PREDICTING THE IMPACT OF WET RENEWABLES ON SEABIRDS USING SIMULATION MODELLING.

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1. INTRODUCTION

- It is possible that tidal stream and wave energy generation may displace breeding seabirds from foraging sites.
- This could lead to increased commuting distances and therefore alterations to an individual's time and energy budgets.
- The simulation model can be used to predict how far from a colony a seabird can commute and still successfully provision > 80% of their chicks to a suitable fledging mass without leaving them unattended >10% of the time, under contrasting prey conditions (Fig. 1).

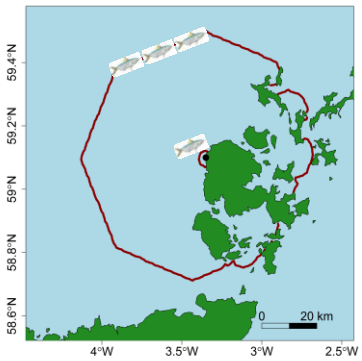
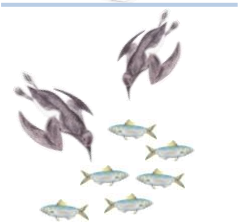


Figure 1. An example of the maximum foraging range birds from a specific colony, in this case Marwick Head, can regularly commute to during the chick rearing period and still successfully fledge over 80% of chicks without leaving them alone for more than 10% of the season, when prey abundance is good or prey abundance is poor. In this situation the model predicts a range of 45km for good prey abundance and 3 km for poor prey abundance.

THE MODEL

The model is based on the common guillemot. It includes both parents and chicks. Each day in the simulation, the model generates a behaviour pattern for the adults by determining their behaviour each minute, based on the behavioural and physiological state of themselves, their partner and their chick. The behaviour pattern is then used to determine how long the chick was left unattended, the daily energy expenditure, food consumption and the number of times the chick is fed. This allows the body mass of individuals for the next day time step to be calculated.



2. METHODS

- For all the colonies in the Pentland Firth and Orkney Waters Region the number of birds displaced by each of the wet renewable lease sites (Fig.2) was estimated assuming: A) the birds evenly distributed themselves over the sea out to the maximum predicted range, B) they completely avoided foraging anywhere within the lease site.
- This allowed the proportion of all the birds in the region, displaced by each property, to be estimated.

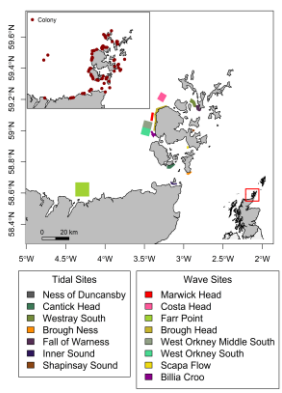
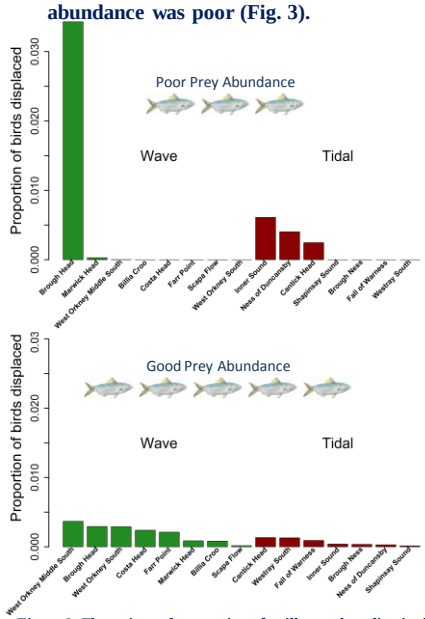


Figure 2. Map showing the location of the different wave and tidal power development sites in the Pentland Firth and Orkney Waters Region and the guillemot colonies.

3. RESULTS & DISCUSSION

- Only a small proportion of guillemots breeding in the region will be displaced by each lease site.
- The largest predicted impact occurred due to the Brough Head wave site when prey abundance was poor (Fig. 3).



- This is probably because the site is adjacent to a number of colonies on Mainland Orkney, and the model predicts that adults cannot commute far and successfully breed when prey abundance is poor.
- More sites lead to an impact when prey abundance is good because parents can travel further and still successfully breed, and so their potential range will overlap with more properties.

Figure 3. The estimated proportion of guillemots breeding in the Pentland Firth and Orkney Waters Region which will be displaced by each wave and tidal power development site when prey abundance is good or poor.

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