Department of Energy & Climate Change

Foraging ranges of northern gannets *Morus bassanus* in relation to proposed offshore wind farms in the UK 2010-2012 – Completed Project

A project undertaken by the Royal Society for the Protection of Birds (RSPB), 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

Britain and Ireland are of outstanding international importance for their breeding seabirds for which they host a high proportion of the biogeographical populations of several species, one of which is the northern gannet *(Morus bassanus)*. The UK hosts approximately 59% of the world population of gannets at colonies distributed mainly around the western and northern coasts of Britain. The only gannet colony in England is at Flamborough Head and Bempton Cliffs, a Special Protection Area (SPA) that includes gannet as part of the breeding seabird assemblage that forms a qualifying feature of the site. Studies from the Bass Rock colony indicate regular foraging ranges for gannets in excess of 100km, suggesting that several proposed offshore wind energy development zones could lie within the expected foraging range of breeding gannets from the Flamborough Head and Bempton Cliffs SPA.

Gannets may be vulnerable to collision with offshore wind turbines; they have poor manoeuvrability and their long, narrow wings and high wing-loading (wing loading is the ratio of weight to wing area) are adaptations to using the wind to assist fast flight. The risk with wind farms is unclear, with it depending on levels of flight activity within the wind farm footprints and within the rotor swept area and extent of avoidance behaviour. It is known that gannets fly at and plunge-dive from, elevations within rotor swept height.

Breeding gannets are centrally placed foragers, consequently their foraging ranges are likely to be most constrained when provisioning growing chicks, although they can still cover large distances during this period. Flight activity, within a given area, may increase as a result of feeding aggregations e.g. individuals commuting to the same foraging locations and it is anticipated that any risk is likely to be increased during chick-rearing as breeding gannets are constrained by the need to return to the nest.

An essential part of both Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA), for offshore development, including for offshore wind farms, is to determine the bird populations that might be affected and in particular to assess the risk of adverse impact on relevant SPAs and their interest features. No information on gannet foraging ranges from the Bempton colony was known prior to the start of the study in 2010.

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Project Objectives & Scope

Study objectives were to:

- Determine foraging ranges, flight directions and foraging destinations of adult gannets from the breeding colony at Bempton Cliffs;
- Determine whether adult gannets from Bempton Cliffs forage within or pass through, on their way to foraging locations, areas of the North Sea proposed for wind energy development;
- Obtain a measure of relative importance of the sea areas used.

Figure 1 - Fitting a PTT to a gannet

The project tagged gannets at the Staple Newk section of the Flamborough Head and Bempton Cliffs colony (hereafter, Bempton Cliffs), using Platform Transmitter Terminals (PTTs) to investigate their foraging ranges during chick-rearing and early post breeding periods. PTTs were used rather than GPS data loggers as these would have required recapture or close approach, with clear line of sight, to remotely download data. The PTTs were mounted on the tail feathers (Figure 1) with birds expected to shed the tags at least when moulting, if not sooner.

Project Outcomes & Outputs

Preliminary results from the first two years of the study (2010 and 2011) were reported previously (Langston & Boggio 2011, Langston & Teuten 2012), with the final report (Langston *et al.* 2013) providing a comprehensive analysis of the data from all three years.

Forty two breeding adult gannets, tracked via satellite PTTs, from Bempton Cliffs in 2010, 2011 and 2012, yielded information about their foraging ranges during chick-rearing, and the extent of overlap of their foraging trips with potential development zones for offshore wind energy generation in the North Sea. Distance to colony had the over-riding influence on foraging range. Most foraging trips were within 150km of Bempton Cliffs (*ca.* 70% of foraging trips were within 50km of the cliffs), and considerable overlap during chick-rearing was noted in particular with the Hornsea Round 3 development zone. Some information was obtained for the early post-breeding period in each year, indicating variability in dispersal and migration away from Bempton Cliffs, and the potential for interaction with several different wind farms at this stage of the gannet's annual cycle. In particular, increased numbers of locations were recorded in the East Anglia zone in the post-breeding period, contrasting with few locations during chick-rearing. Relatively few locations were recorded within the Dogger Bank zone during chick-rearing but there were more post-breeding.

Langston *et al.* (2013), illustrated that the core foraging range (based on the 50% density contour, darkest blue on Figure 2 below) extended further east within the Hornsea zone in 2012, utilising more of this zone, compared with earlier years. The core foraging range extended to 2,547km^2 in 2010, 3,371km^2 in 2011, and 4,570km^2 in 2012. The areas of active use (represented by the 95% density contours, lightest blue on Figure 2) in 2010 and 2011 incorporated clusters of locations within the periphery of the Greater Wash, whereas in 2012 one individual made repeated forays into the Wash. The areas of active use extended to 18,002km^2 in 2010, 15,852km^2 in 2011 and 17,744km^2 in 2012 and indicated a more continuous distribution of activity further eastwards in 2012 than in 2010 and 2011. This was likely due to variability between individual foraging trips or birds rather than a significant difference between years.

