An assessment of high-risk regions for seabirds in the Gulf of Maine draft call area

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1 BACKGROUND

In January 2023, the Bureau of Ocean Energy Management (BOEM) released a draft call area for the siting of offshore wind development in the Gulf of Maine. This region encompasses 9.9 million acres, and represents a 27% reduction in area compared to the original request for interest (RFI) which was announced in August 2022. In response to the RFI, the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the Maine Governor's Energy Office submitted a comment to BOEM highlighting the importance of coastal foraging habitat for nesting marine birds, particularly in nearshore shallow regions around banks and ledges, based on the results of a desktop analysis conducted by the Biodiversity Research Institute (BRI; Stepanuk et al. 2022).

To further inform seabird risk and habitat use in the Gulf of Maine draft call area, BRI has refined the desktop analysis to include multiple developed layers based on recommendations from MDIFW, integrated analyses of risk and vulnerability, and core habitat use determined from seabird telemetry tracking. The layers developed in this report were used to determine which lease blocks comprise the highest risk to seabirds within the draft call area.

2 RISK LAYER DEVELOPMENT

2.1 20 STATUTE MILE BUFFER

MDIFW is recommending to BOEM an exclusion of the portions of the draft call area that are located within 20 statute miles of the Gulf of Maine coastline, including islands and non-contiguous land masses. A 20 statute mile buffer around land masses encompassing the Gulf of Maine was developed using a global coastline shapefile provided by the NOAA Global self-consistent, hierarchical, high-resolution geography database (GSHHG; https://www.ngdc.noaa.gov/mgg/shorelines/gshhs.html). The highest resolution coastline dataset was selected and cropped to include all the U.S. and Canadian land that surrounds the Gulf of Maine including islands and non-contiguous land, and was projected to UTM 19N. A 20 statute mile buffer was calculated with dissolved shapes, providing one large buffer around all land, including islands.

