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Barrow Offshore Wind Farm © Peter Evans

Compensatory measures for Offshore Wind Farm impacts on seabirds

This topic sheet is aimed at practitioners of public, private and academic institutions whose work involves understanding and assessing the impacts of offshore wind farms on seabirds and the wider ecosystem and who are seeking to develop effective compensatory measures that offset such effects.

Black-legged kittiwake © Ken Ritchie

The UK and devolved governments have set ambitious targets for generating energy from renewable sources. Offshore Wind Farms (OWFs) will make a very significant contribution to these targets.

However, one key challenge is that OWFs have the potential to affect seabirds, notably from collisions with turbine blades and through displacement from important habitat. The consenting process involves assessing whether the development is likely to have an adverse effect on protected seabird populations. Accordingly, seabird impacts are the top consenting issue inhibiting OW expansion in the UK sector of the North Sea.

The UK Habitats Regulations allow for a 'derogation' whereby projects predicted to have an adverse effect on the integrity of a protected site may still be approved if there are imperative reasons of overriding public interest (IROPI) for the project to proceed. In such cases, compensatory measures must be secured to ensure that the overall coherence of the network of sites is protected. In the UK, compensatory measures for OW impacts on seabirds are underway, and will become increasingly important in the future as cumulative effects of OW developments become more acute.

Compensatory measures for seabirds: delivering new evidence

UK Centre for Ecology & Hydrology

BioSS

We used a formal expert elicitation process to identify and estimate the likely effectiveness of alternative compensatory measures for 11 UK seabird species (black-legged kittiwake, common guillemot, Atlantic puffin, razorbill, northern gannet, herring gull, lesser black-backed gull, great black-backed gull, Arctic tern, common tern, and sandwich tern).

Experts identified and ranked 14 compensatory measures for seabirds, with the potential for positively affecting breeding successes and survival (Figure 1). Expected changes in these parameters for each compensatory measure were then elicited from the experts, including uncertainty in these values as a distribution of changes in each demographic parameter.

These values of potential gains in seabird breeding success and survival can now be used by regulators and practitioners to help prioritise and implement compensatory measures.

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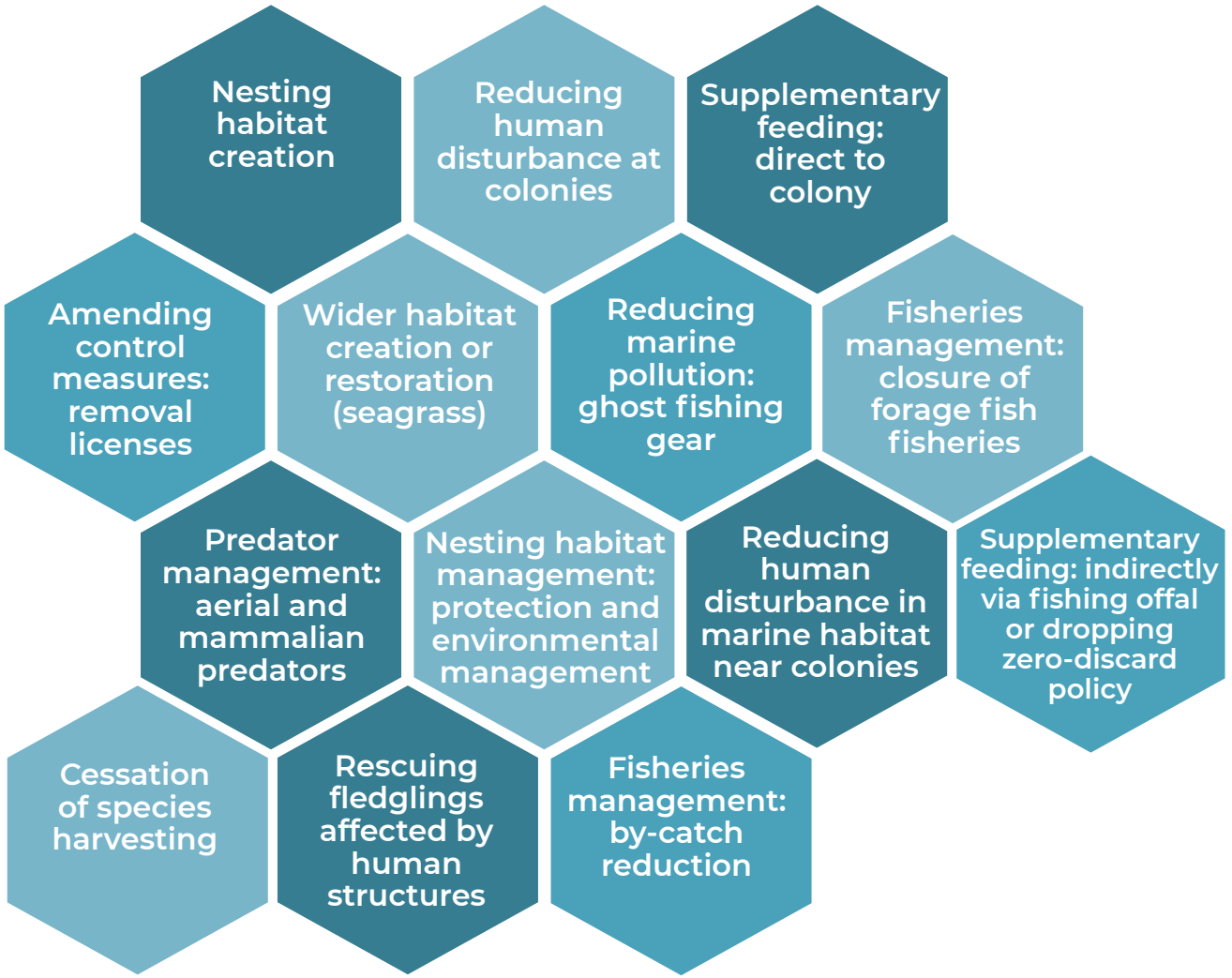

