

MASTS Renewable Energy Forum Small Grant 2017

Final report for grant MESH17: The ecology of black guillemots in relation to marine renewable energy developments.

Daniel Johnston

daniel.johnston@uhi.ac.uk

Environmental Research Institute, North Highland College, University of the Highlands and Islands, Thurso, KW14 7EE

Project Aims and Objectives

As part of a drive for the production of 100% renewable energy by 2020, the Scottish Government has leased 18 inshore areas for the development of tidal renewables. One of these tidal areas is the 3km² Meygen lease, situated 0.5km offshore within the Pentland Firth. Phase 1 of this development included the construction of three submerged tidal turbines in Winter 2016/17. The introduction of structures such as renewable energy devices to tidally dynamic areas may cause changes in the inshore environment by altering current flow, creating reefs, and altering sedimentation patterns. These devices may affect inshore foraging seabirds through collisions, avoidance behaviour, habitat modification, and changes in prey distribution. One such species, the black guillemot *Cephus grylle* has been shown to forage within tidal currents and regularly dive at depths associated with turbine rotors. However, the extent to which these devices will affect black guillemots is unknown. Advances in modern tracking technology can be used to address these potential impacts on the spatial and temporal aspects of black guillemot foraging behaviour and habitat use. We looked to address these knowledge gaps relating to the species' foraging behaviour through the use of GPS tracking and intensive diet study using camera traps and visual observations.

This project aims to identify the foraging habitat of adult breeding black guillemots on islands situated near tidally dynamic currents in North Orkney and the Pentland Firth. Our research will explore the relationship between foraging behaviour and tidal currents, benthic habitat, and prey species. This will highlight the extent of potential change to black guillemot foraging habitat arising from marine renewable energy devices.

The MASTS small grant MESH17 enabled the study of black guillemot foraging ecology on the island of North Ronaldsay, Orkney. The grant facilitated travel and accommodation required to work on North Ronaldsay over June and July 2017.

Methods

This study took place on North Ronaldsay, Orkney, with further field work carried out on Stroma, Caithness not incorporated in the grant. Field work was conducted over the course of the black guillemot incubating and chick rearing periods (June-July 2017). Working with Dr. Elizabeth Masden, 16 GPS loggers were placed on adults at both their incubating and chick rearing stages on North Ronaldsay. Data on breeding success and chick weights were obtained to determine the potential implications of differing foraging behaviour. Chick diet and feeding frequency were monitored through a mixture of remote sensing cameras and direct observations. Prey items returned to the nest are carried outside the bill by the adults and so can be identified and measured relatively to bill length. A total of 10 cameras were placed at nest crevice entrances, and 2 hour sessions of diet watches were carried out three times daily.

Results

In 2017 GPS data was returned from 13 tags on North Ronaldsay, complementing the 9 tracks recorded in 2016. Camera traps recorded a total of 76,962 photographs. Photographs collected dietary data and recorded events of avian predation and kleptoparasitism. Nest success was monitored in 39 nests and chick weights were recorded from 22 Nests.

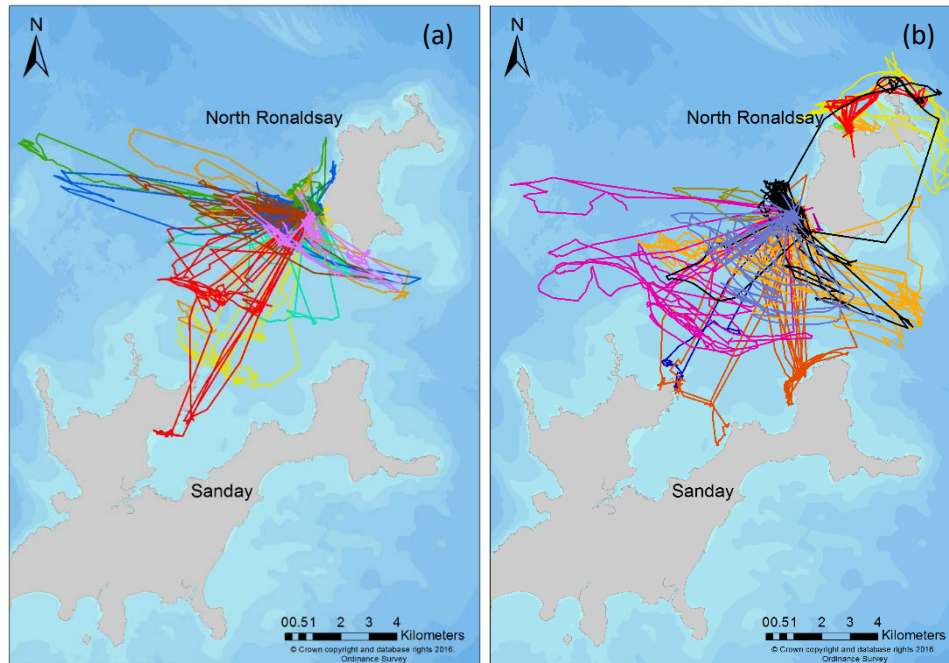


Figure 1. North Ronaldsay tracking data (a) 2016, (b) 2017.

On North Ronaldsay 46 Hours of visual diet watches were carried out, recording 509 feeding events, and 165 Instances of kleptoparasitism. Species of prey observed within the diet included butterfish *Pholis gunnellus*, dragonet *Callionymus lyra*, sandeel *Ammodytes marinus*, blenny spp., flatfish spp., cottidae spp., and prawn spp..

Conclusions and Recommendations

This project is a continuation of MASTS small grant funded field work carried out over the 2016 breeding season (June-July) on North Ronaldsay (<http://www.masts.ac.uk/media/36087/sg334-small-grant-report.pdf>). By carrying out observations over two field seasons (2016/17), potential temporal differences across years at multiple field sites can be traced. By collecting data at two spatially differing but tidally active field sites, a potential comparison can be made between North Ronaldsay, where the construction of marine renewables has not taken place, and Stroma where the installation of devices has begun.

Preliminary visual analysis of the tracking data shows evidence of the foraging behaviour of black guillemots to associate closely with tide direction and tidally driven processes such as eddies. Individuals display strong foraging site preference with further individual variation in the distances travelled to specific foraging locations. Some of the foraging distances are the longest recorded for breeding black guillemots (>24km). These data indicate habitat preferences of foraging adult black guillemots, which can help assess the potential for interaction with tidal renewable developments,

and the effectiveness of Marine Protected Areas. To study environmental variables potentially influencing the foraging behaviour of adults, future analyses will focus on the relationship between GPS tracks and tidal currents, habitat, and prey species. The field season proved successful with a range and wealth of data being collected.

Acknowledgements

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