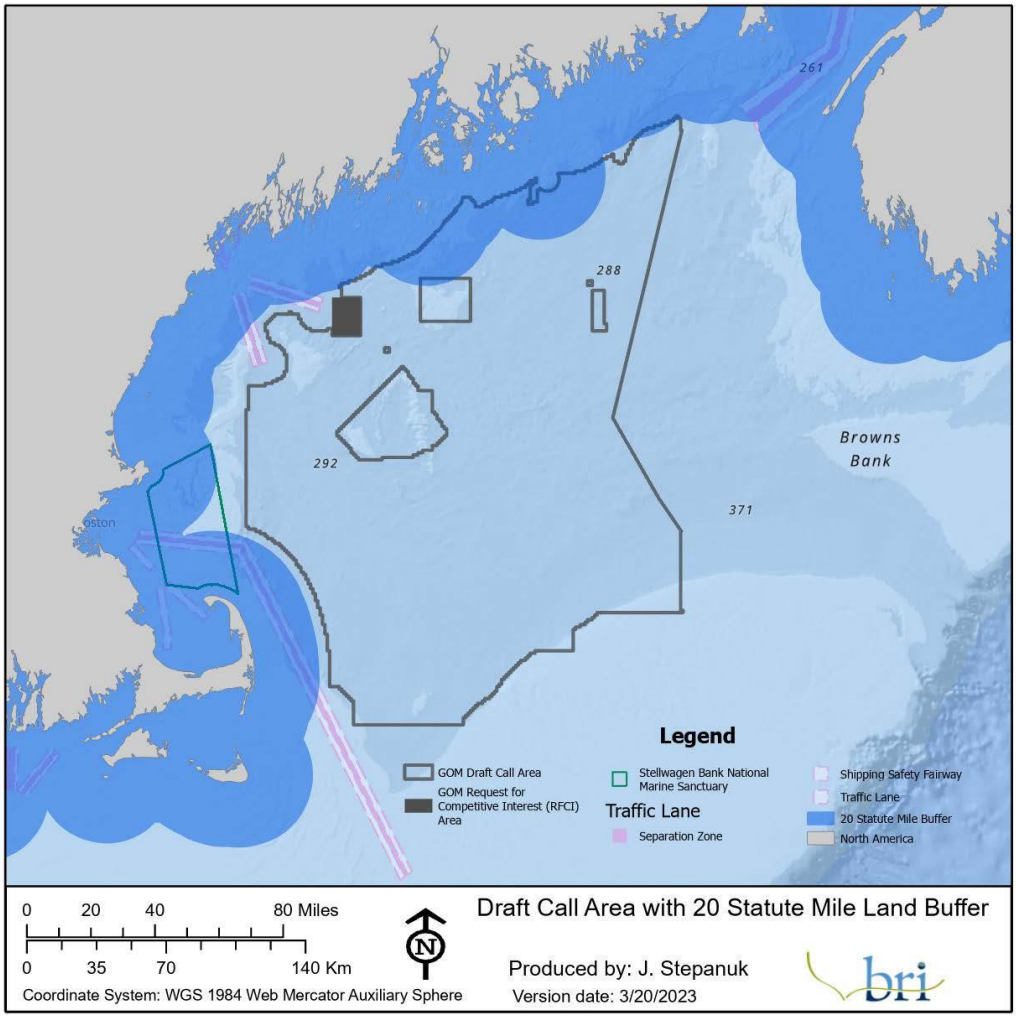

Figure 1 – Gulf of Maine draft call area with 20 statute mile buffer (blue) around all contiguous land and islands surrounding the Gulf of Maine.

2.2 Integrating Seabird Risk and Vulnerability

BRI conducted a desktop study and literature review for MDIFW (Stepanuk et al. 2022) to determine regions of importance for breeding and migrating marine birds in the Gulf of Maine. The study included assessments of marine bird habitat use around nesting islands during the breeding season, and a vulnerability assessment using regional marine bird distribution models and data on taxon-specific risk of collisions or displacement from offshore wind energy development.

2.2.1 Identifying important foraging areas for nesting marine birds

To identify important foraging areas for marine birds that nest in the Gulf of Maine, BRI assessed foraging ranges and population sizes for 15 species, including eiders, auks, gulls, terns, storm-petrels, and cormorants.

- Colony sizes were obtained from the Gulf of Maine Seabird Working Group (GOMSWG) and the U.S. Fish and Wildlife Service (USFWS). Colonies active within the last 20 years were included and colony counts were averaged from 2002–2022 to obtain a count per colony per species.
- Estimates of foraging ranges were obtained from multiple sources and prioritized based on data collection method and study location.

The maximum estimated foraging distance for each species was defined around each colony and weighted by the proportion of the species count at each colony relative to the total Gulf of Maine population. The results indicated regions of expected high and low foraging effort. Species-specific foraging regions were summed across species to indicate important foraging areas in the Gulf of Maine for all nesting marine birds in the analysis.

2.2.2 Assessing the vulnerability of marine birds

The Marine-life Data and Analysis Team (MDAT) at NOAA has developed marine bird relative density and distribution models for US Atlantic waters. Version 2.0 of the models was used for 36 species, weighted by each species' vulnerability to identify spatial risk to the marine bird community. Three categories of vulnerability (defined in the scientific literature) were used to weight the MDAT models among species:

- Population vulnerability – determined using the Partners in Flight "continental combined score", species status at the state level, adult survival rate, and a regional population score.
- Collision vulnerability – based on nocturnal and diurnal flight activity, avoidance behavior, maneuverability, and proportion of time flying (including at the altitude of the turbine rotors).
- Displacement vulnerability – the likelihood that each species may avoid offshore wind farm areas due to their habitat flexibility and susceptibility to disturbance.

These risks were each independently evaluated for all possible species and summed across species to achieve a relative rank of vulnerability for marine birds.

