

ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Study Areas: Atlantic

Administered By: Office of Renewable Energy Programs

Title: Atlantic Marine Assessment Program for Protected Species (AMAPPS)

BOEM Information Needs to be Addressed: This study is addressing BOEM's need to understand the environmental baseline for protected species in BOEM's Atlantic Planning Areas. The results of this study will not only help BOEM conduct environmental assessments, but will also aid understanding how activities authorized by BOEM may impact protected species, especially marine mammals and those listed under the Endangered Species Act.

Total Cost: \$7,600,000

Period of Performance: FY 2010-2017

Conducting Organization(s): National Oceanic and Atmospheric Administration, Northeast and Southeast Fisheries Science Centers

BOEM Contact: [Brian Hooker](#)

Description:

Background: The primary tools for the assessment of population abundance and spatial distribution are aerial and shipboard line-transect surveys. These surveys typically employ visual detection of animals at the surface, though more recently passive acoustic monitoring has been incorporated into these surveys to improve detection of marine mammals. Within U.S. Atlantic waters, the NOAA Northeast and Southeast Fisheries Science Centers have jointly and independently conducted broad-scale aerial and vessel surveys to support stock assessments. Regional aerial surveys have primarily been used to assess marine mammals and turtles within waters over the continental shelf to just beyond the shelf break. The deeper waters of the continental shelf and the inner continental slope to the U.S. Exclusive Economic Zone (EEZ) are most typically surveyed using large vessels and provide data primarily on marine mammals and sea birds.

For NOAA, both aerial surveys and vessel surveys have primarily been conducted during summer months with occasional surveys in the winter. In general, the goals of the surveys were to provide abundance estimates over large spatial scales, and they have often focused on specific stocks of management interest. These survey programs have provided critical information supporting stock assessment and management of protected species and form the basis for spatially explicit models used in impact assessments. There are critical gaps in the data available for population assessments.

First, there are very limited data available outside of summer months (June-August). The last comprehensive, year round surveys of the Atlantic coast were conducted during the late 1970's and early 1980's in the form of surveys of the southeast and northeast Atlantic coast, respectively. The lack of data, particularly during spring, winter, and fall, severely limits the

ability to predict seasonal spatial distribution, especially for seabirds which disperse widely during the "nonbreeding" season. There are large and important differences for seabird use of the marine environment between summer and winter. Therefore, surveys for seabirds need to be uniformly distributed throughout the year.

Second, visual line-transect surveys suffer from known negative biases. Historical surveys typically have not attempted to correct for these biases, limiting the ability to conduct comparative studies to evaluate trends in population size. Most surveys conducted over the last 5-10 years have included approaches to correct for the ability of observers to see animals at the surface. However, in the case of marine turtles, along with deep diving marine mammals, it is particularly important to account for the availability of animals at the surface. Corrections for dive-surface intervals are a critical gap in assessments of population status.

Finally, there has been relatively limited assessment of seabird and pinniped (e.g., harbor seal, gray seal) abundance in U.S. Atlantic Ocean waters. Both of these taxa have the potential to be impacted by offshore energy projects and require dedicated assessment efforts.

Objectives: The objective of this study is to improve the knowledge base of Federal agencies with living marine resource responsibilities through improved surveys of marine mammals, sea turtles, and avian species. This will be accomplished by the following:

- collect broad-scale data over multiple years on the seasonal distribution and abundance of marine mammals (cetaceans and pinnipeds), marine turtles, and sea birds using direct aerial and shipboard surveys of coastal U.S. Atlantic Ocean waters;
- collect similar data at finer scales at several sites of particular interest to NOAA partners using visual and acoustic survey techniques;
- conduct tag telemetry studies within surveyed regions of marine turtles, pinnipeds, seabirds to develop corrections for availability bias in the abundance survey data;
- collect additional data on habitat use and life-history, residence time, and frequency of use;
- explore alternative platforms and technologies to improve population assessment studies; and
- assess the population size of surveyed species at regional scales; and develop models and associated tools to translate these survey data into seasonal, spatially explicit density estimates incorporating habitat characteristics.

Methods: The AMAPPS program will update the available data for marine mammals, turtles, and seabirds, and address critical information gaps in their assessments. The spatial scope of the program includes the U.S. western North Atlantic Ocean coast from the shoreline to the U.S. EEZ. Waters of major estuarine systems (e.g., Delaware Bay, Chesapeake Bay, and Pamlico Sound) may also be covered during aerial surveys. Within the larger area, there are a number of locations where fine-scale visual and/or passive acoustic surveys will be completed to provide enhanced resolution of densities by season. These data will also provide additional information

for testing of the density estimation models to be developed under the 6th objective. Fine-scale surveys will be incorporated into the surveys effort, as appropriate. Seabird data will be collected in several ways.

