Gareth Leigh
Head of Energy Infrastructure Planning
Department for Business, Energy and Industrial Strategy
1 Victoria Street
London
SW1H 0ET

Email: beiseip@beis.gov.uk

31 July 2019

Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data

Our ref. HOW03_CON_20190731

Dear Mr Leigh,

Following the completion of the Hornsea Project Three Offshore Wind Farm ('Hornsea Three') Development Consent Order (DCO) Examination (EN010080) and the Examining Authority issuing their Recommendation Report to the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS) on 2 July 2019, Hornsea Project Three Ltd. ('the Applicant') would like to draw the SoS's attention to the collection of supplementary ornithological baseline comparison data by the Applicant.

During the Hornsea Three Examination, submissions by Natural England were made regarding aspects of the Applicant's approach, evidence and assessment conclusions in respect of offshore ornithology. These submissions focused on the characterisation of the ornithological baseline derived from digital aerial surveys collected for Hornsea Three and the adequacy of digital aerial surveys covering the winter period.

The Applicant's position on ornithological baseline characterisation is documented in the Hornsea Three DCO application and submissions made through the Examination[1]. Without prejudice to the Applicant's position, the Applicant commissioned an additional four digital aerial ornithological surveys during the winter period of 2018/2019.

The purpose of collecting the data was:-

- to respond to and address concerns raised by Interested Parties within their relevant representations;
- in recognition that Natural England felt unable to advance discussion through the Examination on ornithology impacts given their position that 24 months of survey data should be collected;
- in recognition that the collection of supplementary data further increases the accuracy of the Applicant's ornithological collision risk models and therefore adds to confidence in their outputs; and
- to test whether such supplementary data accords with the evidence provided in the Environmental Statement as submitted into the Examination.

[1] REP1-131 'Applicant's Comments on Relevant Representations', Annex 7 – Full response to Natural England (RR-097), the Applicant's response to part 5.2 (page 293), ,REP1-141 'Baseline Characterisation Sensitivity Testing', REP3-004 'Written summary of Applicant's oral case put at Issue Specific Hearing 2', section 4.1 'Baseline characterisation' and REP10-038 'Offshore Ecology Matters Closing Legal Submission on behalf of the Applicant', paragraph 5.2 Ornithology Baseline Issues.

It was recognised by the Applicant that due to the long lead-in time required to undertake, evaluate and report on the findings, the data would not be available prior to the close of the Examination, and therefore could not be relied upon in Examination. The Applicant is now making the findings from these surveys available to SoS at the earliest opportunity. The results of these surveys are presented in the attached report 'Hornsea Project Three Offshore Wind Farm Ornithology Baseline Data Comparison', prepared by NIRAS Consulting Ltd. (NIRAS) on the request of the Applicant.

The attached report demonstrates that the supplementary comparison data falls within the confidence limits of the 2016/17 surveys. As such this report corroborates the Applicant's evidence presented in the Hornsea Three Environmental Impact Assessment (EIA) and during Examination, and does not change any predicted impacts. The Applicant believes this information will assist the SoS.

The Applicant's position remains that the data available during the Examination is sufficient to reach conclusions in respect of EIA and Habitats Regulations Assessment (HRA); analysis of the supplementary data is shown to corroborate those assessments carried out to date. It thus increases the accuracy of the Hornsea Three ornithological models. As there has been no meaningful change in the collision risk estimates for any species, the conclusions remain unchanged but with increased confidence.

The Applicant advised Natural England on 19 July 2019 of the comparison data just prior to the report being finalised, with the aspiration that the two parties could discuss the report in advance of submission to the SoS. Natural England responded stating that, if the SoS was so minded to accept the report and undertake consultation, Natural England along with other Interested Parties[2], would review the report and respond in line with SoS process. In keeping with this preference, the Applicant has sent a copy of the report to Natural England who will await further instruction from the SoS.

The Applicant is cognisant of the Planning Act 2008 and the Infrastructure Planning (Examination Procedure) Rules 2010, which provides an opportunity for the SoS to request comments on the Hornsea Three DCO application to address any outstanding issues which the SoS may have. Notwithstanding any further requests for comments by the SoS, in accordance with Section 107 of the Planning Act 2008, the Applicant awaits the determination of the Hornsea Three DCO application, anticipated on 2 October 2019.

