



Hornsea Project Four

PINS Document Reference: B2.2

APFP Regulation: 5(2)(g)

B2.2: Report to Inform Appropriate Assessment Part 10: Appendix G: Marine Mammals - Grey seal RIAA information

Prepared SMRU Consulting, September 2021
Checked GoBe Consultants, September 2021
Accepted Sarah Randall, Orsted, September 2021
Approved Julian Carolan Orsted, September 2021

Doc. No: B2.2.G
Version: A

Table of Contents

| | | |
|-----|--------------------------------|----|
| 1.1 | Introduction..... | 3 |
| 1.2 | Connectivity Assessment..... | 3 |
| 1.3 | SAC Population Assessment..... | 10 |
| 1.4 | References..... | 12 |

List of Tables

| | |
|--|---|
| Table 1: Telemetry data for the 31 grey seals with telemetry locations within the Hornsea Four buffer..... | 7 |
|--|---|

List of Figures

| | |
|---|----|
| Figure 1: Telemetry tracks of the 31 grey seals with locations recorded within the Hornsea Four buffer..... | 6 |
| Figure 2: Annual grey seal pup production at Donna Nook (Humber Estuary SAC) (SCOS 2021). | 10 |
| Figure 3: Annual August grey seal haul-out counts at Donna Nook (Humber Estuary SAC) (SCOS 2021)..... | 11 |

1.1 Introduction

1.1.1.1 The purpose of this document is to provide context for the assessment of the potential for the Hornsea Four offshore wind farm project to impact grey seals as a qualifying feature of the Humber Estuary Special Area of Conservation (SAC) which will be presented in the Report to Inform Appropriate Assessment (RIAA). The RIAA should consider the movement of grey seals and connectivity between different haul out sites and the offshore location when assigning potential impacts to SACs. Additionally, it is important to note that the numbers of grey seals using the SAC to haul out and breed is now much higher than the population size at the time of SAC designation (and therefore published in the SAC citation). By taking these considerations into account, the predicted impact on the Humber Estuary SAC can be more realistically determined in order to inform the RIAA.

1.2 Connectivity Assessment

1.2.1.1 Grey seals are a wide ranging species and frequently travel over 100 km between haul-out sites and across Seal Management Areas (e.g. Thompson et al. 1996, Cronin et al. 2013, SCOS 2019). Recent analysis of telemetry data has shown that the maximum geodesic distance (shortest path at sea without crossing land) travelled from a haul-out was 448 km for grey seals (Carter et al. 2020). Therefore, it is important to understand that grey seals are not resident at one specific haul-out site, and as such, there is no such thing as a “Humber Estuary SAC grey seal”. Instead, grey seals have associations with SACs (i.e. they have recorded telemetry positions within an SAC) and may associate more with one haul out site over another. Here, the SMRU seal telemetry database was examined to investigate the connectivity between the Hornsea Four project area and the Humber Estuary SAC relative to other haul out areas.

1.2.2 Methods: Connectivity

1.2.2.1 A buffer of 37.6 km was placed around the Hornsea Four Boundary (array area and export cable corridor) (**Figure 1**) representing the approximate maximum disturbance impact area (informed by the maximum design scenario impact contours for a monopile at 5,000 kJ at the northwest modelling location). All tagged seals which had telemetry locations recorded within this Hornsea Four buffer were extracted from the SMRU telemetry database. This process identified a total of 32 adult grey seals with locations within the Hornsea Four buffer¹ (one adult grey seal was removed as its tag only recorded for 5 days, resulting in a total of 31 adult grey seals). The 31 grey seals were investigated further in order to assess connectivity between Hornsea Four and SACs and haul-out sites.

1.2.2.2 The location data for each of the 31 seals were queried to obtain the total number of locations recorded by each seal and how many of these were located within the Hornsea Four buffer, the Humber Estuary SAC boundary or the Berwickshire and North Northumberland Coast SAC boundary. These data were used to assess connectivity between Hornsea Four and the SAC boundaries.

¹ Note, 9 juveniles and pups were also identified but these were removed from subsequent assessment as the movement patterns of pups are not considered to be representative of adult grey seals.

