Environmental Studies Program: Studies Development Plan | FY 2021–2022

Title	Spatial and Acoustic Ecology of Understudied ESA Listed Marine Mammals
Administered by	Headquarters
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Conducting Organization(s)	TBD
Total BOEM Cost	TBD
Performance Period	FY 2021–2023
Final Report Due	TBD
Date Revised	April 23, 2020
PICOC Summary	
Problem	Information on availability bias (i.e., how often we expect to detect them) is lacking for some ESA-listed baleen whale species (e.g., sei, fin, North Atlantic right) leading to uncertainty in these species density estimations. Additionally, the lack of data on the spatial and acoustic behavioral ecology (i.e., what they are doing when they are making particular vocalizations) of these species limits our ability to comprehensively analyze Passive Acoustic Monitoring (PAM) data. The more we know about what they are doing when we hear them, and whether we can *expect* to hear them, the better we can assess potential impacts.
Intervention	Use acoustic and telemetry tags to gather information on the spatial and acoustic behavior of these targeted ESA-listed species.
Comparison	Estimate the degree of overlap and exchange between areas of offshore energy development interest and critical habitats of endangered cetacean species in US Federal waters
Outcome	The data will improve abundance estimates, increase the value of existing PAM data and inform the assessment of the effectiveness of PAM as a mitigation strategy for these understudied priority ESA-listed whale species. Additionally, short- and long-term habitat usage and movements of these species will assist in identifying potentially important biological areas for these species.
Context	Atlantic, Gulf of Mexico and Pacific (depending on species prioritization)

BOEM Information Need(s): BOEM requires robust, current data to (1) fully analyze and disclose the potential for impacts to protected species from OCS activities at the programmatic and site-specific level, (2) help ensure that a species is not jeopardized by an activity or that critical habitat is not adversely modified by that activity pursuant to the ESA, (3) minimize incidental take of marine mammals resulting from BOEM-permitted activities, thus meeting not only the small numbers and negligible impact requirement under the MMPA, but also making every effort to maintain the health and stability of marine mammal populations and their ecosystem, and (4) fulfill Federal assessment and consultation responsibilities that usually include the need for BOEM to design and implement mitigation measures to reduce or eliminate impacts from regulated activities on protected and managed species. These mitigation measures often include the use of PAM, but we cannot know if PAM is effective unless we have basic information on how frequently they vocalize in a given area or when exhibiting a particular behavior.

Background: The lack of information about diving behavior and spatial and acoustic ecology for species like the highly endangered North Atlantic right and other protected whale species creates a high degree of variability in their detection probabilities, leading to high degrees of uncertainty in density and abundance estimates. These data needs also limit the value of data from passive acoustic monitoring (PAM), which is one of BOEM's primary mitigation and monitoring tools. BOEM relies on density and abundance data (e.g., Roberts et al., 2016) to assess the potential impacts on protected species from BOEM-permitted activities. Several ESA-listed large whale species occur throughout the OCS whose acoustic behavior, particularly cue rates, as they relate to habitat usage, is poorly understood or completely unknown. For example, North Atlantic right whales have dramatically different acoustic behavior in the Southeast versus the Northeast parts of their range. Their acoustic behavior in the Mid-Atlantic, where they occur year round, has never been studied. This adds tremendous uncertainty into the density and abundance data models because we are forced to make assumptions in the absence of an understanding of how their vocalizations tie to their behavior. For this reason, it is currently unknown whether passive acoustic monitoring will be an effective mitigation option in the Mid-Atlantic for North Atlantic right whales with no behavioral call rate information in this region – if we don't know whether they make noise while they are there, we cannot say that PAM would be effective in detecting them.

Traditional survey methods for cetaceans (whales, dolphins and porpoises) include shipboard or aerial surveys. However, these surveys provide a snapshot of cetacean occurrence in any given area and these data are spatially and temporally restricted since they can only be obtained under appropriate survey conditions (e.g., good visibility). Therefore, although aerial and broadscale vessel-based survey data provide much-needed regional data, they are of limited use to infer habitat use patterns in fine spatial and temporal scales, including local and migratory movements, preferred habitats and how animals behave underwater.

Establishing cue rates (i.e., a key for PAM analyses) for understudied ESA-listed cetaceans in diverse behavioral states and habitats also allows for PAM data collected previously through BOEM studies to be reanalyzed and be more useful in various ways, including informing and

advancing density and abundance estimation using acoustic data. This information will also provide much needed species-specific behavioral data (for example, dive durations) to feed in to population level impact modeling analyses – an emphasized need identified by The National Academies of Sciences Committee (NASEM, 2016). The US Navy's Living Marine Resources program has recently invested in the Acoustic Cue Rate for Passive Acoustic Density Estimation project which is looking at historical PAM data to understand the current state of cue stability. As the species identified in this profile have little/no cue rate information, the data gathering in this profile would feed directly into this Navy funded project and make the collection of this data even more timely. It also enhances our acoustic science partnership with the Navy, a key goal through BOEM's Center for Marine Acoustics.

The data collected during this study will assist in improving the analytical robustness and biological meaningfulness of acoustic data collected during BOEM-funded studies (Atlantic, Pacific and Gulf of Mexico Marine Assessment Program for Protected Species (AMAPPS/PacMAPPS/GoMAPPS), as well as the credibility of impact analyses conducted by BOEM. Additionally, implementing this study would provide BOEM with a means of validating BOEM's current PAM practices for endangered species impact mitigation.

Objectives:

1. Describe acoustic and foraging ecology of understudied and/or ESA-listed whale species (for example, sei, fin, right whales) where significant data gaps in cue rates exist (e.g., species identified in the BOEM 2018 workshop report from SPAM-I);
2. Verify and/or establish cue rates combined with visual observation to inform accurate density modeling of data deficient marine mammal species applicable to multiple BOEM programs and regions for impact analysis;
3. Update uncertainty analysis for OCS to inform planning and mitigation design in all BOEM's regions;
4. Aid in validating acoustic propagation models by having multiple receiving nodes operating simultaneously;
5. Inform potential overlap of biologically important areas for these understudied ESA-listed species with BOEM's areas of interest.

Methods: This project will utilize validated and available techniques and technologies: 1) Mobile 3D passive acoustic monitoring. Vessel and AUV-based PAM will provide ground truthing and guidance for the stationary PAM; and 2) Animal tagging. Electronic tags such as satellite linked position tags and 3-D accelerometer/acoustic tags will also be used to augment remote study of targeted species to provide a better understanding of habitat use and movement in relation to acoustic behavior. These tags will be deployed from vessels.

Specific Research Question(s):

1. What are the species/regions/life stages where acoustic behavioral information is needed to support detection and mitigation?
2. Are density models improved upon by reducing availability bias?

3. What is the overlap of understudied, endangered and at-risk cetacean species with areas of interest to BOEM for offshore energy development?
4. What is the importance of these areas of overlap to endangered and at-risk cetacean species?

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

National Academies of Sciences, Engineering, and Medicine (NASEM), 2016. *Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals*. Washington, D.C: The National Academies Press. doi: 10.1 7226/23479.

Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E., Halpin, P.N., Palka, D.L., Garrison, L.P, Mullin, K.D., Cole, T.V.N., Khan, C.B., McLellan, W.A., Pabst, D.A., and Lockhart, G.G., 2016. *Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico*. Scientific Reports. 6: 22615.