The observations at Bempton Cliffs fit with the theories of intraspecific competition and colony size, whereby birds from larger colonies have to forage further afield because of intraspecific competition and prey depletion (Lewis *et al.* 2001). This is also likely to suppress foraging extent to the north of Bempton Cliffs, especially as there is pronounced spatial segregation of foraging areas used by gannets from different breeding colonies (Wakefield *et al.* 2013). There were an estimated 3,940

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AONs (apparently occupied nests) of gannets at Bempton Cliffs, compared with 48,065 AONs at Bass Rock (to the north) in 2003/04 (Wanless *et al.* 2005). As the Bempton colony grows in size, it might be expected that foraging ranges will increase, owing to increased intraspecific competition at the colony.

Spatial segregation of feeding areas used by gannets from adjoining breeding colonies during chick-rearing is an important element in considering potential colony-specific effects from offshore developments.

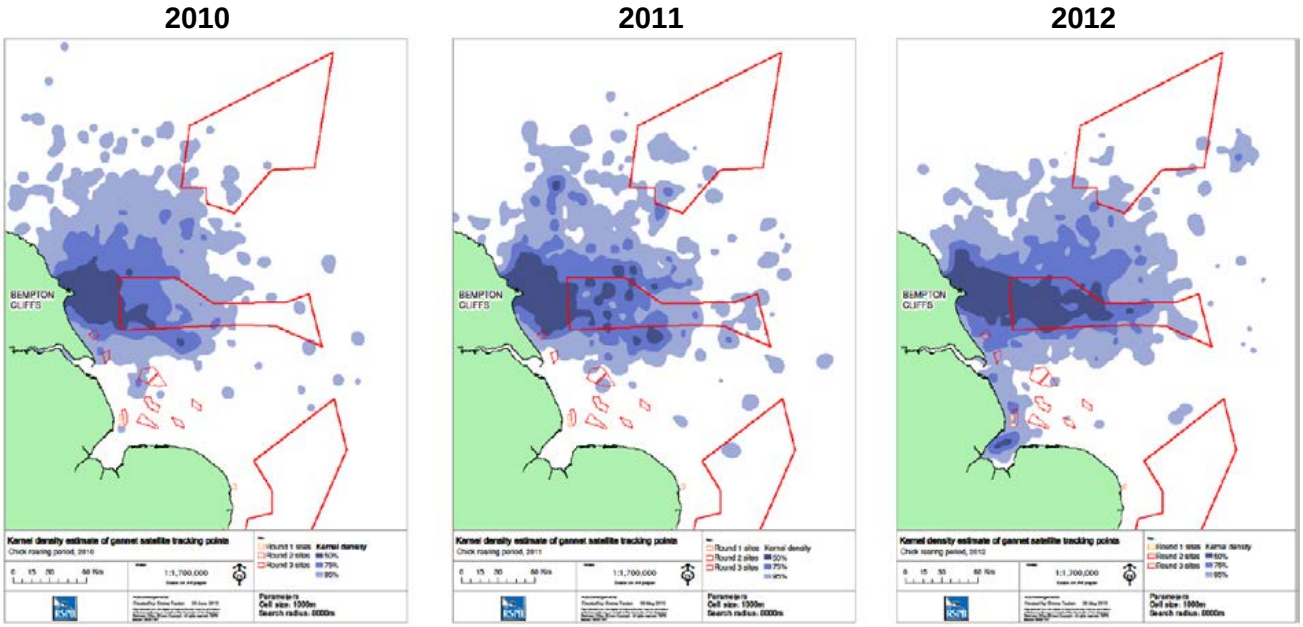

Figure 2: Kernel density estimation for adult gannets during chick rearing: 2010 (n = 14), 2011 (n = 13) & 2012 (n = 15), showing the 50%, 75% and 95% density contours (see Langston et al. 2013 for description).

Gannets are considered to be at moderate to high risk of collision with wind turbines, owing to their flight elevation and plunge dive height, from 10-50m or more, which overlap with rotor swept height (e.g. Langston 2010). Risky flights were identified to be those during foraging and searching, when individuals were observed up to 50m height, but direct flight was often observed to be below 10m (Krijgsveld *et al.* 2011). There is considerable uncertainty at present about likely cumulative effects of the proposed scale of offshore wind farm development on gannets. Collision hazard could become significant, given the substantial scale of proposed wind energy development across the North Sea, not just in UK waters.

Recent studies of gannets, during spring and autumn migration, at Egmond aan Zee offshore wind farm in the Netherlands, indicated strong avoidance of wind turbines (Krijgsveld *et al.* 2011), which suggests that flight avoidance of wind turbines is likely, at least during migration. It is not known whether this response will apply to foraging flights of breeding gannets, especially during chick-rearing, due to the need to make frequent, repeat trips to the colony.

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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