1.2.2.3 The telemetry data was also investigated to assess relative usage of the SAC haul-outs. Seal tags categorise a “haul-out” as any time the tag is dry for 10 mins and therefore, given the at-sea resting behaviour of seals, there are many at-sea locations that are categorised as haul-outs when animals are not actually on land. To remove these, only hauled-out locations recorded within 1 km of land were defined as being associated with a haul-out. Association with haul-outs at the Humber Estuary SAC were defined as haul-out locations both within 1 km from land and within the Humber Estuary SAC boundary. These data were used to assess what proportion of “hauled-out” time each seal spent in association with the Humber Estuary SAC, in order to determine if the SAC was a key haul-out location for each seal.

1.2.3 Results: Connectivity

1.2.3.1 All but one of the 31 grey seals with telemetry locations within the Hornsea Four buffer also recorded locations within the Humber Estuary SAC boundary and were therefore considered to be associated with the Humber Estuary SAC ([Table 1](#)).

1.2.3.2 The seals showed varying levels of association with the Humber Estuary SAC haul-outs ([Table 1](#)). Some grey seals showed high levels of association (i.e. >70% of their coastal haul out locations were within the Humber Estuary SAC (n=6)) while others showed much lower levels of association (i.e. <10% of their locations within 1 km from the coast were within the Humber Estuary SAC (n=10)). Therefore, even though the seals showed association with the Humber Estuary SAC haul-outs, it was not necessarily a key haul-out location for all of these seals.

1.2.3.3 In order to apportion the amount of disturbance impact potentially experienced at the Hornsea Four site to the Humber Estuary SAC, it was assumed that if a seal recorded >50% of its locations within 1 km from the coast within the Humber Estuary SAC, then the Humber Estuary SAC was considered to be its primary haul-out location, and therefore the impacts should be considered to be impacts on the Humber Estuary SAC. Of the 31 grey seals with telemetry locations within the Hornsea Four buffer, 12 seals (39%) recorded >50% of their locations within 1 km from the coast within the Humber Estuary SAC, and therefore 39% of the seals were considered to use the Humber Estuary SAC as a primary haul-out ([Table 1](#)). Therefore, 39% of the impact should be apportioned to the Humber Estuary SAC.

1.2.3.4 The telemetry data also showed connectivity between the two grey seal SACs in east England, with some grey seals tagged at the Humber Estuary SAC having also recorded locations within the Berwickshire and North Northumberland Coast SAC and vice versa, thus these seals are considered to be associated with both SACs ([Table 1](#)). Of the 31 tagged adult grey seals that recorded locations within the Hornsea Four buffer, 10 also recorded telemetry locations within the Berwickshire and North Northumberland Coast SAC and were therefore considered to be associated with the Berwickshire and North Northumberland Coast SAC ([Table 1](#)). Of these 10 grey seals, 8 of them recorded more telemetry locations within the Berwickshire and North Northumberland Coast SAC than the Humber Estuary SAC, and therefore could be considered to have stronger associations with the Berwickshire and North Northumberland Coast SAC than the Humber Estuary SAC.