Yours Sincerely,

[redacted]

Andrew Guyton
Hornsea Project Three Consents Manager
Tel [redacted]

cc. Stuart Livesey, Hornsea Project Three Project Manager

[2] Project Interested Parties:- Natural England (and Joint Nature Conservation Committee as advisors to Natural England on ornithological matters), Royal Society for the Protection of Birds, The Crown Estate, The Wildlife Trusts, Marine Management Organisation and Marine Scotland (as the authority responsible for the integrated management of Scotland's seas.)

Hornsea Project Three Offshore Wind Farm
Ornithology Baseline Data Comparison

July 2019

NIRAS Consulting Ltd
St. Giles Court, 24 Castle Street
Cambridge CB3 0AJ, UK

Reg. No. 07470870
England & Wales

T: +44 (0)1223 803750
www.nirasconsulting.co.uk

Document Details

NIRAS Project Number	UKN0387
NIRAS Contact Name	Matthew Hazleton
Document Title	Hornsea Project Three – baseline data comparison
Client	Ørsted
Client Contact Name	Karma Leyland

The following personnel are designated contacts for queries relating to this document

Name	Role	Telephone	Email
Matthew Hazleton	Senior Environmental Consultant	[redacted]	HAZ@niras.com
Tim Norman	Director	[redacted]	TNO@niras.com

Document Issue Log

Version / Issue	Comment	Date	Author	Checked by	Approved by*
1	**Draft for Client Review**	**4/7/19**	**HAZ**	**TNO**	**TNO**
2	**Final for issue**	**22/7/19**	**HAZ**	**TNO**	**TNO**
3					

Third Party Disclaimer

This report has been prepared by NIRAS Consulting Ltd on behalf of the specific Client, and is intended for use solely by the Client as stated in the agreement between NIRAS Consulting Ltd and the Client. NIRAS Consulting Ltd has exercised due and customary care in compiling this report, but has not, save where specifically stated, independently verified third party information. No other warranty, express or implied, is made in relation to this report. This report may not be used or relied upon by any other party without the express written permission of the Client. Any communications regarding the content of this report should be directed to the Client. NIRAS Consulting Ltd assumes no liability for any loss or damage arising from reliance on or misuse of the contents of this document, or from misrepresentation made by others.

This report has been prepared within the NIRAS Consulting Ltd Quality Management System to British Standard EN ISO 9001 2015

Contents

Tables

Figures

1. Executive Summary

1.1.1. There was considerable discussion during the Hornsea Three examination in relation to the baseline characterisation of Hornsea Three area. The Applicant characterised the baseline using data obtained from twenty aerial surveys alongside a meta-analysis of an extensive historical boat-based dataset collected to characterise the former Hornsea Zone and to inform the applications for previous projects within that zone. It was the Applicant's position that there was sufficient and representative baseline data for the purposes of impact assessment and that the species present, their distribution and abundance and any variability in those was understood sufficiently for this purpose. Evidence submitted throughout the examination supporting this position illustrated that there was no indication that the Hornsea Three area was of particular importance to key species during the period December to March, nor that the conclusions of EIA or HRA were particularly sensitive to assumptions about the densities that were likely to be observed. It was considered that the approach taken to quantify risk to key species during all seasons in the Hornsea Three location allowed for consideration of the appropriate level of precaution and that the assessment conclusions reached on the basis of these risk assessments were robust.

1.1.2. Hornsea Three now has data from four aerial surveys which were conducted at Hornsea Three between January and March 2019. The opportunity has been taken to investigate these data to see whether they indicate variability in the density of key species that is significantly different to that assumed in the application and examination of Hornsea Three. This report presents these data comparing the population estimates derived against those calculated from aerial surveys conducted in 2016-2018. To illustrate what implications any differences have for impact assessment, collision risk modelling and displacement, analyses have been conducted and the resulting collision risk estimates and displacement mortalities compared to those calculated during the Hornsea Three examination.

1.1.3. The data collected from the additional aerial surveys provide useful confirmation that the baseline for the Hornsea Three application captured the variability present in seabird populations present at Hornsea Three. The population estimates calculated from the additional surveys for Hornsea Three plus a 4 km buffer are very similar to those collected during the original survey programme and, in all cases, within the variability that was assumed for that time of year as part of the original baseline characterisation of Hornsea Three. This variability in the abundance of birds during this period of the annual cycle is limited, as stated by the Applicant in its application and examination submissions.

