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East Anglia THREE

Information for Habitats Regulations Assessment

Appendix 3 Apportioning of the Flamborough
Head and Filey Coast pSPA Gannet
Population among North Sea Offshore
Windfarms

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1 INTRODUCTION

1. This report provides an estimation of the percentage of the Flamborough and Filey Coast (FFC) pSPA gannet population at risk of collision effects in North Sea offshore windfarms. This report follows the methods used for previous assessments (MacArthur Green 2014, 2015), but presents updated calculations using breeding colony estimates presented in Murray et al. (2015).

2 ESTIMATION OF UK NORTH SEA & CHANNEL WATERS GANNET BDMPS AND FFC PSPA PROPORTION

2. Due to variations in the timing of migration among individuals both within and between colonies and also between different age classes there is considerable overlap in the gannet seasons for the UK (Furness 2015; *Table 2.1*).

Table 2.1. Gannet seasons in UK waters from Furness (2015).

Season	J	F	M	A	M	J	J	A	S	O	N	D
Non-breeding												
Spring migration (UK waters)												
UK Breeding season (full)												
UK Breeding season (core)												
Autumn migration (UK waters)												

3. For this assessment the following descriptions of the seasons are considered to be appropriate:
- Spring migration (December – March)
 - UK breeding (April – August)
 - Autumn migration (September – November).

2.1 Migration periods

4. During migration periods gannets from different breeding colonies mix together to varying extents but show some segregation in wintering latitude and migration routes (Fort et al. 2012). No birds tracked from the Bass Rock population in 2008-09 spent the winter in the North Sea (Garthe et al. 2012), and passage routes have shown that approximately 63% fly south through the North Sea and English Channel in autumn, while 27% follow the same route north in spring (WWT 2012). Other studies of tracked birds (summarised in WWT 2012) have been used here to generate estimates of movements through the North Sea. On the basis of these data, and observations made at coastal observatories (summarised in Furness 2015)), the proportions of the FFC population expected to be present in the UK North Sea and English Channel during the autumn and spring passage periods are estimated in *Table 2.2*.
5. The estimates in *Table 2.2* make use of flight direction data derived from the detailed tagging studies which have been conducted on birds from the FFC pSPA and Bass Rock colonies. This approach is slightly different from that presented in Furness (2015), where proportions were estimated without specific reference to these

tagging data. The use of these data here also results in a slightly different approach to how migration of different age classes was calculated.

6. Only adults had tags fitted, therefore we only have proportional movement estimates for adults. We have therefore assumed that the proportions of immature birds which travel north and south from their colonies are the same as for observed adults. This differs from the age related differences reported in Furness (2015) and leads to some further small differences between this assessment and the numbers reported in Furness (2015). For example, in the latter a small number of immature birds from the west coast colonies at Grassholm and Ailsa Craig have been predicted to have connectivity with the North Sea. In this assessment, since we have not estimated immature movement rates separately from adults, we have taken a slightly more precautionary approach; only colonies with predicted adult connectivity to the North Sea have been included.
7. Furthermore, there are some minor differences in how colonies have been presented in *Table 2.2* and in Furness (2015). These differences reflect colony status (i.e. whether or not they are included in the relevant SPA citation) and the potential for connectivity with the North Sea, but the actual population sizes used are the same in both this report and Furness (2015). For example, *Table 2.2* includes the named colonies (Foula, West Westray and Troup Head) as these are important components of the North Sea population (although gannet are not currently included on the relevant SPA citations), while in Furness (2015) these colonies are included within the category of 'UK North Sea non-SPA colonies' (Furness (2015); *Table 7.1* and *Appendix Table 14*). These sites have been included in the current assessment on the grounds of their connectivity with the North Sea.
8. The population sizes used here include all age classes, estimated by dividing the breeding population by the adult proportion (0.55; Furness 2015).

