

# Stellwagen Bank National Marine Sanctuary

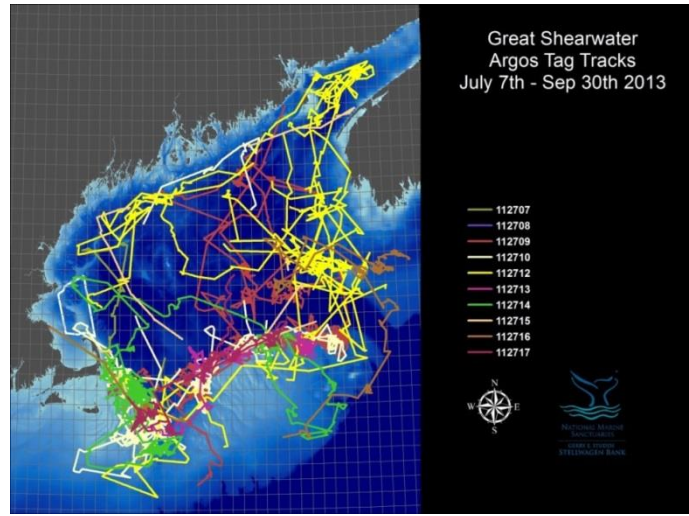
## Seabird Foraging, Habitat Use & Vulnerability to Anthropogenic Activities

### Management Issue

Seabirds are top predators in the Stellwagen Bank National Marine Sanctuary (Sanctuary), yet little is known about their movements, foraging strategies and needs, or risks from anthropogenic activities. For example, little is known about seabird food habits and how animals might be impacted by changes in forage species as a result of climate change or commercial removal.

### Description

Great Shearwaters (*Puffinus gravis*) were chosen as a representative seabird species. Great Shearwater movements are tracked via 12 g. solar PTT satellite tags (Microwave Telemetry Inc., 8835 Columbia 100 Parkway, Columbia, MD). Foraging habits are investigated using Stable Isotope Analysis based on feather, blood and exhaled gas samples. Body weights and wing measurements are taken as indicators of body condition that can be correlated to changes in food resources and patterns of habitat use. Movement data can be combined with fisheries dependent data to investigate bycatch levels and identify potential mitigation strategies.



*Movements of Great Shearwater seabirds in the Gulf of Maine and the Sanctuary. Data are derived from animal borne PTT (satellite) tags. Map: SBNMS*

### Questions and Information Needs

- 1) How do Great Shearwaters use the Gulf of Maine and the Sanctuary (habitat use)?
- 2) How is Great Shearwaters habitat use affected by fluctuations of sand lance and other key forage species in the Gulf of Maine and the Sanctuary?
- 3) What is the relative importance of various forage species in the diet of Great Shearwaters?
- 4) How does wind affect the flight behavior and movements of Great Shearwaters?
- 5) How are Great Shearwaters using the Sanctuary and ecologically connected to other parts of the Gulf of Maine, North Atlantic Ocean and entire Atlantic Ocean?
- 6) Are Great Shearwaters subjected to bycatch in commercial fisheries and where might such interactions take place?
- 7) How can Shearwater behavior contribute to bycatch?
- 8) How can Great Shearwater bycatch be mitigated?

### Scientific Approach and Actions

- Gather information on Shearwater movements using 12 g. solar PTT satellite tags
- Use state-space modeling techniques to identify key foraging areas
- Use Stable Isotope Analysis of feathers, blood and exhaled gasses to identify dietary components
- Use body weight to develop an index of body condition and health
- Combine data of shearwater habitat use with data on forage species abundance to understand how changes in forage species abundance and type impact bird health and movements
- Combine density overlap of birds and commercial fisheries to identify potential areas of bycatch
- Use onboard fishery monitors to determine if bycatch is occurring in predicted areas

*Updated: 11/06/14*

*For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>*

## Key Partners and Information Sources

US Fish and Wildlife Service, National Marine Fisheries Service, Boston University, University of MA-Amherst, Long Island University-Post and University of Canterbury (New Zealand)

## Sanctuary Resources Available

- Research vessel
- Seabird capture and biological sampling equipment
- Data from other ongoing research projects (e.g., sand lance distribution and abundance monitoring) that can be combined with shearwater data to create a more complete understanding
- GIS analysis



*A 12 gram solar PTT is fitted to a Great Shearwater in the SBNMS for identifying patterns of habitat use. Credit: SBNMS*

## Resource Needs

- Financial support

## Management Support Products

- Analyses and visualizations demonstrating habitat use by Great Shearwaters
- Identification of food habits
- Identification of potential bycatch areas
- Long-term database on body condition

## Planned Use of Products and Actions

- Inform stakeholder communities how Great Shearwaters use the sanctuary
- Solicit user input for management strategies to reduce risk of seabird bycatch in commercial fisheries
- Work with appropriate partners to develop bycatch mitigation policies
- Understanding of how climate induced changes in forage species or wind patterns might impact shearwaters

## Program References

### SBNMS Condition Report

- What is the status of biodiversity and how is it changing?
- What is the condition or health of key species and how is it changing?

### ONMS Performance Measures

- Expand observing systems and monitoring efforts within and near national marine sanctuaries to fill important gaps in the knowledge and understanding of ocean and Great Lakes ecosystems
- Investigate and enhance the understanding of ecosystem processes through continued scientific research, monitoring, and characterization to support ecosystem-based management in sanctuaries and throughout U.S. waters.

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