1.1.4. Collision risk modelling and displacement analyses indicate that any changes to impact magnitudes are negligible and immaterial in assessment terms for both EIA and HRA assessments. The further analysis provided through the examination and set out in this report therefore confirms the findings and conclusions of the EIA and RIAA and the position of the Applicant throughout the application and examination.

1.1.5. In summary, although the data available during the examination was sufficient to reach conclusions in respect of EIA and HRA assessments, analysis of the additional data is shown to corroborate the assessments carried out to date. It thus increases the accuracy of the Hornsea Three ornithological models, which in turn lowers the chance of statistical error. As there has been no meaningful change in the collision risk estimates for any species, the conclusions remain unchanged but with increased confidence.

2. Introduction

2.1.1. Baseline characterisation of Hornsea Project Three (Hornsea Three) was achieved using data from twenty aerial surveys undertaken between April 2016 and November 2018. There was therefore only one year of data available for December to March from the aerial survey programme. In addition to the data from aerial surveys and as discussed throughout the Evidence Plan process (see Consultation Report Annex 1 – Evidence Plan (APP-035) of the Environmental Statement), the Applicant used data from the wider Hornsea zone comprising an extensive historical boat-based dataset providing three years of data between March 2010 and February 2013, to understand the likely density and variability of key species during the period December – March.

2.1.2. The use of a dataset comprising twenty months of aerial survey data was the source of considerable discussion during the examination of Hornsea Three with Natural England refusing to provide conclusions based on what they perceived to be an incomplete baseline dataset.

2.1.3. Throughout the application and Examination the Applicant maintained that there is no indication that the Hornsea Three area is of particular importance to key species during this period (December to March), nor that the conclusions of EIA or HRA are sensitive to assumptions about the densities that are likely to be observed. It is considered that the approach taken to quantify risk to key species during all seasons in the Hornsea Three assessments allows for consideration of the appropriate level of precaution and that the assessment conclusions reached on the basis of these risk assessments is robust.

2.1.4. Hornsea Three now has data from four aerial surveys which were conducted between January and March 2019. One survey was undertaken in January 2019, two in February 2019 and one in March 2019.

2.1.5. This report presents a comparison between the baseline population estimates and densities for fulmar, gannet, kittiwake, lesser black-backed gull, herring gull, great black-backed gull, guillemot, razorbill and puffin, at Hornsea Three for those months for which only one year of data was collected to inform the Hornsea Three application (December to March). The aim is to determine whether the additional data indicate the abundance of these species during this period vary significantly from those assumed in the application, or whether they reinforce the assumptions made in the assessment that accompanied the Hornsea Three application. Consideration is given to the implications this has for collision risk modelling and displacement analyses and the resultant effect on Environmental Impact Assessment (EIA) and Habitat Regulations Assessment (HRA) conclusions as presented for Hornsea Three.

3. Data comparison

3.1 Overview

3.1.1. The population estimates and densities obtained from the additional four aerial surveys have been compared to the corresponding population estimates and densities used for kittiwake and other species of interest in the Hornsea Three application in this section. Population estimates for Hornsea Three plus a 4 km buffer are used for comparison, as this is consistent with the data that were used to identify Valued Ornithological Receptors in the impact assessment that accompanied the application. To identify any differences between the data incorporated into assessments in the Hornsea Three EIA and RIAA and the data collected as part of the additional aerial surveys, densities from Hornsea Three alone are used, consistent with the density data used for collision risk modelling (CRM) in the Hornsea Three application. Discussion is then provided considering whether any differences would result in any significant changes (increases or decreases) to the collision risk estimates calculated as part of the Hornsea Three application.

3.2 Additional aerial surveys

Four aerial surveys have been undertaken by Hi-def Aerial Surveying Ltd. between January 2019 and March 2019. One survey was conducted in January and March with two conducted in February. It was not possible to complete a December survey due to timing of commissioning of the survey and limited suitable weather windows. The surveys covered the Hornsea Three array area plus a 4 km buffer and followed an identical methodology to that used for the original aerial surveys undertaken to support the Hornsea Three application. Following the completion of the aerial surveys the data collected have been processed and analysed to provide population estimates and densities for all species observed for three different areas, Hornsea Three alone, Hornsea Three plus a 2 km buffer and Hornsea Three plus a 4 km buffer. For guillemot, razorbill and puffin availability bias (correction of estimates to account for diving individuals) has been taken into account in the resulting population estimates and densities. For each of three areas population estimates, densities and associated confidence metrics have been provided for birds in flight, birds sitting on the water and all birds (flying and sitting birds combined).