Ongoing coastal aerial sea duck and seabird surveys will be expanded spatially (northward and seaward to -30 nm), and seasonally to provide detailed estimates of seabird abundance and distribution. Seabird observers will also be deployed on NOAA survey vessels conducting marine mammal and turtle line transect surveys as well as on other NOAA fishery cruises as Platforms of Opportunity to obtain data on offshore distribution and abundance of seabirds. For seabird surveys conducted from vessels, surveys should go to the shelf break. Data collection will begin during summer 2010 with aerial surveys in the Northeast and Southeast Atlantic Regions.

Products: The data collected during the shipboard/aerial surveys and tagging data will be incorporated into a comprehensive geospatial database. This will include the *QA/QC'd* sighting and telemetry data, survey effort, visual detections, passive acoustic detections, and ancillary habitat data collected during each survey. This comprehensive ORACLE database will be available within NOAA firewalls to its partners. Limited sightings information will also be made available outside the NOAA firewall to online data access systems such as OBIS-SEAMAP. The goal of these data management systems will be to provide ready access to the collected data for both public users and government agencies in support of environmental assessments. For seabirds, data will also be incorporated into the seabird database presently housed by U.S.G.S. at Patuxent Wildlife Research Center. The spatial modeling efforts will also be integrated into online or distributed products. In addition, the collected data will be incorporated into modeling efforts in an interactive manner to allow users to develop customized models for times and areas of interest. This effort will build off the Strategic Decision Support System developed jointly by NOAA and Duke University and funded by the Navy SERDP program. Paper products expected to be produced by the project include at a minimum: annual updates to the *Atlantic Ocean and Gulf of Mexico Marine Mammal Stock Assessment Report*, annual reports of survey results, and a peer reviewed journal manuscript describing the model development and results.

Importance to BOEM: Exploration, usually in the form of seismic surveys, occurs in an area prior to drilling and production. The seismic surveys provide information used by the offshore energy industry and government to evaluate the potential for offshore oil, gas, and methane hydrate resources and geologic hazards. BOEM and industry need accurate data on the location, extent, and properties of hydrocarbon resources, as well as information on shallow geologic hazards and seafloor geotechnical properties in order to explore develop, produce and transport hydrocarbons safely and economically. In addition to potential oil and gas exploration and production, there has been a global movement to develop marine-based renewable energy sources. Wind farms, tidal and ocean wave turbine systems are in various stages of planning for U.S. Atlantic coastal and offshore waters. Seismic surveys may be used to appropriately site structures for wind energy projects. Pile driving to place structures has also been identified as a source of potential impacts to biological resources. Sand and gravel operations also utilize seismic profiles to locate and identify resources. Though the potential impact-producing activities from the production of wind, wave or tidal energy, or the development of sand and gravel resources, may differ from those presented by oil and gas exploration and development,

detailed information on the affected resources will be required for appropriate analysis and mitigation of any of the activities.

Current Status: The contract was awarded on June 22, 2010. Surveys were conducted in 2010, 2011, 2012, 2013, and 2014. 2014 was the final field season for AMAPPS I. GAM habitat models have been completed for 17 species groups. Hierarchical Bayesian models have been completed for several large whales. Work continues on the final report and a website to display seasonal species maps and reports on user selected specific areas for animal abundance and densities.

Final Report Due: Winter 2017

Publications (authors working on AMAPPS in bold):