2.2.3 Integrated Risk

The results of the foraging areas and vulnerability analyses were combined into a single integrated risk map by selecting all cells where either the foraging risk or vulnerability was of the highest values (Figure 2, specifically the "high risk" values). These values were then isolated into a polygon that was used to determine lease block inclusion or omission.

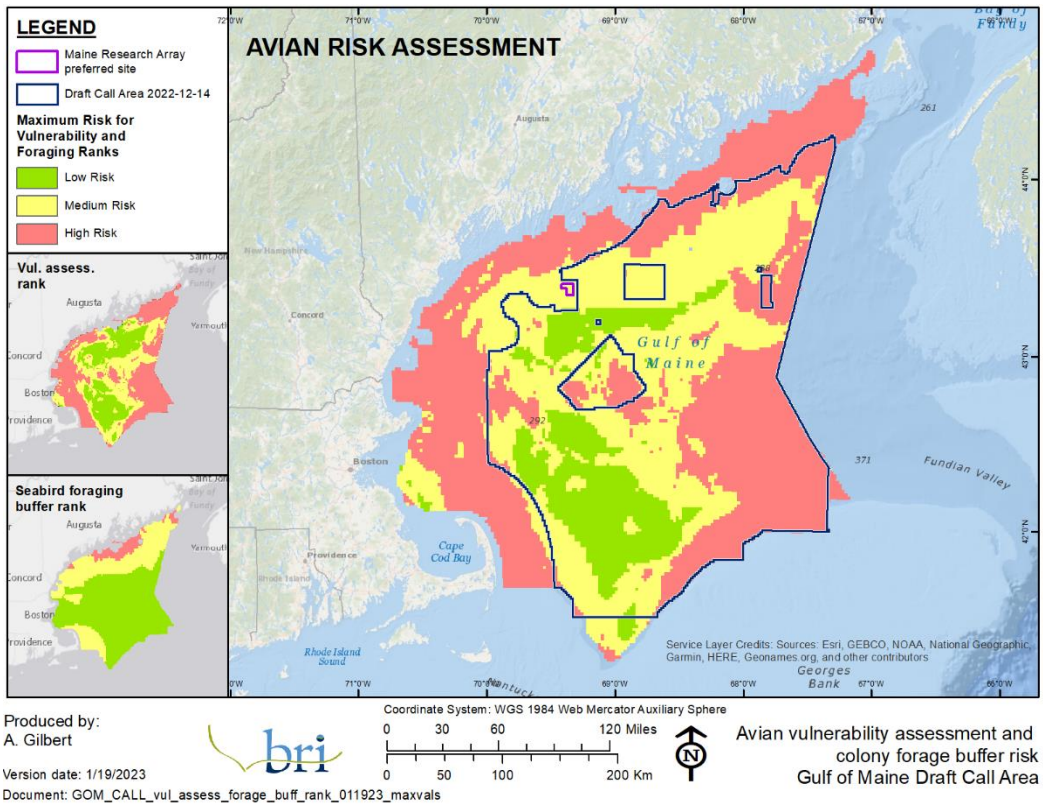

Figure 2 – Integrated risk assessment for avian vulnerability and colony foraging analyses. High risk areas (denoted in red) were isolated for this analysis.

2.3 Diving Bird Dynamic Brownian Bridge Movement Modeling

A satellite telemetry tracking study in the Mid-Atlantic was developed and supported by BOEM and the USFWS with objectives of determining fine-scale use and movement patterns of three species of marine diving birds during migration and winter (Spiegel et al. 2017, Stenhouse et al. 2020). These species – the Red-throated Loon, Surf Scoter, and Northern Gannet – are all considered species of conservation concern and exhibit various traits that make them vulnerable to offshore wind development. Nearly 400 individuals were tracked using satellite transmitters, Argos platform terminal transmitters (PTTs), over the course of five years (2012–2016), in cooperation with the Atlantic and Great Lakes Sea Duck Migration Study by the Sea Duck Joint Venture (SDJV). Of note, the Gulf of Maine was not the target for the Diving Bird study and no effort was made to capture birds in the Gulf of Maine; therefore, distribution of these species may be not capture the full winter and migration use of these species due to the implicit capture bias. For example, Red-throated Loons were found to not move much in winter, yet wintering Red-throated Loons are found in the Gulf of Maine and thus the winter utilization distribution will most likely under-represent the true use of the Gulf. This would also apply to Surf Scoters. Northern Gannet are probably the least affected by any potential capture bias, since their winter movements appear to be the most extensive of the three diving bird species tracked.

