Environmental Studies Program: Ongoing Study

Title	Transparent modeling of collision risk for three federally-listed bird species to offshore wind development (AT-21-x07)
Administered by	Office of Renewable Energy Programs
BOEM Contact(s)	David Bigger (david.bigger@boem.gov)
Procurement Type(s)	Inter-agency Agreement
Conducting Organization(s)	U.S. Fish and Wildlife Service with University of Rhode Island and Biodiversity Research Institute
Total BOEM Cost	$273,374 (Phase 1); $248,994 (Phase 2)
Performance Period	FY 2019–2024
Final Report Due	January 2023
Date Revised	August 7, 2023
PICOC Summary	
Problem	Estimating the number of fatalities of federally-listed birds migrating through offshore wind energy facilities.
Intervention	Develop a stochastic collision risk model to estimate the number of fatalities.
Comparison	N/A
Outcome	A tool that estimates whether "take" is likely and how much.
Context	Rare birds migrating on the Atlantic OCS

BOEM Information Need(s): BOEM has a responsibility under the Endangered Species Act (ESA) to assess the risks of offshore wind energy development to listed species. The red knot, piping plover, and roseate tern are listed species that can migrate through areas developed for offshore wind. Information from this effort will be used to inform ESA consultations with the USFWS and NEPA analyses on the risk of offshore wind development projects to the red knot, piping plover, and roseate tern.

Background: Collision Risk Models are frequently used to estimate bird fatalities from operating wind turbines. The Band Model (2012) is widely used in Europe for common species and was recently used in the US (e.g., VOWTAP BA and Vineyard Wind BA). However, the Band Model is deterministic and does not allow biological variability (e.g., number of birds, flight heights, etc.) to be incorporated into input parameters, thus creating uncertainty in the interpretation of the model outputs (e.g., estimated number of collisions). Recently, McGregor et al (2018) developed a stochastic CRM based on the Band Model that accounts for multiple sources of uncertainty and provides confidence intervals to its fatality estimates for common European birds; however, it does not cover the three focal species on the US Atlantic or species in migration. An additional challenge is how to appropriately assess risk to rare species that are by definition are uncommon.

This effort will improve on previous by i) increasing the transparency of the modeling, ii) improving flexibility of the modeling to consider the cumulative effects of exposure to multiple offshore wind facilities, and iii) properly accounting for multiple sources of uncertainty (i.e., stochasticity, parametric

variability, and model uncertainty). This will be accomplished through the development of an online-graphical-interactive web application for use in the U.S. Atlantic OCS. The web application should include telemetry data for the three focal species (Loring et al. 2018, Loring et al. 2019) as well as data from other sources, and results from this application will be reported as case studies.

This information is essential for understanding the potential for rare or uncommon species to encounter conflicts with renewable energy development in these areas for NEPA assessments and ESA consultations.

Objective: The objective is to develop a user-friendly Collision Risk Model that can inform risk assessments of offshore wind development to three federally listed species (Roseate Tern, Piping Plover, and Red Knot) on the Atlantic OCS.

Methods: Phase 1: The USFWS will develop the online-graphical-interactive web application (i.e., RShiny, https://shiny.rstudio.com/) that adapts and improves upon the McGregor (2018) version of the Band Model. These improvements include a deterministic feature to allow for quick execution of the model a feature to estimate the likelihood of "take," the ability to estimate fatalities during migration, automatic report generation of downloaded PDFs that will contain all relevant model inputs and outputs. The model will be populated with species-specific data including body size, flight height distributions, etc. for roseate tern, red knot piping plover, common tern, plus other relevant species that uses the Atlantic OCS. A user manual will be prepared. USFWS will also host the web application for public use for two years.

Phase 2 will refine the inputs and model. This includes: Adjust the Motus-based movement model for Red Knot to use more than one daily location, develop a GPS model for red knot at the same timescale as the updated Motus model, combine movement models from different data sources like GPS, update flight height models with GPS data, build a version of SCRAM that can run outside of RShiny, Make updates to regional population size estimates where needed, and Start a cross-Atlantic working group on CRMs.