3.3 Baseline data

Overview

3.3.1. The following species-specific sections present population estimates for Hornsea Three plus a 4 km buffer for the key species as considered in the assessments for Hornsea Three EIA and HRA. Population estimates are presented from the aerial surveys undertaken to support the application (blue and orange data points) and from the additional aerial surveys (green data points). This allows for a comparison within months (January, February and March), the trend in abundance within a year and the variability between population estimates.

Fulmar

3.3.2. Figure 3.1 presents population estimates of fulmar for Hornsea Three plus a 4 km buffer.

3.3.3. The population estimates calculated from the additional aerial surveys in January and February 2019 are higher than those calculated from the aerial surveys undertaken in the same months in 2017. The estimate in March 2019 is slightly lower than that predicted in 2017. There is no clear trend in the estimates calculated for fulmar with estimates varying between years. When examining the individual months, the additional estimate in March 2019 is very similar to that predicted in March 2017. In February 2019, the two estimates obtained are very similar and only slightly higher than that predicted in February 2017. In January 2019, a higher estimate was recorded than in January 2017. The estimate is also higher than any other estimate recorded during the non-breeding season suggesting that this estimate is slightly anomalous and may have been influenced by other factors (e.g. unusual weather events preceding the survey). The effect this has on the magnitude of impacts for which fulmar was considered in the RIAA is provided in Section 3.5.

