Environmental Studies Program: Ongoing Studies

Study Area(s): Atlantic and Gulf of Mexico Outer Continental Shelf

Administered By: Marine Minerals Program

Title: Working Group and Research Planning to identify the Habitat Value and Function of Shoal/Ridge/Trough Complexes on the Outer Continental Shelf

BOEM Information Need(s) to be Addressed: The Magnuson-Stevens Fishery Conservation and Management Act requires that any federal agency undertaking or authorizing an action that may adversely affect Essential Fish Habitat (EFH) or federally-managed fish species consult with the National Marine Fisheries Service (NMFS). In several recent EFH consultations, NMFS has expressed concern about effects to fisheries habitat and federally-managed fishes resulting from repeat dredging of sand ridge and shoal complexes. It is anticipated that NMFS will have similar concerns over wind development projects sited on shoal systems offshore the mid-Atlantic Bight, where such features are the dominant geomorphology. BOEM needs to improve the scientific understanding of biophysical coupling in these systems in order to better predict cumulative effects and design targeted mitigation strategies. A critical step is to develop a strategic scientific approach to this complex, understudied problem.

Approx. Cost: (in thousands) $150 **Period of Performance:** FY 2013-2015

Description:

Background: There is a growing consensus about the habitat value and function of physically-dominated, ridge-swale and cape-associated shoal complexes for demersal, demersal-foraging, and pelagic fishes; however, the means of biophysical coupling remain poorly understood (e.g., Vasslides and Able, 2008 ; Geomarine, 2010; Slacum et al., 2010). Differences in geomorphology and microhabitat, including factors such as sediment texture, roughness elements, and bottom-boundary conditions, have been linked to diversity in benthic and fish communities. Fish utilization has also been shown to vary on both daily and seasonal scales, but the most important habitat is consistently the finer-grained, prey rich deeper troughs adjacent to higher-relief shoals (Slacum et al., 2010). It is surmised that strong benthic prey segregation across habitat may have implications for trophic structure and bioenergetics (Michel et al., 2007).

Various shallow-water OCS activities, including dredging and wind energy development, may disturb benthic habitat and infaunal/epifaunal communities, such that there are cascading effects on keystone demersal and pelagic fishes. In the case of offshore dredging, beach fill is often derived from the same borrow area, equating to frequent dredging of the same or adjacent seafloor over a fifty year to occasionally longer period. Similarly, scour protection and scour around structures sited on shoals may destroy or enhance habitat, affecting species abundance and diversity in unpredictable ways (Blyth-Skyrme, 2010). Because most shoal features on the OCS are self-maintaining, perturbations in the footprint or profile of a sand ridge crest, flank, or adjacent swale, potentially affects local and residual flow, inducing sediment composition or

morphologic responses, etc. When a system exhibits tight biophysical coupling, the ecosystem function of sensitive biological habitat and resources may be disturbed or enhanced. If monopiles, jacketed structures, and associated foundations and scour protection systems are erected along shoal systems, marine fouling may serve to attract species and communities that may not otherwise used such habitat (e.g., Wilhelmsson and Malm, 2008) and those communities may not be adapted to physical dynamics of shoal environments.

Benthic surveys and characterizations prepared for project-specific site assessment, because of their relative expense, often under-sample and describe a system in a single, particular state (Brooks et al., 2006). To accurately characterize habitat function and value, it is important to understand the temporal and spatial variability of habitat distribution, as well as status and trends in community structure and productivity. Additional research is needed to illuminate how the dynamics of and gradients in bottom topography, sedimentology, roughness elements, and bottom boundary conditions influence the distribution and abundance of infauna, epifauna, other invertebrates, and fishes. Relatively long-term monitoring datasets, collected in different inner shelf ridge-swale settings accounting for environmental differences over daily, seasonal, and inter-annual time scales, are needed to assess habitat function pre-disturbance and then through disturbance and recovery (Michel et al., 2007).

Objectives:

- Synthesize current scientific understanding of biophysical linkages regarding habitat value and function of ridge/swale and shoal complexes, identifying critical gaps in understanding.

- Identify relevant areas, space, and time scales for study, cost-effective research methods, costs, and cost-leveraged study opportunities to develop appropriate duration datasets to address the critical gaps in understanding.

Methods: The contractor, working with BOEM and NMFS, identified potential members for, then organized and facilitated a working group of governmental, non-governmental, academic, and industry professionals, representing geological sciences, physical and biological oceanography, and fisheries biology. The working group helped to develop a draft white paper that explains current scientific understanding, identifies the critical gaps in understanding, identifies data and methodology needs, and offers a strategic research plan identifying study areas, methods, costs, and cost-leveraging opportunities. Methods utilized in this study included literature research, data mining, surveying, and synthesis, comparative analysis, and stakeholder coordination. The final white paper is pending.

Revised Date: November 26, 2014