



Larval transport pathways from three prominent sand lance habitats in the Gulf of Maine

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1.0 EXECUTIVE SUMMARY

Project Title: Larval transport pathways from three prominent sand lance habitats in the Gulf of Maine

Year Awarded: 2018 BOEM Interagency Agreement Number M17PG00019/P00002

RSA Priorities Addressed By This Research: N/A

Industry Partners: N/A

Coastal erosion and emersion threaten beach habitat, the species that depend on that habitat, and the recreational and economic activities that beach habitat and waterfront locations support. Climate change, in the form of higher sea level, stronger storms and changing currents, is accelerating erosion and emersion in parts of the U.S. While coastal habitats and economies can be protected through beach nourishment using offshore sand deposits, when done poorly, it can harm offshore sand habitats that support a different set of fish and wildlife populations, ecosystem functions and economic activities.

The Bureau of Ocean Energy Management (BOEM) proactively sought to assess the potential to disrupt marine habitats and ecosystem service provided by sand habitat by entering into an Interagency Agreement (IA agreement M17PG00019/P00002) with the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Services (NOS)/Office of National Marine Sanctuaries/Stellwagen Bank National Marine Sanctuary (SBNMS) to conduct collaborative research to address critical knowledge gaps relative to the productivity and ecology of sand habitat. Collaborators included Boston University, Center for Coastal Studies, University of Connecticut, University of Massachusetts - Dartmouth, and the Woods Hole Oceanographic Institution.

The goal of this work was to document and quantify the productivity and ecology of sand habitats, using sand lance forage fish as a proxy for what drives sand habitat ecological and economic value in Stellwagen Bank National Marine Sanctuary. We conducted field work, laboratory studies, data analysis and modeling to investigate the abundance and distribution of sand lance and dependent predators, sand lance ecology and life history characteristics, and the relationship between sand habitat and commercial fisheries. We used knowledge accumulated from these studies to produce sand lance and ecosystem services vulnerability matrices to describe associated risks from sand habitat disruption throughout the year.



2.0 PRELIMINARY RESULTS AND DISCUSSION

Findings that are potentially relevant for scallop fishery management in and around SBNMS are as follows:

- *Calanus finmarchicus* dominated sand lance diet by biomass and feeding occurred primarily from December – July, with peak growth and lipid accumulation from February to April, suggesting that April is a critical time for sand lance reproductive success and adult survival.
- Settlement of larval sand lance on Stellwagen Bank is estimated to occur during March and April, which coincides with the start of scallop fishing on N Stellwagen Bank.
- Stellwagen Bank sand lance originate in coastal / northern Gulf of Maine, while sand lance spawned on Stellwagen are exported south / southeast to coastal Cape Cod, Great South Channel and Southern New England.
- Stellwagen Bank shows habitat connectivity with other sand lance hotspots (Great South Channel and Georges Bank), emphasizing the importance of Stellwagen Bank as a sand lance source.
- Strong southerly winds lead to increased sand lance retention / recruitment on Stellwagen Bank, which can contribute to years of particularly high sand lance abundance in SBNMS.

3.0 SPECIAL COMMENTS

Based on our findings, we present two recommendations for the Council to consider:

1. Address impacts on the sand lance resource in the Gulf of Maine as a future work priority.
2. Prioritize research on impacts to sand lance through its five-year priority setting process for 2022-2026.