

## **Environmental Studies Program: Ongoing Study**

**Study Area(s):** Atlantic OCS

**Administered By:** Marine Minerals Program

**Title:** Natural Habitat Associations and the Effects of Dredging on Fish at the Canaveral Shoals, East-Central Florida (NT-14-x12)

**BOEM Information Need(s) to be Addressed:** This study is a continuation of an existing collaborative effort between BOEM, Navy, and NASA to investigate the long-term use patterns and the recovery of fish communities following dredging of a borrow area offshore central Florida. Environmental monitoring is important for BOEM to document disturbances to the condition of offshore sand shoal habitat and its associated fauna, including resident and transient fish communities. To identify appropriate conservation and mitigation measures, a comprehensive understanding of the quality and function of the habitat and how it may contribute to different ecosystem services over storm, post-disturbance, seasonal and inter-annual time scales is needed. Further knowledge is needed into A) the natural behavior of federally managed or “keystone” fish species including higher level predators, and the degree to which sand shoals serve in the life history of economically and/or ecologically important coastal fishes, and B) the site fidelity and behavior of small-bodied benthic fish species in association with a dredging event. Existing project-specific, post-construction monitoring is not of sufficient duration or temporal resolution to fully understand the association of fish species with these cape-associated shoal complexes. This knowledge will improve effects analyses in National Environmental Policy Act (NEPA) documents and greatly focus and improve the outcomes of EFH consultations.

**Total Cost:** \$1,473,000

**Period of Performance:** FY 2013–2018

**Conducting Organization(s):** U.S. Navy and NASA

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### **Description:**

**Background:** The MMP is often involved with coastal restoration and construction projects that follow severe storms such as Hurricane Sandy. Environmental monitoring may be a requirement for project proponents to access and use sand resources. However, because of the relative expense, monitoring is generally limited in scope and concluded within a year of project completion. Using approximately \$500,000 of Disaster Relief Appropriations Act funds, the MMP developed a passive acoustic telemetry array in Fall 2013 on Canaveral Shoals located off Cape Canaveral, Florida (currently funded until Fall 2018) to examine the use of the shoals by managed fishes before and after dredging. Dredging began in November 2013 and was completed in late Spring 2014. The Canaveral Shoals array and tagging effort is a powerful tool in assessing the pre- and post-dredging behavior of marine organisms, allowing site fidelity, habitat preferences, and migration patterns to be resolved in fine detail without

reliance on direct observations or recaptures of animals. Previous studies have indicated that the recovery time may be greater than 3 years particularly in borrow areas that are repetitively used, such as Canaveral Shoals II (Byrnes, et al. 1999). The examination of residual impacts to borrow and control sites over a longer time period (7-10 years) from the sediment removal process will allow for BOEM to further understand the extent and nature of both disturbance and recovery to the entire ecosystem. Partnering this fish telemetry study with the University of Florida's trophic recovery study (NT-14-x14) is allowing for an examination of how the altered prey base may impact higher trophic levels and the extent of recovery over time.

Pre-disturbance and post-disturbance physical and biological sampling followed a Before-After-Control-Impact (BACI) methodology. The same telemetry array and tagging protocol is being used in a nearby control site at the Chester Shoal complex. Present sampling regimes include longline surveys and acoustic telemetry but are soon to include more fine scale acoustic sampling with the use of a recently purchased wave glider. Ideally, data on the fish locations should be collected from four different habitat settings at each site (offshore ridge slope, ridge crest, shoreward ridge slope, and swale bottom) over multiple seasons following a random stratified methodology. The stationary nature of the current receiver array makes this difficult. The recent purchase of a wave glider will allow us to examine the movement of target fish species on a broader and finer scale than the current detection abilities. This data is critical baseline data for future long-term efforts examining the resiliency of these habitats and their trophic viability.

**Objectives:** The objective of the proposed study design is to assess natural movements and habitat preferences of federally managed fishes associated with the Canaveral Shoal complex, and also to monitor finer scale movements of benthic forage fishes before, during, and after dredging the shoals. In addition, to obtain further scientific information on the habitat uniqueness and value and use of ridge/swale and shoal complexes for fish communities.

Questions BOEM would like to address include:

1. To what degree do selected fish species associate with sand shoal features?
2. For fish that do strongly associate with shoals, do they exhibit fidelity to specific locations or move freely across habitat of similar quality?
3. How do habitat preferences vary seasonally and across life stages?
4. For highly migratory species, do individual animals return to the Canaveral Shoal complex at certain times of the year?
5. Do shoal associates also utilize the surf zone, a habitat type analogous in many respects to offshore shoals and that is similarly impacted by beach renourishment activities?
6. Do benthic fishes exhibit site fidelity to open sand-mud habitats under natural conditions?
7. Will environmental disturbances from sand mining (e.g., elevated turbidity, loss of invertebrate forage base) displace fish from a given area? If so, how far are fish displaced?

**Methods:** The proposed study sites include the Canaveral Shoals II borrow area and Chester Shoals control site located off Cape Canaveral, Florida. This site is the location of the FACT array. The methodological approach for this study includes the addition of passive acoustic receivers to the FACT array, traditional fisheries sampling in the form of monthly bottom longline surveys, additional tagging of targeted fish species and the future deployment of the Liquid Robotics wave glider. Observations will be analyzed via basic statistical procedures (e.g. determination of mean values, standard deviations, transformations of data, comparisons of means) along with more complex statistical analyses and comparisons of community structure. These observations will also be integrated into an Ecopath model developed by the University of Florida (another BOEM funded study) to assess the perturbation to the system due to dredging.

**Current Status:** Twenty-eight VEMCO acoustic receivers existed within the Cape Canaveral region at the study inception in 2013. BOEM installed thirty-four additional receivers including 11 at the control site at Chester Shoals, 12 in an identical configuration at the CSII dredge site, six broadly distributed to improve the resolution of the existing array, and five deployed directly adjacent to hard-bottom reef habitat east of the existing array. 500+ fish have been tagged we have documented residency rates and behavior of 34 fish and two sea turtle species within the Canaveral Shoals complex. Nineteen fish species have locally-designated Essential Fish Habitat. Two fish (Atlantic sturgeon and smalltooth sawfish) and two turtle species (loggerhead and Kemp's ridley) are listed under the Endangered Species Act. Longline sets (16 per month) were completed from June-September and November-December 2016.

**Final Report Due:** September 2018.

**Publications Completed:** N/A

**Affiliated WWW Sites:** N/A

**Revised Date:** February 2, 2017