

## Environmental Studies Program: Ongoing Study

Title	Atlantic Marine Assessment Program for Protected Species II (NSL #AT-14-03)
Administered by	Office of Renewable Energy Programs
BOEM Contact(s)	Desray Reeb (desray.reeb@boem.gov)
Principal Investigators(s)	Debra Palka (debra.palka@noaa.gov)
Conducting Organizations(s)	National Oceanic and Atmospheric Administration, Northeast and Southeast Fisheries Science Centers
Total BOEM Cost	\$9,096,000
Performance Period	FY 2014–2019
Final Report Due	September 8, 2019
Date Revised	May 20, 2019
PICOC Summary	Write one or two sentences for each of the following elements, as appropriate. If not appropriate, write N/A.
<i>Problem</i>	Broad scale and long-term ecological data on protected species in the Atlantic are limited. Collection of these data are essential in order to understand the potential effects of BOEM-related activities on these species.
<i>Intervention</i>	Aerial observations, shipboard observations and oceanographic sampling, telemetry and passive acoustic monitoring can be used to collect ecological data, covering all major species of interest.
<i>Comparison</i>	This study will build upon the 5 years of baseline data collected previously and provide a comparative data set with which to identify changing environmental conditions and assess the potential impact of BOEM-related activities on offshore species of interest in the Atlantic.
<i>Outcome</i>	Accurate abundance estimates, distribution, ecology, and behavior of marine mammals, sea turtles, and seabirds throughout the US Atlantic.
<i>Context</i>	Maine to the southern tip of Florida, from the coastline to the US EEZ.

**BOEM Information Need(s):** BOEM requires abundance and distribution information about protected marine mammal and sea turtle species for consultations under the Endangered Species Act and Marine Mammal Protection Act. Stock assessments are used to calculate take requirements for industry permits. In addition, offshore observations of bird distributions are limited but growing. These surveys allow for concurrent collection of avian information and expansion of baseline knowledge about birds offshore.

**Background:** : The first 5 years of the Atlantic Marine Assessment Program for Protected Species (AMAPPS) was a collaborative program involving BOEM, U.S. Navy, NOAA Fisheries, and U.S. Fish and Wildlife Service. The program focuses on collecting seasonal data on the abundance, distribution, and behavior of marine mammals, sea turtles, and seabirds throughout the U.S. Atlantic EEZ and providing spatially explicit

information in a format that can be used by Federal decision makers with living marine resource responsibilities. 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. AMAPPS II will continue the work of the original program in conducting surveys of the entire Atlantic EEZ in each season in replicate surveys. AMAPPS has, and will continue to support tagging of sea turtles. AMAPPS is also actively coordinating with other BOEM, NOAA, U.S. Fish and Wildlife Service, U.S. Navy, and Department of Energy funded efforts that are surveying and modeling the density, abundance, and distribution of marine mammals, sea turtles, and seabirds.

AMAPPS was initially conceived as a long-term research and monitoring program, and the first 5-year phase ended in FY2015. Although great strides have been made in improving the base knowledge regarding the abundance and distribution of marine mammals, sea turtles, and seabirds, important information gaps remain. For the next 5-year phase (FY2014-FY2019), core survey work will need to continue, particularly given the dramatic inter-annual differences in oceanographic conditions within just the first three years (2010-2012) of AMAPPS. Fine or finer scale surveys will also likely be required, along with continued efforts to integrate and cross-validate fine-scale and broad-scale survey results. Additional emphasis could be placed on tagging seabirds, cetaceans, and seals both to inform survey corrections and to gather information on behavior, seasonal movements, and habitat use. Current AMAPPS efforts are incorporating more passive acoustic survey and monitoring efforts to learn more about large whale behavior, movements and habitat use. Analytical and modeling results from the first phase of AMAPPS is helping to inform which of these various topics will be most fruitful to focus on during the next 5-year phase.

**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 tasks:

- Collect broad-scale data over multiple years on the seasonal distribution and abundance of marine mammals (cetaceans and pinnipeds), sea turtles, and sea birds using fixed passive acoustic monitoring direct aerial and shipboard surveys of U.S. Atlantic Ocean waters;
- Collect distribution and abundance data at finer scales at several sites of particular interest to BOEM, NOAA, and their partners using visual and acoustic survey techniques;
- Conduct tagging studies of protected species to develop corrections for availability bias in the abundance survey data and to investigate behavior and ecology of species in areas of interest;
- Collect additional data on life-history and ecology, including habitat use, residence time, frequency of use, and behavior;
- Identify currently used, viable technologies and explore alternative platforms and technologies to improve population assessment studies, if necessary; 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.
- Collect long-term ambient noise data in U.S. Atlantic Ocean waters.