2.2 Breeding season

9. During the core breeding season gannets observed in windfarm sites in the North Sea are assumed to originate from one of two candidate colonies: FFC and the Bass Rock (BR). For windfarm sites located to the south of FFC and within the maximum foraging range (590km Thaxter et al. 2012) it has been assumed that all breeding season observations are birds from FFC. Wakefield et al. (2013) present evidence indicating there is relatively little overlap in foraging areas between breeding colonies. However, it remains possible that windfarm sites located within the zone where birds from the two colonies may forage have been assigned equally between the two populations.

Table 2.2. Total population estimates for gannet breeding populations with connectivity to the North Sea on passage (using adult percentage of 55% from Furness (2015); see text for description of region extent). Note that AON are the values presented in Murray et al. (2015) where provided.

Breeding colony (year of count)	AON	No. adults	All ages	Autumn migration through N Sea & English Channel				Spring migration through N Sea and English Channel			
				Fly south		Fly north		Fly north		Fly south	
				Prop.	No.	Prop.	No.	Prop.	No.	Prop.	No.
Iceland (1999)	37216	74432	134722	0.42	56583	0	0	0.1	13472	0	0
Norway (2010)	6000	12000	21720	0.5	10860	0	0	0.2	4344	0	0
Faeroes (2012)	2500	5000	9050	0.42	3801	0	0	0.2	1810	0	0
Hermaness (2008)	25580	51160	92600	0.5	46300	0	0	0.5	46300	0	0
Noss (2008)	11786	23572	42665	0.5	21333	0	0	0.5	21333	0	0
Foula (2007)	1226	2452	4438	0.5	2219	0	0	0.5	2219	0	0
Fair Isle (2013)	3591	7182	12999	0.5	6500	0	0	0.5	6500	0	0
West Westray (2012)	751	1502	2719	0.5	1359	0	0	0.5	1359	0	0
Sule Skerry & Sule Stack (2004)	6420	12840	23240	0.1	2324	0	0	0	0	0	0
North Rona and Sula Sgeir (2004)	11230	22460	40653	0.1	4065	0	0	0	0	0	0
St. Kilda (2004)	60290	120580	218250	0.1	21825	0	0	0	0	0	0
Troup Head (2010)	6456	12912	23371	0.63	14724	0.37	8647	0.27	6310	0.73	17061
Bass Rock (2009)	75259	150518	272438	0.63	171636	0.37	100802	0.27	73558	0.73	198879
Flamborough Head and Filey Coast (2012)	11061	22122	40041	0.75	30031	0.25	10010	0.5	20020	0.5	20020
Helgoland (2004)	656	1312	2375	1	2375	0	0	1	2375	0	0
Total	260022	520044	941280		395934		119459		199600		235960

2.3 Estimation of the percentage of the FFC pSPA gannet population at risk of collision effects in North Sea offshore windfarms

10. Using the estimated movement patterns of gannets through UK waters, seasonal definitions and regional definitions the percentage of gannets within North Sea offshore wind farms originating from the FFC pSPA colony is provided in *Table 2.3*. At wind farms within foraging range of the FFC pSPA (but beyond foraging range of all other colonies) all the gannets seen during the breeding season have been assumed to originate from FFC. For sites which are located within potential range of both FFC and Bass Rock it has been assumed that birds are equally likely to originate from either colony (hence 50% are attributed to FFC). This was based on consideration of the comparative ranges and site locations which indicate that while these sites are not equidistant to both colonies, they do fall within the region of overlapping foraging ranges.
11. The breeding season values reflect estimates for all age classes combined. To estimate the number of breeding adults from the FFC pSPA at risk, the breeding season percentages provided in *Table 2.3* need to be adjusted by the estimated proportion of this age class present (a value of 0.55 has been assumed for this metric, Furness 2015).
12. During migration the number of British SPA birds travelling north and south through the North Sea has been summed using the population estimates and proportions in *Table 2*. The British total was then added to the numbers estimated to pass through the North Sea which originate from Norwegian, Icelandic and Faeroese colonies. Having estimated the total flux of gannets on passage, the FFC pSPA percentage of this was then calculated for each windfarm in *Table 2.3* on the basis of its location relative to the colony locations.
13. The following examples illustrate the method used to calculate the number of birds from the FFC pSPA which pass through OWFs in each region of the North Sea and also the number estimated to remain in the North Sea over the winter. The calculations use the population estimates and the proportions predicted to pass through the North Sea in *Table 2.2*.
14. During autumn migration, the proportion of adult birds from FFC passing through OWFs in the Moray Firth has been calculated as:
 - The no. of adults from FFC $(11,061 \times 2) = 22,122$ multiplied by the proportion of this population estimated to migrate north through the Moray Firth $(0.25) =$

5,530; this is then divided by the total number of all age birds estimated to pass through the Moray Firth on migration (derived below).

