

Impacts of offshore renewables on the marine environment

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Offshore renewables are an important area of economic and industrial growth in Scotland, and are a key element in the UK Energy Security Strategy (April 2022). Scotland has globally important seabird and marine mammal populations, which may be adversely impacted by direct mortality from collisions or indirect harm such as disturbance. The BioSS Offshore Renewables Group investigates the impacts of offshore renewables on the marine environment and develops tools that are used to support the consenting process for proposed developments. We seek to inform policy, providing evidence so that animals living in the marine environment can be safeguarded. Our research supports the achievement of emissions and climate change targets through reducing uncertainty and increasing transparency in the impact assessment process, lowering consenting risk for energy developments.

Cumulative effects framework

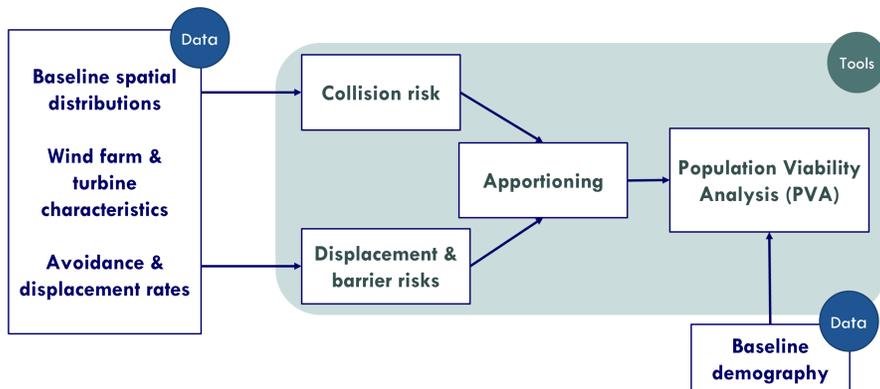


Funded by Marine Scotland & EMFF, led by UKCEH

Project aims: Develop a framework for assessing impacts of offshore renewable developments on seabirds and marine mammals, so that potential wind farm developments can be assessed consistently, either individually or in combination.

BioSS leads the development of open access software tools that link different steps in the assessment to data and to each other, enabling project-level and in-combination assessments.

Outcomes: Producing a best-practice approach that allows public bodies and industry to use one consistent framework to underpin consenting risk assessments and decisions.



Representation of the seabird data and tools that are combined within the CEF

Climate change and seabirds^[1]



Funded by Marine Scotland, led by UKCEH

Project aims: Investigate potential impacts of climate change on seabird distribution, abundance and demography.

Modelling seabird abundance & demography, BioSS focused on the choice & development of statistical methods.

Outcomes: Conserving the marine ecosystem requires natural adaptation and human-induced mitigation. We inform how the impacts of offshore renewables can be assessed within the context of climate change that already drives alterations in ecological processes.

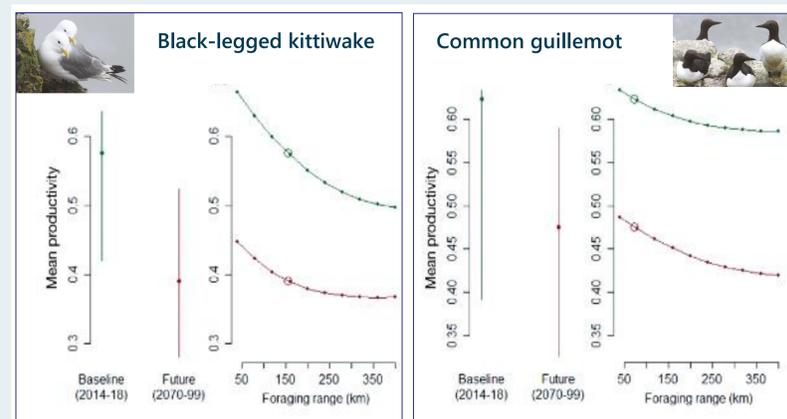
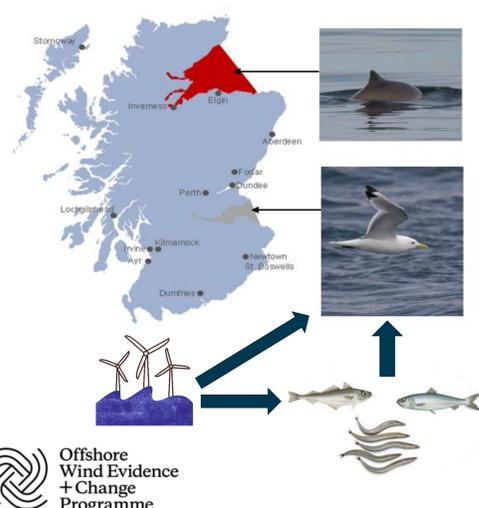


Fig. 1 Projected changes in breeding success of Black-legged kittiwake and Common guillemot on the east coast of the UK from 2014 – 2018 to 2070 – 2099 based on best-supported models for the influence of climate (left panel); mean and 95% CI, arising from differing access to climatic variables across varied foraging ranges around breeding colonies (right panel). Open circles: foraging range used within fitted models [1]

[1] Searle, K.R., Butler, A., Waggitt, J.J., Evans, P.G.H., Quinn, L.R., Bogdanova, M., Evans, T., Braithwaite, J. and Daunt, F. (2022). Potential climate-driven changes to seabird demography: implications for assessments of marine renewable energy development. *Marine Ecology Progress Series*, 185-200. Inter-Research Science Centre



Funded by OWEC, led by Marine Scotland



Project aims: Large-scale concurrent data collection of marine predators and prey to build the evidence base for adaptation to, and mitigation of, human impacts in the marine environment.

BioSS are leading the seabird-fish analyses to investigate how predator-prey relationships are impacted by offshore wind farms.

Outcomes: Characterising predator-prey relationships during offshore wind construction and operation, and understanding the extent to which relationships in the study site are transferable to other regions. This evidence will be incorporated into future impact assessments.

Ecosystem Change, Offshore Wind, Net Gain and Seabirds (ECOWINGS)



Funded by NERC & OWEC, led by UKCEH



Project aims: Transform existing evidence base on cumulative effects of offshore wind on seabirds, establish pathways for strategic compensation to ensure net gain & wider marine ecosystem, and account for projected effects of climate change.

BioSS are investigating predator-prey patch dynamics and competition between seabirds, assessing potential for habituation to offshore wind, developing a toolkit for rapid assessment of cumulative impacts on seabirds, and co-facilitating expert elicitation on the effectiveness of strategic compensatory measures.

Outcomes: Through parallel development of policy, environmental science, and offshore developments, scientific learnings and knowledge can be leveraged efficiently and put into practice.