**Methods:** Visual sightings of cetaceans, seabirds, sea turtles, and seals from shipboard and aerial surveys; acoustic detections of vocalizing cetaceans and fish from ship-towed and bottom-mounted passive acoustic recorders; and location/depth information telemetered to satellites from radio tags affixed to turtles, seals, and cetaceans. Physical water characteristics and distribution and densities of various fish and planktonic trophic levels are documented using the following: Conductivity-temperature-depth (CTD); Video Plankton Recorder (VPR); Bongo nets; Multiple Opening/Closing Net Environmental Sensing System (MOCNESS); Issac Kidd Midwater Trawls (IKMT); a modified 1x2m neuston net, midwater trawls; paired go-pro video cameras; Didson high definition imaging sonar; an Imaging Flow Cytobot, and multifrequency Simrad EK60 echosounders.

**Specific Research Question(s):**

1. What is the abundance, distribution, ecology, and behavior of marine mammals, sea turtles, and seabirds throughout the US Atlantic?
2. What environmental factors affect the distribution of surveyed species?

**Current Status:** During 2018 under AMAPPS II, NMFS conducted field studies to collect cetacean, sea turtle, seal, and sea bird seasonal distribution, abundance and biological data (12 field collection projects). In addition, NMFS staff continued to analyze past and present data collected under AMAPPS I and II (11 different projects), resulting in papers and presentations. Draft 2018 Annual report was received in April, 2019 and is currently under review. From Jan 1 to March 30, 2019, preparation for field activities was underway as well as the analysis of summer 2016 shipboard and aerial survey data to estimate abundance of 27 cetacean species for inclusion in the Atlantic Stock Assessment Reports that will be reviewed in May 2019. Efforts continue in order to develop methodologies to process passive acoustic data and to analyze the visual and passive acoustic data jointly to result in an abundance estimate of deep divers (sperm and beaked whales) that includes the availability bias. In addition many other AMAPPS-related efforts, for example, sea turtle tagging, passive acoustic data analysis, development of a protocol to identify species shifts in response to environmental changes based on habitat models, are currently being undertaken and support the overall successful progress of this study.

In the past year, AMAPPS researchers have presented 13 presentations on AMAPPS-related data at meetings both locally and internationally.

AMAPSS II will be completed in September 2019.

**Publications Completed:**

- Batta-Lona, P.G., Maas, A., O'Neill, R., Wiebe, P.H., and Bucklin, A. 2016. Transcriptomic profiles of spring and summer populations of the Southern Ocean salp, *Salpa thompsoni*, in the Western Antarctic Peninsula region. *Polar Biol.* 40: 1261-1276.
- Chavez-Rosales, S., Palka, D., Garrison, L., and Josephson, E. 2019. Environmental predictors of habitat suitability and occurrence of cetaceans in the western North Atlantic Ocean. *Scientific Reports* 9:5833.
- Cholewiak, D., DeAngelis, A.I., Palka, D., Corkeron, P., and Van Parijs, S.M. 2017. Beaked whales demonstrate a marked acoustic response to the use of shipboard echosounders. *Royal Society Open Science*: 170940.
- Davis, G.E., Baumgartner, M.F., Bonnell, J.M., Bell, J., Berchok, C., Bort Thornton, J., Brault, S., Buchanan, G., Charif, R.A., Cholewiak, D., Clark, C.W., Corkeron, P., Delarue, J., Dudzinski, K., Hatch, L., Hildebrand, J., Hodge, L., Klinck, H., Kraus, S., Martin, B., Mellinger, D.K., Moors-Murphy, H., Nieuwirth, S., Nowacek, D.P., Parks, S., Read, A.J., Rice, A.N., Risch, D., Širović, A., Soldevilla, M., Stafford, K., Stanistreet, J.E., Summers, E., Todd, S., Warde, A., Van Parijs, S.M. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014. *Scientific Reports* 17: 13460.
- DeAngelis, A.I., Stanistreet, J.E., Baumman-Pickering, S., and Cholewiak, D.M. 2018. A description of echolocation clicks recorded in the presence of True's beaked whale (*Mesoplodon mirus*). *The Journal of the Acoustical Society of America*, 144(5), 2691-2700.
- Garrison, L.P., Barry, K., and Hoggard, W. 2017. The abundance of coastal morphotype bottlenose dolphins on the U.S. east coast: 2002-2016. Southeast Fisheries Science Center, Protected Resources and Biodiversity Division, 75 Virginia Beach Dr., Miami, FL 33140. PRBD Contribution # PRBD-2017-01, 37 pp.
- Garrison, L.P., and Rosel, P.E. 2017. Partitioning short-finned and long-finned pilot whale bycatch estimates using habitat and genetic information. Southeast Fisheries Science Center, Protected Resources and Biodiversity Division, 75 Virginia Beach Dr., Miami, FL 33140. PRBD Contribution # PRBD-2016-17, 24 pp.
- NEFSC and SEFSC (Northeast Fisheries Science Center and Southeast Fisheries Science Center). 2011-2017. Annual reports of work conducted under AMAPPS for each year 2010 - 2017. <https://www.nefsc.noaa.gov/psb/AMAPPS/>
- NEFSC (Northeast Fisheries Science Center). 2010 – 2017. Hydrographic conditions of the Northeast continental shelf summaries for each year 2010 - 2017. <https://www.nefsc.noaa.gov/HydroAtlas/>
- Patel, S.H., Barco, S.G., Crowe, L.M., Manning, J.P., Matzen, E., Smolowitz, R.J. and Haas, H.L. 2018. Loggerhead turtles are good ocean-observers in stratified mid-latitude regions. *Estuarine, Coastal and Shelf Science* 213: 128-136.