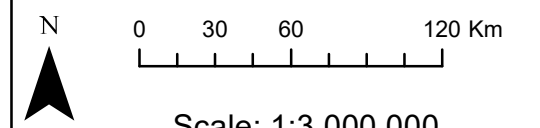
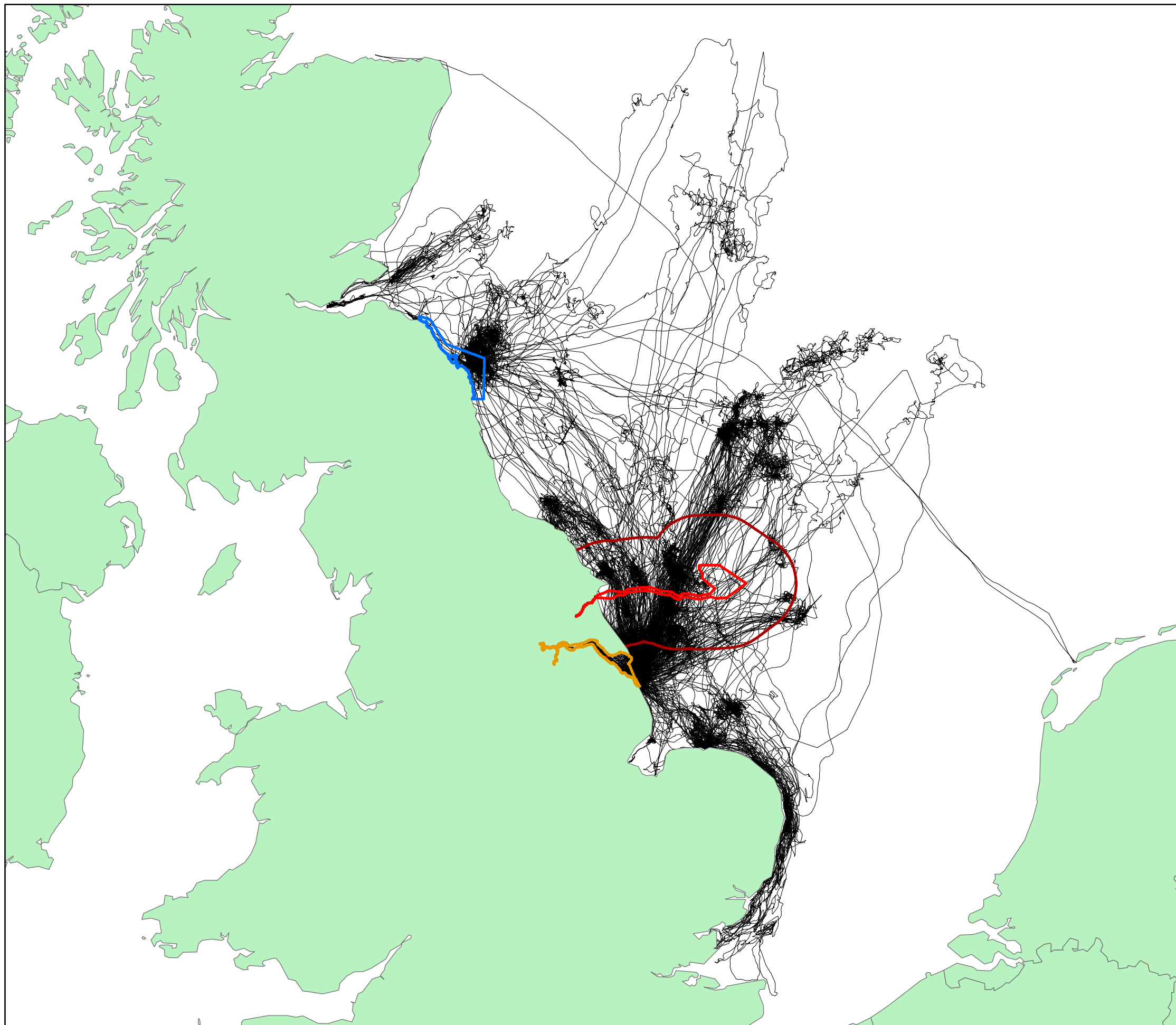
1.2.3.5 It is acknowledged that there are a couple of limitations to this approach. Firstly, the locations have not been regularised and therefore variation between individuals may be due to the different temporal variations between the tags. Secondly, 13 of the tags were ARGOS tags which have a higher location error compared to the GPS tags, therefore there is less confidence in assigning seals to haul-outs or the Hornsea Four Boundary with these datasets. Despite this, the assessment clearly showed that seals in the Project boundary area showed associations with both the Berwickshire and North Northumberland Coast SAC and the Humber Estuary SAC, and therefore it is not appropriate to attribute all impacts from Hornsea Four to the Humber Estuary SAC alone.

Hornsea Project Four

Grey Seal Telemetry Tracks
Connectivity with SACs

Legend

- Order Limits
- Berwickshire and North Northumberland Coast SAC
- Humber Estuary SAC
- 37.6 km buffer
- Adult grey seal telemetry tracks within the Hornsea Four 37.6 km buffer



| | | | | | |
|------|-----------------------------------|----|-----|------|------------|
| Rev | 1 | By | RRS | Date | 24/09/2021 |
| Proj | Projection: WGS 1984 UTM Zone 30N | | | | |

Table 1: Telemetry data for the 31 grey seals with telemetry locations within the Hornsea Four buffer.