1. **Avens L**, Goshe LR, Pajuelo M, Bjorndal KA, MacDonald BD, Lemons GE, Bolten AB, Seminoff JA. 2013. Complementary skeletochronology and stable isotope analyses offer new insight into juvenile loggerhead sea turtle oceanic stage duration and growth dynamics. *Marine Ecology Progress Series* 491: 235-251.
2. Ceriani, S. A., J. D. Roth, **C. R. Sasso**, C. M. McClellan, M. C. James, **Heather L. Haas**, R. J. Smolowitz, D. R. Evans, D. S. Addison, D. A. Bagley, L. M. Ehrhart, and J. F. Weishampel. 2014. Modeling and mapping isotopic patterns in the Northwest Atlantic derived from loggerhead sea turtles. *Ecosphere* 5(9):122. <http://dx.doi.org/10.1890/ES14-00230.1>
3. **Cholewiak D**, Baumann-Pickering S, Van Parijs SM. Description of sounds associated with Sowerby's beaked whales (*Mesoplodon bidens*) in the western North Atlantic. *Journal of the Acoustical Society of America* 134(5): 3905-3912.
4. **Cholewiak D**, Risch D, Valtierra R, Van Parijs SM. Methods for passive acoustic tracking of marine mammals: estimating calling rates, depths and detection probability for density estimation. Chapter 6 in Adam, O. (ed) *Detection, Classification and Localization of marine mammals*, pp. 107 - 145.
5. **Force M**, 2014. Bermuda Petrel in Nova Scotia: first confirmed sighting for Canada. *Nova Scotia Birds* 56(4): 42-45.
6. **Goodman Hall A**, Belskis LC. 2012. Guide to the aerial identification of sea turtles in the US Atlantic and Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFSC-633, 24 pp. or online at http://www.nefsc.noaa.gov/read/protosp/mainpage/AMAPPS/docs/TM_633_Goodman-Hall_Belskis_Aerial_ID.pdf
7. **Northeast Fisheries Science Center**. 2011. Preliminary summer 2010 regional abundance estimate of loggerhead turtles (*Caretta caretta*) in northwestern Atlantic Ocean continental shelf waters. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-03; 33 p. Available from National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://www.nefsc.noaa.gov/publications/crd/crd1103/>
8. **Palka D**. 2012. Cetacean abundance estimates in US northwestern Atlantic Ocean waters from summer 2011 line transect survey. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-29; 37

p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://nefsc.noaa.gov/publications/crd/crd1103/>

9. Scott-Hayward LAS, Borchers DL, Burt ML, Barco S, **Haas HL**, **Sasso CR**, Smolowitz RJ. 2014. Use of zero- and one-inflated beta regression to model availability of loggerhead turtles off the east coast of the United States. Final Report Prepared for U.S. Fleet Forces Command. Submitted to Naval Facilities Engineering Command (NAVFAC), Atlantic, Norfolk, Virginia, under Contract No. N62470-10-D-3011, Task Order 40, issued to HDR Inc., Norfolk, Virginia. Prepared by CREEM, University of St. Andrews, St. Andrews, Scotland. July 2014.
10. Silverman ED, **Leirness JB**, **Saalfeld DT**, Koneff MD, Richkus KB. 2012. Atlantic Coast Wintering Sea Duck Survey, 2008-2011. Division of Migratory Bird Management U.S. Fish & Wildlife Service, 11510 American Holly Drive, Laurel, MD 20708. Online at <http://seaduckjv.org/studies/pro3/pr109.pdf>
11. Silverman ED, **Saalfeld DT**, **Leirness JB**, Koneff MD. 2013. Wintering Sea Duck Distribution along the Atlantic Coast of the United States. Journal of Fish and Wildlife Management. <http://fwspubs.org/doi/full/10.3996/122012-JFWM-107>
12. Valtierra, R. D., Holt, R. G., **Cholewiak, D.**, Van Parijs, S. M. 2013. Calling depths of baleen whales from single sensor data: Development of an autocorrelation method using multipath localization. Journal of the Acoustical Society of America 143(3): 2571-2581.
13. **Waring GT**, **Josephson E**, Maze-Foley K, Rosel, PE, editors. 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2012. NOAA Tech Memo NMFS NE 223; 419 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://www.nefsc.noaa.gov/publications/tm/tm223/>
14. **Waring GT**, **Josephson E**, Maze-Foley K, Rosel, PE, editors. 2014. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2013. NOAA Tech Memo NMFS NE 228; 464 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://www.nefsc.noaa.gov/publications/tm/tm223/>
15. Zipkin EF, **Leirness JB**, Kinlan BL, O'Connell AF, Silverman ED. 2014. Fitting statistical distributions to sea duck count data: implications for survey design and abundance estimation. Statistical Methodology 17:67-81.
16. Patel Samir H., Dodge Kara L., **Haas Heather L.**, **Smolowitz Ronald J.** 2016. Videography Reveals In-Water Behavior of Loggerhead Turtles (*Caretta caretta*) at a Foraging Ground. Frontiers in Marine Science Volume 3. 2016. <http://journal.frontiersin.org/article/10.3389/fmars.2016.00254>. DOI=10.3389/fmars.2016.00254. ISSN=2296-7745

Affiliated Web Sites: http://www.wildlifetracking.org/index.shtml?project_id=537
<http://www.nefsc.noaa.gov/psb/AMAPPS/>
<http://nefsc.wordpress.com/>

Revised Date: July 6, 2017