Department of Energy & Climate Change

Measuring the interaction between marine features of Special Protection Areas with offshore wind farm development sites through telemetry – Completed Project

A project undertaken by the British Trust for Ornithology (BTO), funded by the Department of Energy and Climate Change (DECC) Offshore Energy Strategic Environmental Assessment (OESEA) programme. For further information, contact the Project Coordinator at sml@hartleyanderson.com

Context

Potential areas for development of offshore wind farms include locations that may hold large numbers of seabirds, seaduck and other waterbirds. Both consented and proposed development sites within the North Sea may also overlap the foraging areas of seabirds that are features of protected sites. Offshore wind farms may potentially have an impact on these bird populations through four main effects: (1) displacement due to the disturbance associated with developments; (2) the barrier effect posed by developments to migrating birds and birds commuting between breeding sites and feeding areas; (3) collision mortality; (4) indirect effects due to changes in habitat or prey availability. When assessing the potential effects of proposed wind farms on local bird populations, it is important to establish not only the use that birds make of the proposed wind farm area, but also in the assessment of collision risk, whether they are likely to come into contact with the turbines. The latter is largely determined by the height at which the birds fly, and any avoidance behaviour that they may show towards the turbines.

Wind farms have the potential to affect breeding seabirds or wintering waterbirds that are features of Special Protection Areas (SPA) if they forage in, or migrate through areas where wind farms are proposed. Thus it is important to understand the connectivity between features of SPAs with development regions.

Project Objectives & Scope

Figure 1 – Tagging a LBB at Orford Ness in 2011

The project was carried out to investigate the movements of two SPA feature species, lesser black-backed gulls (LBB) and great skuas which are thought fly at heights that puts them at risk of interaction with offshore wind farms. The objectives were threefold:

To understand the connectivity of these species with the areas of consented (constructed and partially constructed) and proposed wind farm sites;
To understand the extent to which these species used the areas of already constructed/partially constructed wind farms;
To provide an assessment of the flight altitudes of these species that could usefully inform collision risk modelling.

The project tagged LBBs at Orford Ness, Suffolk, part of the Alde-Ore Estuary SPA, using GPS devices attached either using a leg-hoop, body or wing harness (Figure 1). For LBBs, the project covered the period from June 2010 to August 2013, with tags gradually wearing out, so fewer measurements were taken per bird in each successive year and some tags stopped working completely before August 2013. Great skuas from a colony at the Foula SPA and also the Hoy SPA were also tagged with GPS devices on either a leg-hoop and wing harness. Due to the apparent

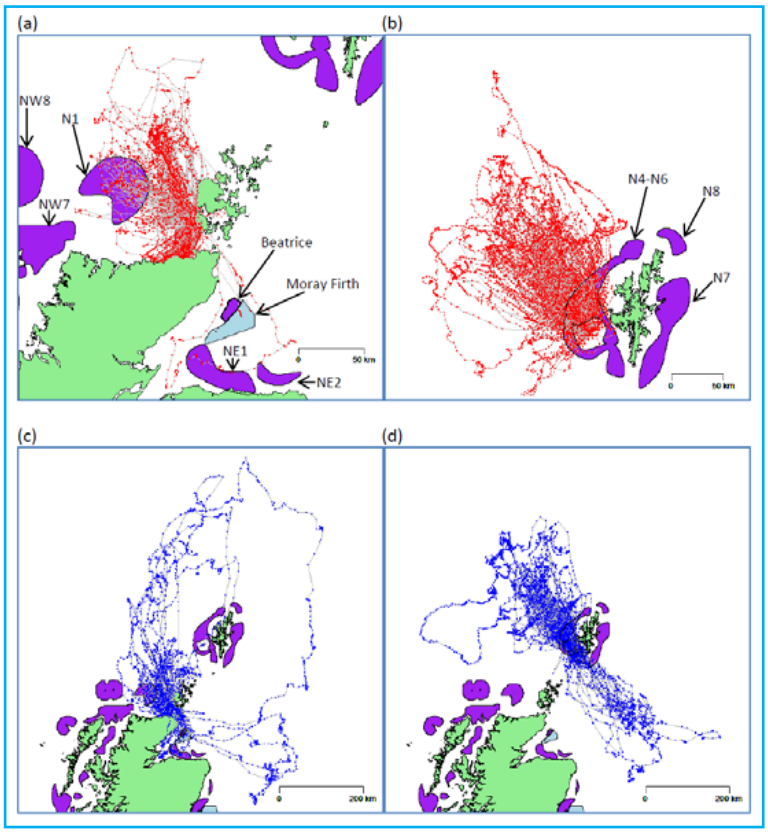
impacts of the attachment methods on over-winter survival in great skuas, the data was restricted to observations from the breeding seasons of 2010 and 2011 only. Between 2010 and 2011, twenty-five adult LBBs (n=11 in 2010 and n=14 in 2011) and twenty-four great skuas (n=4 in 2010 and n=20 in 2011) were tagged with GPS devices.