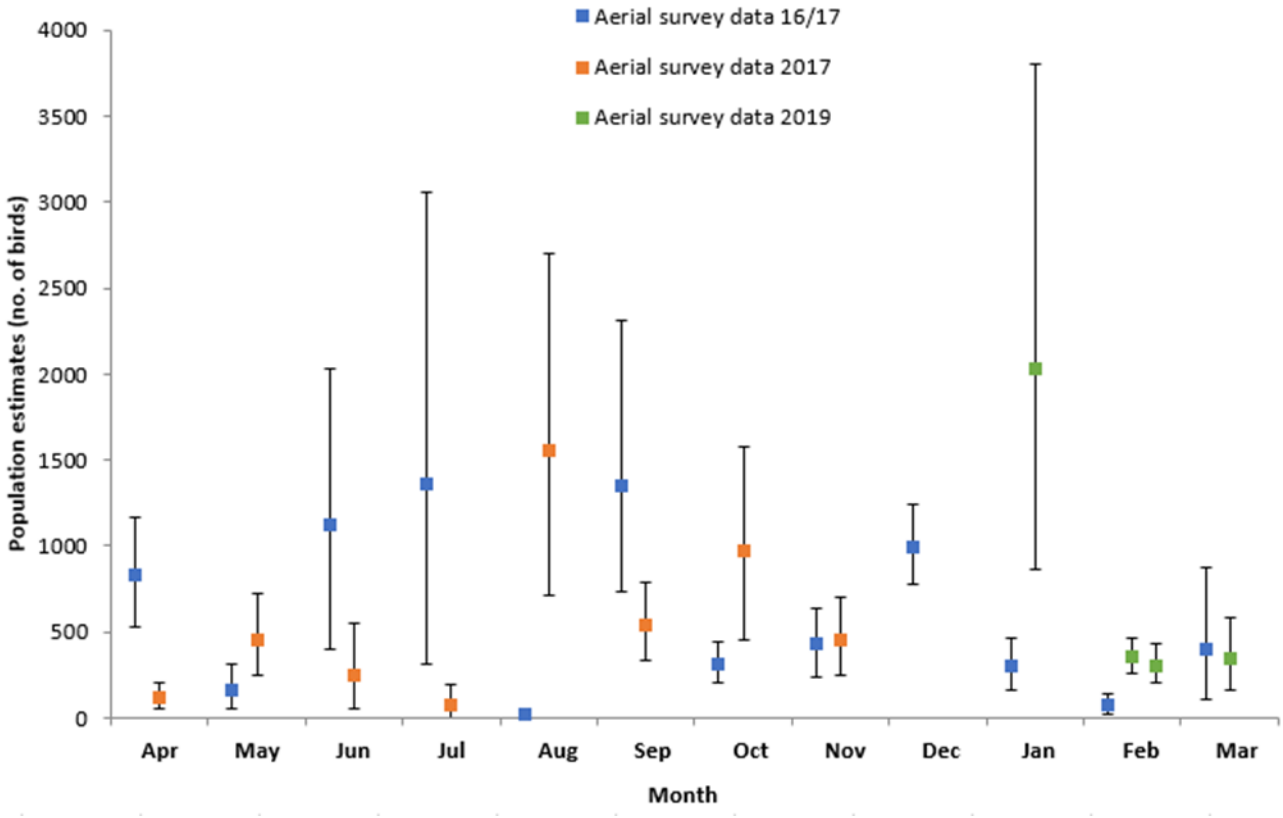

Figure 3.1: Population estimates (plus 95% confidence intervals) of fulmar obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Gannet

3.3.4. Figure 2.2 presents population estimates of gannet for Hornsea Three plus a 4 km buffer.

3.3.5. The population estimates calculated from the additional aerial surveys (Jan, Feb and Mar 2019) are lower than those calculated from the aerial surveys undertaken in the same months in 2017, with the exception of January for which the population estimate in 2019 is slightly higher. The estimates do however, fall within the range of estimates calculated for other months and follow the trend expected in the seasonal abundance of gannet, being low in winter months and beginning to increase into March (Furness, 2015). When examining the individual months, the additional estimates in February and March fall within the confidence intervals associated with the original estimates. However, the additional estimate calculated for January is very similar indicating that the variability in this month is limited, especially when compared to estimates obtained in breeding season months.

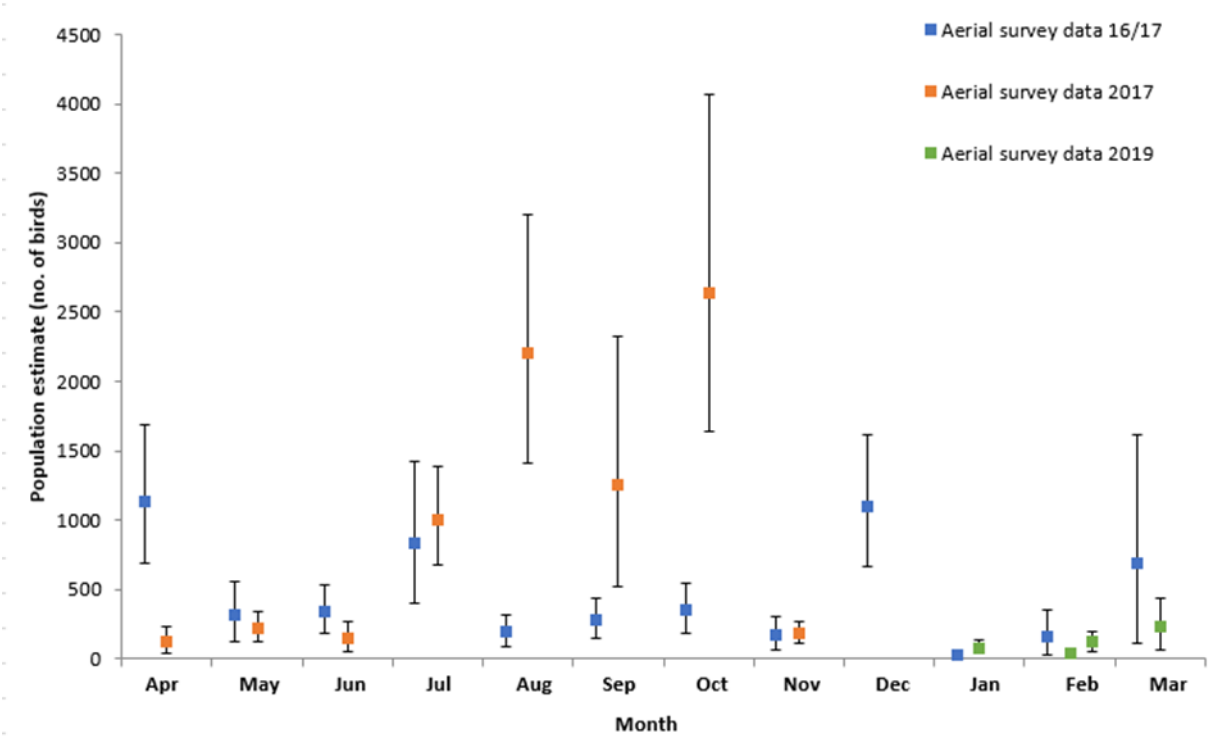

Figure 3.2: Population estimates (plus 95% confidence intervals) of gannet obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Kittiwake