Another tracking study was conducted for Great Shearwaters off the coast of Massachusetts and the southern Gulf of Maine from 2013 to 2018 (Silva et al., 2022). Solar PTT-199 tags were deployed in July and August on a total of 58 shearwaters across all years.

Utilization distributions (UDs) were determined for each species by calculating individual level dynamic Brownian-bridge movement model (dBBMM) surfaces (Kranstauber et al. 2012) using package Move for R (Kranstauber and Smolla 2016). Separate dBBMM surfaces were calculated for each of season with at least five days of data and combined into a weighted mean surface for each animal (as a percentage of the total number of days represented in the surface) with a minimum 30 total combined days of data for the Red-throated Loon, Surf Scoter, and Northern Gannet. This method of combining multiple seasons was also used for the migration periods, but with relaxed requirements for days of data – requiring only five days per year and seven total days per period, since migration duration often occurred over a much shorter time period. For Great Shearwater, a single dBBMM surface was calculated for each individual across all seasons. Utilization contour level of 50%, representing the core habitat use, were calculated for the mean UD surface.

3 INTEGRATION OF RISK LAYERS

To inform high risk regions for seabirds in the draft call area, the above layers were combined in the following configurations to provide three options to inform recommendations for consolidation of the draft call area:

- Option 1: Omit a 20-mile buffer of lands and islands only
- Option 2: Omit all of Option 1, combined with the highest risk regions from the vulnerability and risk assessment
- Option 3: Omit all of Option 2, as well as the core habitat use regions identified for satellite-tagged seabirds in the Gulf of Maine

For each of these options, a single combined polygon was developed that was used to isolate the lease blocks that would be omitted in each scenario. Lease blocks were only omitted when greater than 50% of the block area was encompassed by the polygons developed for each scenario. If less than 50% of the block area was encompassed by the developed polygons, the block was not omitted.

4 RESULTS AND CONCLUSIONS

There are a total of 1,925 possible lease blocks within the Gulf of Maine draft call area. For each option, varying numbers of lease blocks were identified as areas of concern (Figure 3):

- Option 1: A total of 7.3% (*n* = 141) of the lease blocks were identified as areas of concern
- Option 2: A total of 39.7% (*n* = 765) of the lease blocks were identified as areas of concern
- Option 3: A total of 47.1% (*n* = 907) of the lease blocks were identified as areas of concern

For the first omission option, lease blocks of concern were identified along the coastline of Downeast Maine, particularly from Matinicus Rock to Petit Manan Island. For the second option, many additional lease blocks were identified throughout the draft call area, including towards the Bay of Fundy, substantial omission in the eastern portion of the draft call area towards and including the edge of George's Bank, and some additional regions in the western portion of the draft call area. The third option was similar to the second option, but introduced some additional high risk areas in the south-central portion of the draft call area as well as along the southwestern edge, buffering Cape Cod.

The results of this analysis suggest that there are substantial portions of the draft call area that are of high importance and high risk to seabirds in the Gulf of Maine. In particular, the Downeast Maine region, the western portion of the draft call area, and the far eastern region extending towards George's Bank are all of significant importance for nesting and foraging seabirds. The results of this analysis suggest that, while the removal of some important regions, such as Cashes Ledge, have successfully omitted some high-risk regions for seabirds, the edges of the draft call area are of importance for seabirds, while the central portion of the draft call area was not identified as a high risk area. By integrating multiple datasets, modeling efforts, and institutional knowledge, this analysis provides a comprehensive overview of risk to seabirds in the Gulf of Maine region.