- The total number on passage through the Moray Firth includes birds travelling both south (from farther north colonies) and north (from farther south colonies):
 - The number of all age birds from non-GB colonies (165,492) multiplied by the proportion estimated to pass through the Moray Firth (0.5 for Norway, 0.42 for Iceland and Faeroes) = 71,244, plus
 - The number of all age birds from UK colonies north of the Moray Firth which are predicted to have connectivity to the North Sea (Noss, Hermaness, Foula, Fair Isle, West Westray, Sule Skerry and Sule Stack, North Rona and Sula Sgeir, St. Kilda; 437,564) multiplied by the proportion estimated to pass southwards through the Moray Firth (0.5 & 0.1) = 105,925, plus
 - The number of all age birds from North Sea colonies south of the Moray Firth (Troup Head, Bass Rock, FFC; 335,849) multiplied by the proportion estimated to pass north through the Moray Firth (0.37 for Troup and Bass Rock, 0.25 for FFC) = 119,459.
 - = $5530 / (71244 + 105925 + 119459)$
 - = 0.019
15. Therefore, 1.9% of the gannets which pass through Moray Firth OWFs on autumn passage are estimated to be breeding adults from the FFC pSPA population.
16. This process was conducted for all North Sea OWFs under consideration, split into the following geographical categories:
- Moray Firth (Beatrice and MORL)
 - Aberdeen (EOWDC)
 - Firths of Forth and Tay (Inch Cape, Neart na Goithe, SeaGreen)
 - NE England (Blyth, Dogger Bank CB A&B, Teesside A&B and Teesside C&D, and Teesside)
 - SE England (Dudgeon, EA1, Hornsea Projects One and Two, Humber Gateway, Galloper, Gtr Gabbard, Lincs, London Array, Race Bank, Sheringham, Thanet, Triton Knoll, Westermost Rough)

- S England (Rampion and Navitus Bay)

17. For each geographical division the FFC passage number was divided by the summed contribution from colonies to the north and south on the basis of the proportions travelling in each direction (N or S). The same method was used for calculating FFC proportions passing through the OWFS during spring migration.

Table 2.3. Percentage of gannets in offshore wind farms during the breeding season (BS), autumn migration (Aut.), and spring migration (Spr.) periods which are estimated to originate from the FFC pSPA population.

Project	UK Round	Status	Period		
			BS	Aut.	Spr.
Beatrice	Scottish	Consent Authorised	0	1.9	3.3
Blyth Demonstration Site	-	Consent Authorised	0	1.5	5.6
Dogger Bank Creyke Beck A & B	3	Consent Authorised	50	1.5	5.6
Dogger Bank Teesside A & B	3	Consent Authorised	50	1.5	5.6
Dogger Bank Teesside C & D	3	Concept / Early Planning	50	1.5	5.6
Dudgeon	2	Consent Authorised	100	4.2	5.6
East Anglia ONE	3	Consent Authorised	100	4.2	5.6
East Anglia THREE	3	Consent Application Submitted	100	4.2	5.6
European Offshore Wind Development Centre		Consent Authorised	0	1.8	3.4
Firth of Forth Alpha and Bravo (Seagreen)	Scottish	Consent Authorised	0	1.8	3.4
Galloper	2 – extn.	Consent Authorised	0	4.2	5.6
Greater Gabbard	2	Fully Commissioned	0	4.2	5.6
Hornsea Project One	3	Consent Authorised	100	4.2	5.6
Hornsea Project Two	3	Consent Application Submitted	100	4.2	5.6
Humber Gateway	2	Consent Authorised	100	4.2	5.6
Inch Cape	Scottish	Consent Authorised	0	1.8	3.4
Lincs	2	Partial Generation / Construction	100	4.2	5.6
London Array	2	Fully Commissioned	0	4.2	5.6
Moray	Scottish	Consent Authorised	0	1.9	3.3
Navitus Bay	3	Consent Application Submitted	0	4.2	5.6
Near na Gaoithe	Scottish	Consent Authorised	0	1.8	3.4
Race Bank	2	Consent Authorised	100	4.2	5.6
Rampion	3	Consent Authorised	0	4.2	5.6
Sheringham Shoal	2	Fully Commissioned	100	1.9	3.3
Teesside	1	Fully Commissioned	50	1.5	5.6
Thanet	2	Fully Commissioned	0	1.5	5.6
Triton Knoll	2	Consent Authorised	100	1.5	5.6
Westermost Rough	2	Partial Generation / Construction	100	1.5	5.6