| Tag ID | Tagging location | Tag type | # Days | Year | Total # Locations | Within Hornsea Four Boundary (+Buffer) | | Within Humber Estuary SAC Boundary | | Within Berwickshire and North Northumberland Coast SAC Boundary | | Within 1 km of land | | |
|---------------|------------------|----------|--------|------|-------------------|--|------------------------|------------------------------------|------------------------|---|------------------------|---------------------|------------------------------------|--------------------|
| | | | | | | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # within 1 km | # within 1 km & Humber Estuary SAC | % of # within 1 km |
| dn2-5813-88 | Donna Nook | ARGOS | 45 | 1988 | 131 | 21 | 16% | 75 | 57% | 0 | 0% | 72 | 57 | 79% |
| dn3-5813-89 | Donna Nook | ARGOS | 104 | 1989 | 771 | 21 | 3% | 200 | 26% | 243 | 32% | 155 | 97 | 63% |
| fa1-5813-91 | Farnes | ARGOS | 152 | 1991 | 854 | 30 | 4% | 10 | 1% | 485 | 57% | 308 | 2 | 1% |
| hg11-Ailsa-05 | Donna Nook | ARGOS | 186 | 2005 | 1211 | 473 | 39% | 169 | 14% | 0 | 0% | 69 | 50 | 72% |
| hg11-Bella-05 | Donna Nook | ARGOS | 166 | 2005 | 763 | 133 | 17% | 120 | 16% | 0 | 0% | 89 | 56 | 63% |
| hg11-Chuck-05 | Donna Nook | ARGOS | 185 | 2005 | 829 | 153 | 18% | 150 | 18% | 0 | 0% | 150 | 97 | 65% |
| hg11-Donna-05 | Donna Nook | ARGOS | 178 | 2005 | 1079 | 113 | 10% | 189 | 18% | 0 | 0% | 96 | 70 | 73% |
| hg11-Earl-05 | Donna Nook | ARGOS | 150 | 2005 | 325 | 35 | 11% | 7 | 2% | 52 | 16% | 59 | 3 | 5% |
| hg11-Festa-05 | Donna Nook | ARGOS | 11 | 2005 | 64 | 6 | 9% | 41 | 64% | 0 | 0% | 23 | 13 | 57% |
| hg11-Garth-05 | Donna Nook | ARGOS | 143 | 2005 | 619 | 298 | 48% | 169 | 27% | 0 | 0% | 88 | 70 | 80% |
| hg11-Hank-05 | Donna Nook | ARGOS | 158 | 2005 | 1141 | 178 | 16% | 277 | 24% | 0 | 0% | 93 | 62 | 67% |
| hg11-Irene-05 | Donna Nook | ARGOS | 146 | 2005 | 352 | 244 | 69% | 207 | 59% | 0 | 0% | 246 | 113 | 46% |

| Tag ID | Tagging location | Tag type | # Days | Year | Total # Locations | Within Hornsea Four Boundary (+Buffer) | | Within Humber Estuary SAC Boundary | | Within Berwickshire and North Northumberland Coast SAC Boundary | | Within 1 km of land | | |
|---------------|------------------|----------|--------|------|-------------------|--|------------------------|------------------------------------|------------------------|---|------------------------|---------------------|------------------------------------|--------------------|
| | | | | | | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # within 1 km | # within 1 km & Humber Estuary SAC | % of # within 1 km |
| hg11-Jessy-05 | Donna Nook | ARGOS | 256 | 2005 | 1440 | 694 | 48% | 106 | 7% | 0 | 0% | 113 | 25 | 22% |
| hg45-482b-12 | Tentsmuir | GPS | 169 | 2015 | 6744 | 43 | 1% | 0 | 0% | 206 | 3% | 568 | 0 | 0% |
| hg48-009-15 | Blakeney | GPS | 222 | 2015 | 12985 | 863 | 7% | 649 | 5% | 0 | 0% | 895 | 56 | 6% |
| hg48-010-15 | Donna Nook | GPS | 150 | 2015 | 11342 | 4830 | 43% | 514 | 5% | 1471 | 13% | 754 | 0 | 0% |
| hg48-291-15 | Blakeney | GPS | 194 | 2015 | 9754 | 2435 | 25% | 572 | 6% | 273 | 3% | 519 | 78 | 15% |
| hg48-315-15 | Blakeney | GPS | 114 | 2015 | 7360 | 1423 | 19% | 830 | 11% | 0 | 0% | 196 | 53 | 27% |
| hg48-342-15 | Donna Nook | GPS | 212 | 2015 | 8993 | 727 | 8% | 1513 | 17% | 0 | 0% | 404 | 11 | 3% |
| hg48-356-15 | Blakeney | GPS | 195 | 2015 | 16828 | 6200 | 37% | 843 | 5% | 3581 | 21% | 2370 | 14 | 1% |
| hg48-357-15 | Blakeney | GPS | 203 | 2015 | 16119 | 3623 | 22% | 855 | 5% | 0 | 0% | 567 | 76 | 13% |
| hg48-358-15 | Donna Nook | GPS | 203 | 2015 | 13809 | 6259 | 45% | 1801 | 13% | 0 | 0% | 136 | 131 | 96% |
| hg48-359-15 | Donna Nook | GPS | 170 | 2015 | 12638 | 495 | 4% | 546 | 4% | 1754 | 14% | 2011 | 8 | 0% |
| hg48-360-15 | Donna Nook | GPS | 238 | 2015 | 10606 | 1350 | 13% | 991 | 9% | 139 | 1% | 683 | 59 | 9% |
| hg48-362-15 | Blakeney | GPS | 187 | 2015 | 12538 | 4224 | 34% | 521 | 4% | 2240 | 18% | 1681 | 64 | 4% |