Patel, S.H., Dodge, K.L., Haas, H.L., and Smolowitz, R.J. 2016. Videography reveals in-water behavior of loggerhead turtles (*Caretta caretta*) at a foraging ground. *Frontiers of Marine Science*. 3: 254.

Soldevilla, M.S., Baumann-Pickering, S., Cholewiak, D., Hodge, L.E., Oleson, E.M., and Rankin, S. 2017. Geographic variation in Risso's dolphin echolocation click spectra. *Journal of the Acoustical Society of America*. 142 (2): 599-617.

Virgili, A., Authier, M., Boisseau, O., Canadas, A., Claridge, D., Cole, T., Corkeron, P., Doremus, G., David, L., Di-Meglio, N., Dunn, C., Dunn, T.E., Garcia-Baron, I., Laran, S., Lauriano, G., Lewis, M., Louzao, M., Mannocci, L., Martinez-Dedeira, J., Palka, D., Panigada, S., Pettex, E., Roberts, J.J., Ruiz, L., Saavedra, C., Begona Santos, M., Van Canneyt, O., Vazquez Bonales, J.A., Monestiez, P., and Ridouz, V. 2018. Combining multiple visual surveys to model the habitat of deep-diving cetaceans at the basin scale. *Global Ecological Biogeography*. 1-15.

Winship, A.J., Kinlan, B.P., White, T.P., Leirness, J.B., and Christensen, J. 2018. Modeling at-sea density of marine birds to support Atlantic marine renewable energy planning: Final report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2018-010. x+67 pp.

Winton, M.V., Fay, G., Haas, H.L., Arendt, M., Barco, S., James, M., Sasso, C., and Smolowitz, R. 2018. Estimating the distribution and relative density of tagged loggerhead sea turtles in the western North Atlantic from satellite telemetry data using geostatistical mixed effects models. *Marine Ecology Progress Series*. 586: 217-232.

Yang, T., Haas, H.L., Patel, S., Smolowitz, R., James, M.C., and Williard, A. 2019. Blood biochemistry and hematology of migrating loggerhead turtles (*Caretta caretta*) in the Northwest Atlantic: reference intervals and intrapopulation comparisons. *Conservation Physiology*. 7(1).

BOEM (Bureau of Ocean Energy Management). 2018. Findings from Atlantic Marine Assessment Program for Protected Species. BOEM Science Notes June 2018.

News press articles on various NEFSC AMAPPS field work 2011 - 2018:  
<https://nefsc.wordpress.com/category/amapps/> and  
[https://www.nefsc.noaa.gov/press\\_release/pr2018/features/cetacean-survey-gunter-2018/](https://www.nefsc.noaa.gov/press_release/pr2018/features/cetacean-survey-gunter-2018/).

**Affiliated WWW Sites:**

<https://marinecadastre.gov/epis/#/search/study/100066>

<http://www.nefsc.noaa.gov/psb/AMAPPS/>

<https://www.nefsc.noaa.gov/AMAPPSviewer/>

<http://www.nefsc.noaa.gov/psb/acoustics/>

<http://www.nefsc.noaa.gov/psb/turtles/turtleTracks.html>

[http://www.seaturtle.org/tracking/?project\\_id=510](http://www.seaturtle.org/tracking/?project_id=510)

<http://www.nefsc.noaa.gov/psb/seals/GraySealCapture2013.html>

[https://www.nodc.noaa.gov/OC5/WOD/pr\\_wod.html](https://www.nodc.noaa.gov/OC5/WOD/pr_wod.html)