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

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| Title | Bioenergetic Model for North Atlantic Right Whales |
| Administered by | Office of Renewable Energy Programs |
| BOEM Contact(s) | Kyle Baker (kyle.baker@boem.gov) |
| Conducting Organization(s) | TBD |
| Total BOEM Cost | TBD |
| Performance Period | FY 2021–2023 |
| Final Report Due | TBD |
| Date Revised | April 14, 2020 |
| PICOC Summary | |
| *Problem* | A lack of information regarding the bioenergetics of North Atlantic right whales due to the construction and operation of wind farms limits robust impact assessments and results in uncertainty regarding bioenergetic consequences of disturbance. |
| *Intervention* | Convening workshops and meetings to review existing information, develop a report and predictive model for the bioenergetic consequences of behavioral disturbance, and identify future research and monitoring needs that would address the problem. |
| *Comparison* | Compare the baseline condition of North Atlantic right whales to bioenergetic consequences from anthropogenic impacts. |
| *Outcome* | A review, predictive bioenergetic model, and assessment of data needs to test the model for North Atlantic right wales. |
| *Context* | Areas along the Atlantic where North Atlantic right whales occur in wind energy areas. |

**BOEM Information Need(s):** BOEM integrates information into assessments for activities it authorizes with cumulative effects on threatened and endangered species. Many of these assessments consider the effects of disturbance on North Atlantic right whales but have largely been limited to qualitative analyses. This study will allow BOEM to conduct a more robust quantitative assessment of disturbance from renewable energy activities. BOEM has an obligation to understand how activities that it authorizes may impact threatened and endangered species. The information from this study will help in BOEM's environmental assessments under the National Environmental Policy Act and the Endangered Species Act.

**Background**: Disturbance to wildlife populations can have repercussions on individuals. These disturbances could result in effects that have potentially population-level consequences. In particular, threatened and endangered species may be more susceptible to environmental stressors at the population level. The population consequences of disturbance (PCoD) has

received recent attention, but most models have focused on odontocetes (Booth et al. 2014; Farmer et al. 2018; King et al. 2015; Natural England 2017; Pirotta et al. 2015) and pinnipeds (Costa 2012; Noren et al. 2009). Only recently have some bioenergetic models for mysticetes been developed (Pirotta et al. 2019; Van der Hoop et al. 2017; Villegas-Amtmann et al. 2015). Offshore wind development could result in long-term noise from pile driving of wind turbine foundations. The pile driving could occur for one or more projects in any given year along the Atlantic. Depending on the size of the area impacted, geographic region, duration, and time of year different life stages and important behaviors of North Atlantic right whale can be affected, for example, displacement during migration or feeding, and interrupted nursing of calves. Such disturbances have unknown bioenergetic consequences that could be of possible concern to right whale management.

This study will assess the bioenergetic requirements of different right whale life stages and develop a bioenergetic model to assess the possible consequences of disturbance from pile driving and other anthropogenic activities.

**Objectives**: The objective of this study is to develop a predictive bioenergetic model to assess the consequences of disturbance to North Atlantic right whales. There is a potential for collaboration with and expansion of NMFS and USGS efforts to develop a population viability analysis for North Atlantic right whales.

**Methods:** The model should be developed through the best available information from peer reviewed literature, gray literature, and expert elicitation. This model must be peer-reviewed and developed collaboratively with partners such as BOEM, marine mammal physiologists, and population modelers.

**Specific Research Question(s):**

1. What are the vital rates for North Atlantic right whales?

2. What are the energetic requirements for different life stages of North Atlantic right whales?

3. How much bioenergetic disturbance is required to result in an individual fitness-level impact during migration, feeding, displacement, or nursing of calves?

4. How can non-lethal impacts of disturbance be incorporated into existing population models to assess a population-level consequence?

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