| Tag ID | Tagging location | Tag type | # Days | Year | Total # Locations | Within Hornsea Four Boundary (+Buffer) | | Within Humber Estuary SAC Boundary | | Within Berwickshire and North Northumberland Coast SAC Boundary | | Within 1 km of land | | |
|--------------|------------------|-----------|--------|------|-------------------|--|------------------------|------------------------------------|------------------------|---|------------------------|---------------------|------------------------------------|--------------------|
| | | | | | | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # Locations | % of Total # Locations | # within 1 km | # within 1 km & Humber Estuary SAC | % of # within 1 km |
| hg48-363-15 | Donna Nook | GPS | 182 | 2015 | 9715 | 1462 | 15% | 1753 | 18% | 0 | 0% | 24 | 24 | 100% |
| hg48-364-15 | Donna Nook | GPS | 123 | 2015 | 5482 | 2761 | 50% | 2048 | 37% | 0 | 0% | 6 | 6 | 100% |
| hg48-923-15 | Blakeney | GPS | 234 | 2015 | 16538 | 4702 | 28% | 1068 | 6% | 0 | 0% | 814 | 67 | 8% |
| hg48-924-15 | Donna Nook | GPS | 223 | 2015 | 10592 | 5997 | 57% | 1873 | 18% | 0 | 0% | 599 | 202 | 34% |
| hg48-925-15 | Blakeney | GPS | 203 | 2015 | 13120 | 5815 | 44% | 1214 | 9% | 0 | 0% | 633 | 174 | 27% |
| hg48a-150-15 | Donna Nook | GPS/ARGOS | 201 | 2015 | 1955 | 307 | 16% | 400 | 20% | 0 | 0% | 10 | 6 | 60% |

1.3 SAC Population Assessment

- 1.3.1.1 When attributing impacts to the “Humber Estuary SAC Population” it is important to consider that the grey seal population in the east coast of England has been significantly increasing for several years, and therefore the “SAC population size” at the time of SAC designation (2009) is considerably smaller than that estimated by the current count data. The Humber Estuary SAC Natura 2000 – Standard Data Form² lists the population of grey seals in the Humber Estuary SAC as 1,800 individuals with a data quality score of “good (e.g. based on surveys)”.
- 1.3.1.2 The most recent haul-out and pup count data show that the number of grey seals that use the Humber Estuary SAC is considerably more than 1,800 seals. The 2019 August haul-out count recorded 5,265 grey seals hauled-out at Donna Nook within the Humber Estuary SAC (compared to 1,329 in 2009) (Figure 3) (SCOS 2021), and the 2019 grey seal pup production at Donna Nook was 2,187 pups (compared to 1,371 in 2009) (Figure 2). The 2019 August haul-out count can be scaled to account for the proportion of the population at sea at the time of the survey, using the scalar in Russell et al. (2016) (0.239, 95% CI: 0.192 – 0.286) to produce an estimate of 22,029 grey seals using the Humber Estuary SAC (95% CI: 18,409 – 127,422). Therefore, using the estimated population size at the time of SAC designation against which to assess potential impacts is considered to be inappropriate as it is not reflective of the current level of grey seal usage within the SAC.

