

Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Fish Fry: Frying Pan Shoals Biophysical Dynamics (MM-22-03)
Administered by	Headquarters
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Procurement Type(s)	Cooperative Agreement
Conducting Organization(s)	University of North Carolina, Wilmington
Total BOEM Cost	\$2,200,000
Performance Period	FY 2022–2026
Final Report Due	September 2026
Date Revised	October 16, 2023
Problem	Offshore sand resource alternatives in sand-starved Southeast North Carolina (NC) are limited to thin sand sheets, buried channels, and a cape-associated shoal complex. Frying Pan Shoals (FPS), a large cape associated shoal complex designated by the National Marine Fisheries Service (NMFS) as Essential Fish Habitat (EFH) and Habitat Area of Particular Concern (HAPC), contains a significant volume of Outer Continental Shelf (OCS) sand and has been identified as a potential long-term resource to support future coastal resiliency planning efforts. Physical and biological ecosystem function drivers of this highly productive and dynamic system are poorly understood and could be affected by potential dredging activities.
Intervention	Gather and synthesize existing data and collect new baseline data related to physical, biological, chemical, and human coupled natural systems, including fisheries independent and dependent data. Examine the relationship of seafloor and water column disturbance to ecosystem services and dynamically model ecosystem trade-offs associated with potential dredging scenarios.
Comparison	Existing data is limited. Data obtained from this study will establish reference conditions to analyze and compare potential dredging impacts.
Outcome	Inform impact analyses through the collection of baseline information, evaluation of dredging scenarios and associated ecosystem trade-offs, and development of targeted mitigation measures.
Context	Frying Pan Shoals, North Carolina, in the South Atlantic OCS planning area.

BOEM Information Need(s): In anticipation of future lease requests within the next 2–5 years, BOEM’s Marine Minerals Program (MMP) needs to better understand the relationships between fish habitat use and OCS sand resource management decisions at FPS, a cape-associated shoal feature off of southeast NC. Offshore sand resources are limited in southeast NC, and the coastal communities of Brunswick County require more sand to support their coastal resiliency initiatives over the next 50 years than is currently available. In order to fill this deficit, sand resource alternatives have been identified in state

and Federal waters at FPS, a dynamic system with complex physical and biological drivers that support a unique and highly productive habitat. Existing physical and biological data that are needed in order to understand the relationship of future dredging related disturbance to ecosystem services is severely limited. Research on biological activity and human use can strengthen future National Environmental Policy Act (NEPA), ESA, and EFH analyses that consider the potential effects of dredging on fisheries resources and inform the development of targeted mitigation measures.

Background: FPS is currently designated by the South Atlantic Fishery Management Council and the NMFS as EFH and HAPC for many fish species. NMFS has expressed concern that long-term and repeated dredging operations could significantly impact the habitat value that supports several important commercial and recreational fisheries. Realizing that long-term coastal resiliency strategies include the use of high valued OCS sand resources at FPS, the MMP implemented the following study as a first phase effort to evaluate existing data, solicit perspectives from relevant stakeholders, and assess the science needs: "Workshop and Research Planning to Improve Understanding of the Habitat Value and Function of Frying Pan Shoals, NC on the Atlantic Outer Continental Shelf (MM-19-x06)." This initial study summarized the current physical and biological characteristics of FPS, the potential dredging implications/concerns, and the priority data gaps and research questions that may serve as a long-term science strategy to support future decision making. The technical report was informed by consultations with scientific experts, state and Federal agency officials, and local project proponents. The literature review and workshop results reinforce prior assumptions regarding the demand for future sand at FPS, limited baseline data set to inform future impact analyses, and need for developing a science strategy to fill data gaps.

The research prioritization and data collection approach for this currently proposed phase II study leverages stakeholder feedback provided in MM-19-x06 along with lessons learned from two ongoing studies evaluating ecological function and recovery of shoal habitat in the South Atlantic Bight (NT-14-x12) and the Gulf of Mexico (MM-19-01).

Objectives: Inform potential dredging scenarios using a dynamic systems model that informs trade-offs across ecosystem services.

Methods: This study will begin by developing a sampling design methodology report for ecological data collection leveraging existing data and technical insight gathered during prior workshops. The methodological approach includes sampling chemical (chlorophyll, N, etc.), biological (ichthyoplankton, benthic invertebrates, macroinvertebrates, fishes, stable isotope analyses, fish acoustic tagging), and physical and geological parameters (ADCP, side scan sonar, sub-bottom, multibeam surveys, geological coring, carbon dating), along with modeling dredging scenarios and associated ecosystem tradeoffs. Acoustic tagging and tracking of fishes as well as ichthyoplankton, longline, and trawl surveys will be used to gather data on fish communities, including temporal variation and correlation to the Cape Fear River plume discharge. Other sampling methods include the following:

- Benthic grabs – infauna composition, sediment grain size.
- Leveraging existing current and wave data – sediment transport, larval dispersal, "fronts" associated with concentration of fish/prey.
- Turbidity – water quality, natural fluctuations/background conditions, influence of riverine system to ecosystem.

- Fisher and other stakeholder interviews – engage local shrimpers and fishermen about species use of the area, as well as the local state and federal officials responsible for management of species along the shoal.
- Food web dynamics – understand the connection between benthic resources and fish via diet studies.

Specific Research Question(s):

- What is the baseline seasonal variability of benthic community species composition and distribution relative to the physical environment of Frying Pan Shoals, and how does it relate to interannual variability of the Cape Fear River plume?
- What is the habitat and spatial distribution of key species, including pelagic fish and sharks?
- What are the linkages and interplay between benthic and higher trophic levels?
- What are the sediment recharge rates based on hypothetical dredging scenarios located at various locations within the Frying Pan Shoals complex?
- How sensitive is the mesoscale morphology on Frying Pan Shoals to affecting broader sediment pathways, biological impacts, and recovery rates?

Current Status: First year of geophysical sampling completed. Additional biological and physical sampling to begin in October 2023.

Publications Completed: None

Affiliated WWW Sites: None

References: None