Project Outcomes & Outputs

Preliminary results from the three years of the study (2010, 2011 and 2012) were reported previously (Thaxter *et al*. 2011, Thaxter *et al*. 2012, Thaxter *et al*. 2013), with a final report (Thaxter *et al.* in preparation) providing a comprehensive analysis of the data from all three years. For great skuas, data were collected during 2010 and 2011 and the final analysis is not yet complete, therefore, information for this species is from the preliminary reports only.

Connectivity with wind farm areas

Initial investigation into the interaction of LBB with offshore wind farms revealed likely individual, and annual variation. Of all birds tracked, the proportion of birds that used areas of operational, consented and proposed offshore wind farm areas was 70% (of 10 birds) in 2010, 78% (of 18 birds) in 2011, and 57% (of 14 birds) in 2012, with all birds using the large Round 3 East Anglia zone, for which wind farm project proposals have been submitted. Connectivity with operational wind farms was more limited, with up to 50% of birds (in 2010) recorded in the area of the Greater Gabbard offshore wind farm, and one bird (in 2010 and 2012) recorded in the area of the Scroby Sands wind farm. Up to 50% of birds (in 2010 and 2011) used the Galloper extension to the Greater Gabbard site that at the time was consented, but contained no turbines. Despite the apparent high numbers of birds interacting with wind farms, the total time spent and spatial extent of overlap of areas used with offshore wind farms was more limited. The percentage of time spent in the areas of offshore wind farms peaked at 4% in 2010.



From the second year report (Thaxter *et al.* 2012), the findings for great skua suggested substantial spatial and temporal overlap with some of the Scottish Government's renewable energy development zones (Figure 2), especially for birds on Foula, as potential development zones essentially surround the island.

Figure 4: Movement of great skua in 2011 during breeding: a) Hoy and b) Foula and post-breeding: c) Hoy and d) Foula. Wind farm zones shown as purple for Scottish medium term zones (note these were announced after the data for great skua were collected), and one short term zone in Beatrice in the Moray Firth and blue for the Round 3 Moray Firth zone.

LBB use of wind farm areas

The use of offshore areas and thus the areas of operational, consented and proposed offshore wind farms during the breeding season (covering the pre-breeding (*ca*. March-May), breeding (*ca*. May-July) and post-breeding (*ca*. July-September) periods) showed individual, seasonal, sex-specific and annual variations (Figure 2).

Lesser black-backed gulls and great skua telemetry study

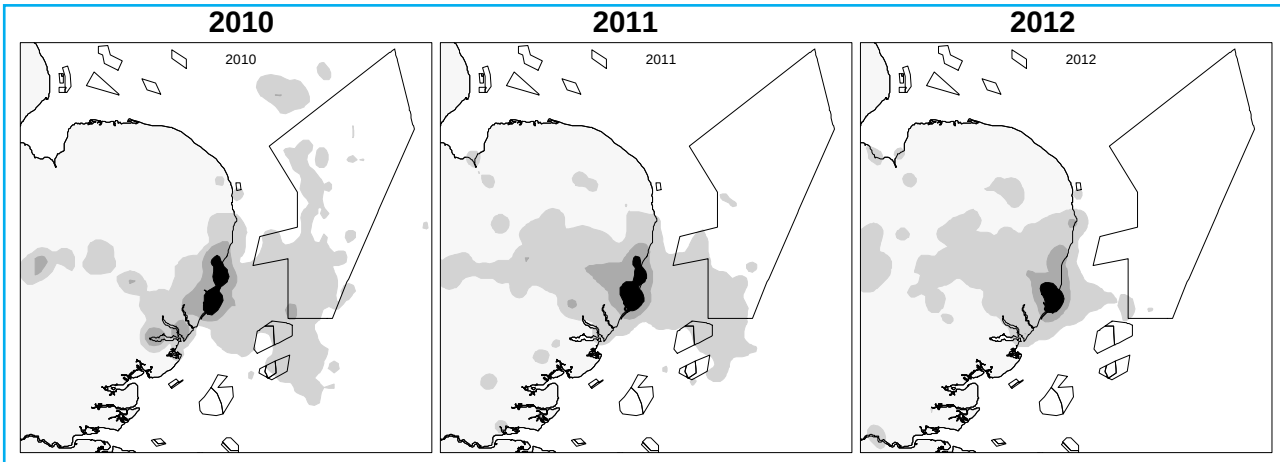


Figure 2: Spatial area usage by lesser black-backed gulls during respective years of 2010, 2011, 2012. Shown are the 95% (light grey) representing total area usage, 75% KDEs (medium grey) and 50% KDE, representing core area usage. Also shown are polygons shown represent wind farms in the area.