3 REFERENCES

Fort, J., Pettex, E., Tremblay, Y., Lorentsen, S-H., Garthe, S., Votier, S., Pons, J.B., Siorat, F., Furness, R.W., Grecian, W.J., Bearhop, S., Montevecchi, W.A. and Gremillet, D. (2012) Meta-population evidence of oriented chain migration in northern gannets (*Morus bassanus*). *Frontiers in Ecology and the Environment* 10: 237-242.

Furness, R.W. (2015) *Biologically appropriate, species-specific, geographic non-breeding season population estimates for seabirds*. Report for Natural England and Marine Scotland.

Garthe, S., Ludynia, K., Hüppop, O., Kubetzki, U., Meraz, J.F. and Furness, R.W. (2012) Energy budgets reveal equal benefits of varied migration strategies in northern gannets. *Marine Biology* 159: 1907-1915.

MacArthur Green (2014) Apportioning of the Flamborough and Filey Coast pSPA Gannet Population Among North Sea Offshore Wind Farms – Final Version. Submitted for Deadline VI Dogger Bank Creyke Beck

(<http://infrastructure.planningportal.gov.uk/wp-content/uploads/projects/EN010021/2.%20Post-Submission/Hearings/Issue%20Specific%20Hearing%20-%2001-07-2014%20-%200900%20-%20KC%20Stadium%20-%20%20Hull/Forewind%20Appendix%203-%20Apportioning%20of%20gannet%20populations.pdf>) – accessed 10/07/2015

MacArthur Green (2015). Apportioning of the Flamborough and Filey Coast pSPA Gannet Population Among North Sea Offshore Wind Farms. Hornsea Offshore wind Farm Project 2, Habitats Regulations Assessment Appendix B – Gannet Apportioning.

(<http://infrastructure.planningportal.gov.uk/wp-content/uploads/projects/EN010053/2.%20Post-Submission/Application%20Documents/Reports/12.6%20HRA%20Report%20Part%202.pdf>) – accessed 10/07/2015

Murray, S., Harris, M.P. & Wanless, S. (2015). The status of the gannet in Scotland in 2013-14. *Scottish Birds*, 35, 3-18.

Natural England (2013) 131018_EN010025: East Anglia One Wind Farm Order Application Written Summary Of The Oral Case Put By Natural England During the issues specific hearing 18 October 2013

Natural England / JNCC joint comments on Application by East Anglia One Ltd for East Anglia ONE Offshore Windfarm (the application) –Interested Parties Deadline IV (email dated 25/11/2013)

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W. and Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation* 156: 53-61.

Wakefield, E.D., Bodey, T.W., Bearhop, S., Blackburn, J., Colhoun, K., Davies, R., Dwyer, R.F., Green, J.A. Gremillet, D., Jackson, A.L., Jessopp, M.J., Kane, A., Langston, R.H.W., Lescroel, A., Murray, S., Le Nuz, M., Patrick, S.C., Peron, C., Soanes, L.M., Wanless, S., Votier, S.C. and Hamer, K.C. (2013). Space partitioning without territoriality in gannets. *Science* 341: 68-70.

WWT (2012). SOSS-04 Gannet Population Viability Analysis. Slimbridge.

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