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MONITORING FOR CHANGE IN THE STELLWAGEN BANK NATIONAL MARINE SANCTUARY

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The Stellwagen Bank National Marine Sanctuary is an 842 sq mi, federally designated marine protected area in the southern Gulf of Maine. Its mission is to protect and restore the ecological integrity, biological diversity and cultural legacy of the sanctuary, while facilitating compatible human uses. To this end, the sanctuary has developed an innovative, extensive and multifaceted monitoring program designed to provide information to aid user groups and impacted communities in their understanding of sanctuary issues, and managers in decision-making.

Some examples are the sanctuary's monitoring of the relative abundance, distribution and behavior of endangered whales, the abundance and distribution of shipping traffic and the monitoring of ocean noise (10 – 1000 Hz). The relative abundance, distribution and behavior of endangered whales is accomplished through (1) collaborations with research groups (Whale Center of New England and Provincetown Center for Coastal Studies, Provincetown, MA) who use commercial whale watching boats operating in the sanctuary as observation platforms, (2) the use of 10 in-situ autonomous acoustic recording units (ARUs) that record and archive whale calls, and (3) the tagging of individual whales with synchronous motion, acoustic recording tags. The abundance and distribution of shipping is monitored using the USCG's Automatic Identification System (AIS). AIS continuously and autonomously transmit vessel information (e.g., identity, position, course, speed) via the VHF-FM maritime band at variable rates between 2 and 30 seconds. The sanctuary has 3 receiver sites that cover the entire sanctuary and regions beyond. Ocean noise is monitored using the ARU array. Data are visualized using a variety of commercial software (e.g., GIS, Google Earth) and custom applications (e.g., whales using TrackPlot and GeoZUI4D; Center for Coastal Ocean Mapping, University of New Hampshire and noise using the Acoustic Integration Model; Marine Acoustics Inc; Middletown, RI and Cornell University Bioacoustics Laboratory, Ithaca, NY).

An example of using these data for change involves moving the Boston Traffic Separation Scheme (TSS) for ships traversing the sanctuary to reduce the risk of collisions between ships and whales. Whale-watch derived data were used to create GIS maps of the historic distribution and abundance of whales in the sanctuary relative to the TSS. These data were augmented and substantiated using whale call data from ARUs. The TSS was identified as crossing high use whale areas and a proposal was created to divert the TSS to low use areas. Multi-beam bathymetry and sediment-type data were used to provide an ecological basis for the observed whale distribution and whale tagging data were used to help stakeholders understand the water column use of whales and resulting vulnerability to ship strike. The International Maritime Organization approved the realignment of the TSS in December of 2006 and the USCG implemented the shift on 1 July 2007. AIS was used to monitor the use of the realigned TSS by shippers and substantiated their use of the reduced risk TSS. By moving ships and ship-generated noise away from whales, the sanctuary also reduced the impact of noise to whales.

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