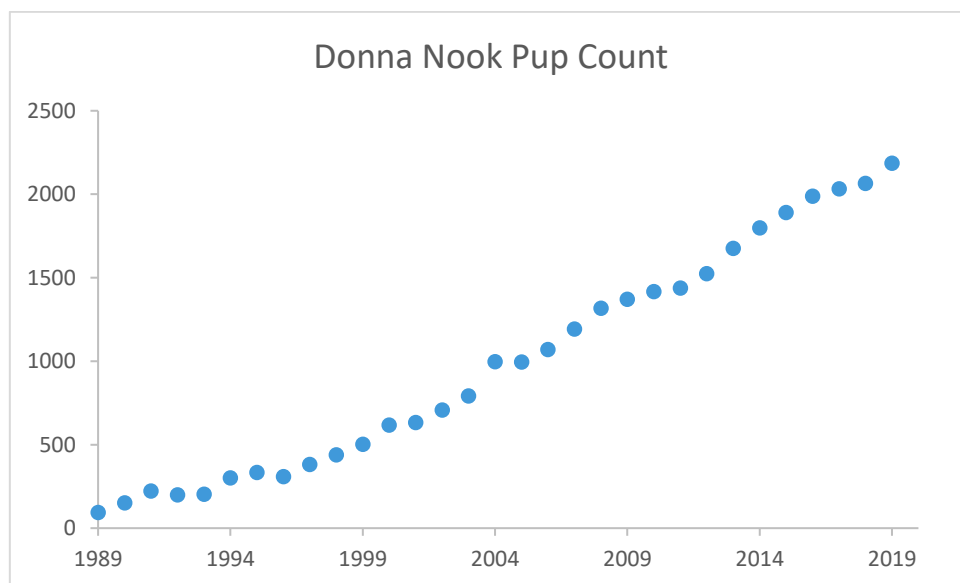


Figure 2: Annual grey seal pup production at Donna Nook (Humber Estuary SAC) (SCOS 2021).

² <https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030170.pdf>

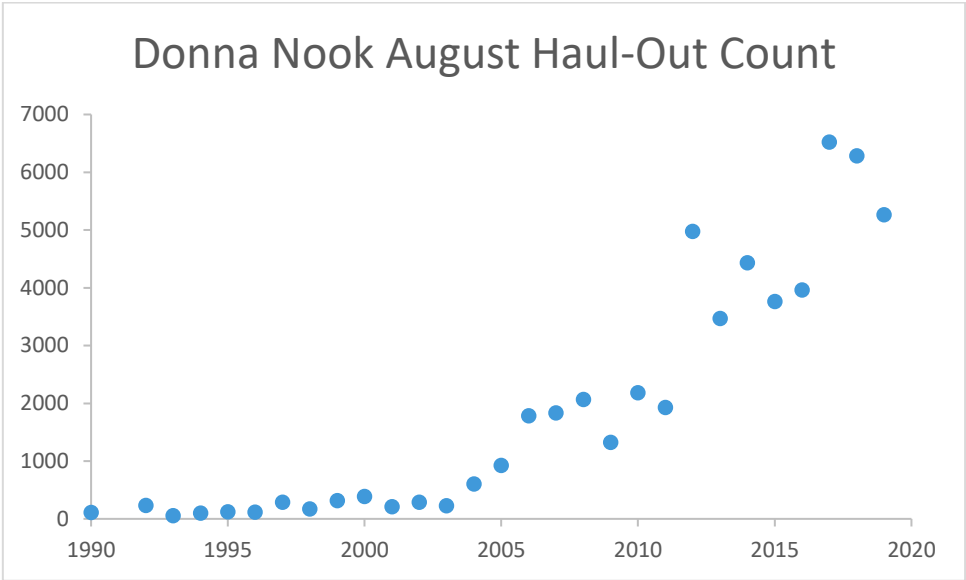


Figure 3: Annual August grey seal haul-out counts at Donna Nook (Humber Estuary SAC) (SCOS 2021).

1.4 References

Carter, M., L. Boehme, C. Duck, W. Grecian, G. Hastie, B. McConnell, D. Miller, C. Morris, S. Moss, D. Thompson, P. Thompson, and D. Russell. 2020. Habitat-based predictions of at-sea distribution for grey and harbour seals in the British Isles. Sea Mammal Research Unit, University of St Andrews, Report to BEIS, OESEA-16-76/OESEA-17-78.

Cronin, M., P. Pomeroy, and M. Jessopp. 2013. Size and seasonal influences on the foraging range of female grey seals in the northeast Atlantic. *Marine Biology* **160**:531-539.

Russell, D., C. Duck, C. Morris, and D. Thompson. 2016. SCOS –BP-16/03: Independent estimates of grey seal population size: 2008 and 2014.

SCOS. 2019. Scientific Advice on Matters Related to the Management of Seal Populations: 2018.

SCOS. 2021. Scientific Advice on Matters Related to the Management of Seal Populations: 2020.

Thompson, P., B. McConnell, and D. Tollit. 1996. Comparative distribution, movements and diet of harbour and grey seals from the Moray Firth, NE Scotland. *Oceanographic Literature Review* **6**:622.