Field	Study Information
Title	Regional Interconnectivity of Mobile Marine Organisms among Gulf of Mexico Sand Shoals (MM-25-05)
Administered by	Marine Minerals Program
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Procurement Type(s)	Contract, Cooperative Agreement and/or Interagency Agreement
Performance Period	FY 2025–2028
Final Report Due	TBD
Date Revised	February 8, 2024
Problem	Data of habitat and shoal species (e.g., sea turtles, sharks) occurrence, distribution and movement on Sabine Bank, Texas and knowledge of shoal interconnectivity and/or differences in the northwestern Gulf of Mexico (GOM) region is necessary to establish an environmental baseline prior to dredging in near future anticipated coastal restoration projects within Louisiana and Texas, and to accurately assess future post dredging animal and shoal habitat impacts in the northwestern GOM.
Intervention	Establish and maintain an acoustic telemetry array in the northwestern GOM, particularly on Sabine Bank, Texas to acquire baseline shoal species occurrence and distribution. Monitor and maintain an active telemetry array on Ship Shoal, Louisiana. Compare and assess species interconnectivity between the two sites.
Comparison	Conduct movement and habitat occurrence analyses at Sabine Bank and Ship Shoal to gain understanding on shoal species occurrence, distribution and movement, and shoal species interconnectivity in the northwestern GOM.
Outcome	Regional understanding of interconnectivity and/or differences of shoal species occurrence and distribution in the northwestern GOM, including potential impacts to the shoal species from future development activity within the Lake Charles renewable energy lease area.
Context	GOM OCS.

BOEM Information Need(s): The Marine Minerals Program at BOEM needs to collect baseline data on Sabine Bank, Texas to help understand long term use of the shoal, particularly by sea turtles and sharks, in near-future anticipated coastal restoration projects within Louisiana and Texas that will use the shoal as a borrow area. Moreover, a regional understanding of shoal interconnectivity and/or differences in the northwestern GOM is essential for accurately assessing future post dredging animal and habitat impacts in the region. This study will inform broad spatial and temporal species occurrence, distribution and movement patterns on Sabine Bank, and through monitoring and maintenance of an established and active telemetry array on Ship Shoal, Louisiana (funded by BOEM as part of MM-19-01 and operated since 2021) BOEM will gain regional understanding of shoal species occurrence, distribution and movement, and shoal interconnectivity/differences in the northwestern GOM. Results from this study will help inform dredging windows as well as NEPA effects analysis, particularly related to fisheries

species. This study will also benefit OREP because the Sabine Bank study region is near the site of the first wind energy lease in the GOM. Acquiring baseline data will be used to better understand potential impacts of future marine minerals dredging and renewable energy projects.

Background: Several of the largest shoals and shoal complexes in the northern GOM are located on the inner shelf of Louisiana and north Texas (i.e., Sabine Bank, Trinity Shoal, Ship Shoal) and are as a primary source of sand for coastal restoration projects. However, knowledge of how mobile marine organisms, such as sea turtles and sharks, occur and are distributed along these shoals is relatively limited. Sea turtles are protected species capable of basin wide migration and are particularly vulnerable during marine minerals activities, such as dredging, as they risk injury or mortality through dredge entrainment. Traditionally, information on the distribution of marine animals within shoal habitats has relied on trawl and/or longline samples, which are subject to gear selectivity and represent a snapshot in time, limiting the ability to evaluate seasonal, and interannual occurrence of mobile taxa. In contrast, acoustic telemetry represents a potentially powerful tool to continuously examine animal occurrence and movement patterns at higher resolution over extended temporal scales. Acoustic telemetry use has increased dramatically over the past two decades, due in part to cheaper costs relative to satellite telemetry, and recent technological advances that allow researchers to passively collect movement data across a variety of spatial (meters to 1,000s of km) and temporal scales (days to > 10 years). As a result of the relatively small size of acoustic transmitters, the technology can be used on a wide range of marine organisms (and life stages) from benthic invertebrates to highly mobile bony fishes, turtles, and even large sharks. Acoustic receivers (data logging hydrophones) can be deployed in various configurations to address questions of interest related to habitat occurrence, distribution, site fidelity, connectivity, and characterization of migratory patterns, while also recording environmental data such as water temperature and ambient noise. Animal detection data can then be combined with environmental/physical data to characterize species-habitat relationships and develop predictive models (and maps) of species occurrence.