Specific Research Question(s): This simulation tool will allow the user to ask whether there will be "take" of federally listed species and to estimate how much.

Current Status: Post-award meeting conducted on September 26, 2019. Updated Project Plan submitted on May 29, 2020. Quarterly Reports submitted in October 2020, February 2021, June 2021, and October 2021. Beta testing and external review was initiated on June 15, 2021. USFWS partnered with Biodiversity Research Institute in January 2022. Updated Project Plan submitted on March 25, 2022. Draft final report submitted in October 2022. Final Report for Phase 1 delivered November 2022. SCRAM will continue to be updated with model improvements, bug fixes, and additional functionality in the coming years; future changes will be documented in the GitHub repository and on the SCRAM webpage at briwildlife.org/SCRAM. Several immediate next steps have been identified for the application under the current funding support mechanism, which extends until September 1, 2024.

Publications Completed:

Adams EM, Gilbert A, Loring P, Williams, KA (Biodiversity Research Institute, Portland, ME and U.S. Fish and Wildlife Service, Charlestown, RI). 2022. Transparent Modeling of Collision Risk for Three Federally Listed Bird Species in Relation to Offshore Wind Energy Development: Final Report.

Washington, DC: U.S. Department of the Interior, Bureau of Ocean Energy Management. 79 p. Report No.: OCS Study BOEM 2022-071. Contract No.: M19PG00023.

Other Products:

1. Model code: Available at https://github.com/Biodiversity-Research-Institute/SCRAM

2. Web application: Stochastic Collision Risk Assessment for Movement (SCRAM). 2022. Version 1.0.3. Available at: https://briloon.shinyapps.io/SCRAM/

3. User manual for web application: Gilbert AT, Adams EM, Loring P, Williams KA. 2022. User documentation for the Stochastic Collision Risk Assessment for Movement (SCRAM). Available at https://briloon.shinyapps.io/SCRAM/. 39 pp. (Available via the book link at the header of the application UI).

Affiliated WWW Sites: https://briwildlife.org/SCRAM

Presentations:

Gilbert, A, A Evans, K Williams, P Loring. SCRAM Model for Estimating Offshore Avian Collision Risk Using Avian Movement Data. NYSERDA State of the Science, July 2022. Video link to session https://www.youtube.com/watch?v=ctWMiDYbi8g

Field C, Loring P, Gerber B. Updating collision risk models to quantify cumulative impacts for endangered birds. State of the Science Workshop on Wildlife and Offshore Wind Energy 2020: Cumulative Impacts, November 16-20, 2020. New York State Environmental Technical Working Group.

Affiliated WWW Sites: None

References:

Band W. 2012. Using a collision risk model to assess bird collision risks for offshore wind farms. Report to The Crown Estate Strategic Ornithological Support Services (SOSS), SOSS-02. http://www.bto.org/science/wetland-and-marine/soss/projects

Largey N, Cook ASCP, Thaxter CB, MCluskie A, Stokke BG, Wilson B, Masden EA. 2021. Methods to quantify avian airspace use in relation to wind energy development. Ibis. https://doi.org/10.1111/ibi.12913

Loring PH, McLaren JD, Smith PA, Niles LJ, Koch SL, Goyert HF, Bai H. 2018. Tracking movements of threatened migratory rufa Red Knots in U.S. Atlantic Outer Continental Shelf Waters. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-046. 145 p. https://espis.boem.gov/Final%20Reports/BOEM_2018-046.pdf

Loring PH, Paton PWC, McLaren JD, Janaswamy R, Goyert HF, Griffin CR, Sievert PR. 2019. Tracking offshore occurrence of Common Terns, endangered Roseate Terns, and threatened Piping Plovers with VHF arrays. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-017. 140 p. https://espis.boem.gov/final%20reports/BOEM_2019-017.pdf

McGregor, R., King, S., Donovan, C., Caneco, B., and Webb, A., 2018. A Stochastic Collision Risk Model for Seabirds in Flight. Report by Marine Scotland Science. 61 p. https://www2.gov.scot/Topics/marine/marineenergy/mre/current/StochasticCRM