Individual birds tracked across multiple years differed in their seasonal patterns of wind farm usage, with some birds foraging in wind farm areas in some years but not in others. Use of offshore areas and areas of offshore wind farms showed a peak between late June and early July, corresponding to the chick-rearing period. Males used offshore areas and wind farms significantly more than females later in the season. Birds used areas of offshore wind farms more during 2010 than other years, a pattern that could not be explained solely by annual differences in productivity. The use of offshore wind farm areas at this colony was highly ephemeral for this species and variable between years.

LBB flight altitudes

LBBs affiliated with their breeding colony were shown to fly higher overland than over water, and higher at day than during the night. In all cases, flight altitude was relatively low (below 30m), with the highest proportion of observations below 5m from ground/sea level. Based on boat-based surveys, Analysis of boat-based surveys (Johnston *et al.* 2013), predicted a higher proportion of LBBs flying at approximately 20m, a height that put them at risk of colliding with offshore wind turbine rotor blades. The findings from this study using GPS suggest the proportion of birds at risk of collision could be lower, since their recorded flight altitudes were lower.

Interactions with offshore wind farms during LBB migration and wintering periods

Tracking of 18 LBBs over three consecutive migration periods (2010, 2011 and 2012) revealed mixed migration strategies, with at least four birds remaining in the UK, thirteen migrating to areas further south, to wintering areas in Iberia or North Africa, with one bird (in 2010/11) reaching Mauritania. The migration band of those birds leaving the UK was of greatest spatial intensity across the outer Thames Estuary, the central English Channel and Channel Islands and northern France. The exposure of birds to the potential effects associated with offshore wind farms was thus highest in these areas.

DECC Offshore Energy SEA

The SEA process aims to help inform licensing and leasing decisions by considering the environmental implications of a plan/programme and the activities which could result from its implementation. Since 1999, DECC has conducted a series of offshore energy SEAs, the latest covering wind, tidal stream and range, CO_2 and hydrocarbon gas storage, and oil & gas – see right.

	Area	Sector
SEA 1	The deep water area along the UK and Faroese boundary	Oil & Gas (19th Licensing Round, 2001)
SEA 2	The central spine of the North Sea which contains the majority of existing UK oil and gas fields	Oil & Gas (20th Licensing Round, 2002)
SEA 2 Extension	Outer Moray Firth	Oil & Gas (20th Licensing Round, 2002)
SEA 3	The remaining parts of the southern North Sea	Oil & Gas (21st Licensing Round, 2003)
R2	Three strategic regions off the coasts of England and Wales in relation to a second round of offshore wind leasing	Offshore wind (R2 of Leasing, 2003)
SEA 4	The offshore areas to the north and west of Shetland and Orkney	Oil & Gas (22nd Licensing Round, 2004)
SEA 5	Parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland	Oil & Gas (23rd Licensing Round, 2005)
SEA 6	Parts of the Irish Sea	Oil & Gas (24th Licensing Round, 2006)
SEA 7	The offshore areas to the west of Scotland	Oil & Gas (25th Licensing Round, 2008)
OESEA	UK offshore waters*	Oil & Gas (26th Licensing Round, 2009) Gas storage Offshore wind (R3 of Leasing, 2009)
OESEA2	UK offshore waters*	Oil & Gas (27th Licensing Round, 2012) Gas storage Carbon dioxide transport and storage Offshore wind, wave and tidal energy

*For renewable energy included potential leasing in the UK Renewable Energy Zone (REZ) and the territorial waters of England and Wales but not the Scottish Renewable Energy Zone and Northern Irish waters within the 12 nautical mile territorial sea limit

Since the first SEA, the associated research programme has targeted key information gaps on the marine environment and potential industrial impacts, to inform the SEA process, developers, consenting bodies and others. Research priorities are discussed with the SEA Steering Group and a range of other stakeholders.

For more information on the OESEA programme, visit the offshore SEA web pages on https://www.gov.uk/ or email oep@decc.gsi.gov.uk

A data portal for previous SEA reports and data is at http://www.bgs.ac.uk/data/sea