Figure 1. Compensatory measures identified, ranked and quantified by a formal expert elicitation process.

Modelling the sensitivity of seabirds to proposed compensatory measures

University of Strathclyde Glasgow

To better understand the effectiveness of compensatory measures on seabirds, it is important to consider how the measures propagate through the wider ecosystem, and how this is shaped by climate change.

We analysed the sensitivity of seabird biomass in the StrathE2E marine ecosystem model of the North Sea to variations in the model's parameters including those that mimic compensatory measures and those that are most influenced by climate. StrathE2E is an 'end-to-end' computational model of the ecosystem, representing processes that link physics and chemistry to top predators and fishing.

Half of the sensitivity in modelled seabird biomass was explained by just 18 out of the 435 model parameters and environmental input data. Seabird biomass was most strongly affected by the flow of energy through the food web, from nutrients and phytoplankton, through zooplankton and planktivorous fish. Seabird biomass was also strongly influenced by climate-sensitive parameters

These results indicate that compensatory measures that affect the availability of seabird prey are likely to prove most effective in increasing seabird biomass in the North Sea.

Atlantic puffin carrying sandeels
©Ken Ritchie

CONCLUSIONS: Both the Expert Elicitation (page 2) and model sensitivity analysis (this page) identified compensatory measures that have potential to offset impacts of offshore renewable energy developments on seabirds, but demonstrated the importance of ensuring measures have sufficient headroom to be robust to climate change.

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ECOWind

The NERC Ecological Consequences of Offshore Wind (ECOWind) programme is addressing two challenges:

- How will offshore wind expansion, combined with other anthropogenic pressures, affect species interactions and marine ecosystems?
- How can understanding these consequences enable robust approaches to marine environmental restoration and net environmental gain?

It aims to provide evidence to inform marine policy and management of increasing pressures on UK marine ecosystems from a combination of offshore wind and other anthropogenic stressors, including environmental responses to climate change.

Outcomes will inform how we manage human activities impacting UK waters and achieve net zero, while ensuring net environmental gain and how to address the lack of progress toward achieving Good Environmental Status in several biodiversity indicator areas, including pelagic habitats and food webs, and marine birds.

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Offshore renewable energy is playing a critical role in UK energy security and net zero goals. However, uncertainty surrounding the effects on protected species and the marine ecosystem remains a key concern. Seabirds represent a serious risk to consenting due to impacts from collisons, displacement and barrier effects. ECOWINGS is investigating the effects of offshore wind farms on seabirds and the wider ecosystem to inform cumulative impact assessment at the North Sea scale that is robust to climate change, and delivering evidence to shape strategic compensation and marine net gain. The specific objectives of the project are:

- Transforming the evidence base on cumulative effects of offshore wind on key seabird species.
- Establishing pathways for strategic compensation to ensure net gain for seabirds and the wider marine ecosystem.
- Ensuring that the assessments of offshore wind effects, and associated compensatory measures, are robust to future projections of climate change.

Project partners:

UK Centre for Ecology & Hydrology

BioSS

Heriot-Watt University

National Oceanography Centre

University of Glasgow

University of Strathclyde Glasgow