The proliferation of passive acoustic arrays across the Atlantic and Gulf (e.g., the Atlantic Cooperative Telemetry network, Integrated Tracking of Aquatic Animals in the Gulf of Mexico) has also facilitated development of large-scale cooperative networks which link arrays maintained by different research groups and have greatly improved the utility of acoustic telemetry for migratory species. Long term funding of these cooperative networks is necessary to enable data sharing across research groups and allows for continued detection of tagged animals that move beyond the initial study area. In this vein, acoustic telemetry has recently been used to evaluate long term patterns of habitat occurrence and distribution of mobile marine fauna on sand shoals in both the U.S. Atlantic and GOM. A recent study on Canaveral Shoals (NT-14-x14) on the Atlantic Ocean (Reyier et al. 2023) investigated movement and use patterns of a variety of species to determine seasonal patterns of occupancy on the shoal and habitat associations for species over a multi-year period. In addition to the species tagged in the Reyier et al. 2023 study, the study documented the presence of animals tagged by other researchers in nearby array networks. In the future, these cooperative networks can be used to further leverage other research and agency partnerships (i.e., NOAA, U.S. Fish and Wildlife Service, and USGS). Similar efforts are now underway at the Ship Shoal array in the GOM, where tagging efforts have mostly focused on blacktip sharks due to their common occurrence in that shoal. Before the establishment of the telemetry array, BOEM funded study NT-16-07 tagged a number of sea turtles on Ship Shoal to understand their movement, distribution and habitat use on the shoal.

Goal/Objectives: The overall goal is to establish and maintain an acoustic telemetry array on Sabine Bank, Texas for three years and fund additional monitoring and maintenance for a duration of three

years (no additional tagging) of a previously deployed array on Ship Shoal, Louisiana. Specific objectives include:

- Tag and characterize shoal habitat occurrence, distribution and movement patterns for sea turtles, and a coastal migratory species (e.g., blacktip shark). Combine acquired environmental data (e.g., water temperature, ambient noise) with animal detection data to characterize species-habitat relationships and movement for tagged species. Use all recorded species data (e.g., bull sharks, Atlantic tarpon, red drum) between Sabine Bank and Ship Shoal to understand potential interconnectivity and differences in species distribution between the shoals.

Methods:

1. Set up a skeleton telemetry array (i.e., 5–7 acoustic receivers) on fixed structures around Sabine Bank, with a subset of acoustic release receivers deployed on open bottom habitat of the shoal (3–5). Installing receivers on fixed energy infrastructure will allow evaluation of potential loss of equipment from trawling activities and keep a subset of receivers in reserve, as replacements for receivers that are lost. Installation of receivers in open bottom habitat within the shoal will allow to fill any noticeable gaps in the array. Service receivers 2–3 times per year.
2. Deploy a number of transmitters (about 50 total) at Sabine Bank on sea turtles and a model migratory species (e.g., blacktip shark) common to the region and known to utilize shoal habitats. Field deployments to tag species is recommended to occur 1–2 times per year over multiple years.
3. Provide maintenance funds to service receivers and data downloads 2–4 times per year for the pre-established telemetry array at Ship Shoal.
4. Conduct movement and habitat data analyses at Sabine Bank and Ship Shoal to evaluate seasonal use patterns and habitat associations of sea turtles and a model migratory species on the shoals, while also monitoring/documenting timing and occurrence of other tagged animals that use the features.

Specific Research Question(s):

1. What is the regional spatial/temporal occurrence, distribution and movement of sea turtles and a model migratory species (i.e., blacktip shark) on Sabine Bank?
2. What is the occurrence and variability of other tagged animals in the study area?
3. What is the interconnectivity and/or differences of species occurrence and distribution between Sabine Bank and Ship Shoal?

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

Reyier E, Ahr B, Lafrate J, Scheidt D, Lowers R, Watwood S, Back B. 2023. Sharks associated with a large sand shoal complex: community insights from longline and acoustic telemetry surveys. PLoS One. 18(6):e0286664. https://doi.org/10.1371/journal.pone.0286664.