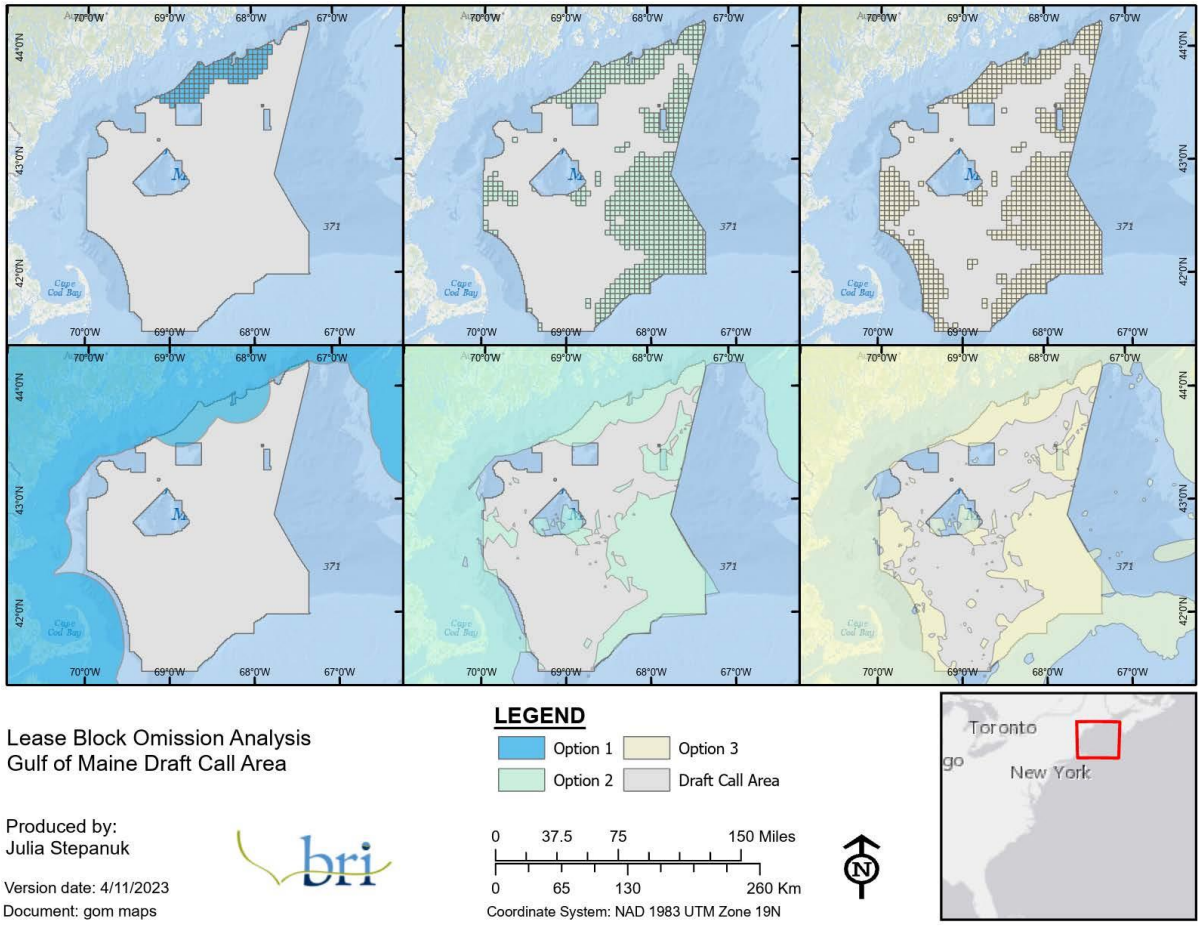

Figure 3 – Lease blocks identified as high risk (top row) and integrated polygon layers developed (bottom row) for the three options identified in this study (see Section 3).

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