantic shoals (including Sandbridge Shoal) are sites of reproductive activity for multiple HMS;

- HMS distribute according to both biotic (*i.e.*, prey resources) and abiotic (*e.g.*, temperature) forces; and

- if applicable, increased habitat variability and surface area has the potential to increase long-term diversity.

Methods: Surveys should be performed every season for two or three years. Monitoring approaches could include, at varying frequencies, biological sampling via plankton net, longline, and trawl surveys; water column profiles to measure current flow and direction and water chemistry (*e.g.*, temperature, salinity, pH, dissolved oxygen, turbidity, chlorophyll); direct observation using video cameras or remotely operated vehicles; acoustic surveys; and tagging.

These surveys would target multiple species and lifestages to gather a more comprehensive understanding of HMS shoal use. Data would then be modeled with abiotic factors to identify any environmental correlations with HMS occurrence. Sampling of fish distribution, composition, and biomass would occur before, during, and after dredging to investigate changes. Additionally, if available, a similar habitat not subject to dredging would be sampled as a control site, thus following a Before-After-Control-Impact (BACI) model.

BOEM will seek out industry and stakeholder knowledge, including local fishermen that target HMS off the mid-Atlantic. BOEM will also coordinate with NMFS to identify specific data gaps, survey methods, and challenges before field operations.

Opportunities may exist for leveraging ongoing surveys by other researchers, including other BOEM programs such as the Office of Renewable Energy Programs. BOEM will coordinate with other Federal, state, and academic entities currently researching HMS and other prey species, while also sharing data with other tagging efforts and existing telemetry arrays, as outlined in the Atlantic Cooperative Telemetry (ACT) Network.

Specific Research Question(s):

1. How do highly migratory species (HMS) use Sandbridge Shoal, particularly for reproduction and foraging? How does this compare to use of other available habitats in the mid-Atlantic?

2. How does HMS use of Sandbridge Shoal vary temporally? Which factors (biological, physical, or chemical) impact species' distributions most strongly?

3. How might dredging impacts (*e.g.*, turbidity, benthic prey removal, geomorphic shoal changes) affect HMS shoal use?

4. What best management practices and long-term management would maintain or improve Sandbridge Shoal habitat for HMS?

References:

National Marine Fisheries Service (NMFS). 2017. Final amendment 10 to the 2006 consolidated Atlantic highly migratory species fishery management plan: Essential Fish Habitat and environmental assessment. NOAA Fisheries Office of Sustainable Fisheries, Atlantic Highly Migratory Species Management Division. September 1, 2017. 442 pp.