3.3.6. Figure 3.3 presents population estimates of kittiwake for Hornsea Three plus a 4 km buffer.

3.3.7. The population estimates calculated from the additional aerial surveys (Jan, Feb and Mar 2019) are slightly higher than those calculated from the aerial surveys undertaken in the same months in 2017. The estimates do however, fall within the range of estimates calculated for other months and follow the trend expected in the seasonal abundance of kittiwake being low in winter months and beginning to increase into March. When examining the individual months, the additional estimates fall within the confidence intervals associated with the original estimates with the exception of February. However, the two additional estimates calculated for February are very similar indicating that the variability in this month is limited, especially when compared to estimates obtained in breeding season months. The increase in abundance between the two datasets in March is potentially due to the timing of surveys. The survey in 2017 was undertaken on the 10th March whilst the survey in 2019 was undertaken on the 18th March. The abundance of kittiwake in UK waters is likely to increase as March progresses (Furness, 2015) and, if the timing of migration was similar in both years, this is likely to have affected the number of birds recorded in the two respective surveys. As a result, the increase in March is not unexpected and still within the variability expected at this time of year.

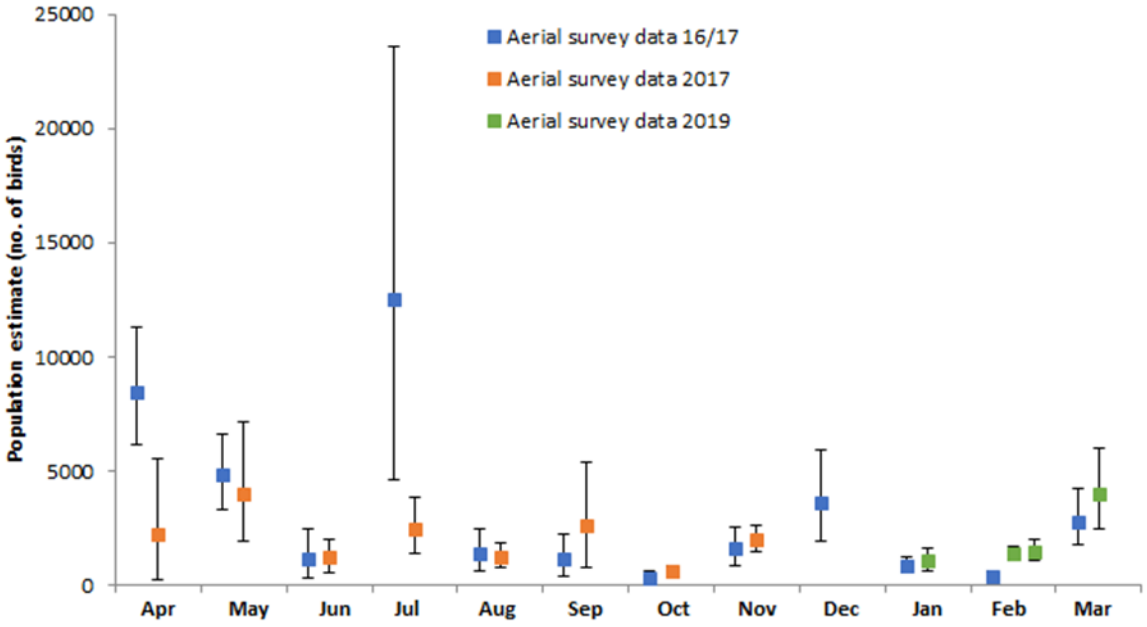

Figure 3.3: Population estimates (plus 95% confidence intervals) of kittiwake obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Lesser black-backed gull

3.3.8. Figure 3.4 presents population estimates of lesser black-backed gull for Hornsea Three plus a 4 km buffer.

3.3.9. No lesser black-backed gulls were recorded in the aerial surveys conducted between January and March 2017. The species was also not recorded during two of the surveys undertaken in 2019. The population estimates calculated for the remaining two surveys were 11 (February 2019) and 33 (January 2019) birds. The estimates from the additional surveys fall within the range of estimates calculated for other months and follow the trend expected in the seasonal abundance of lesser black-backed gull with the species only occurring in notable numbers during the breeding season.

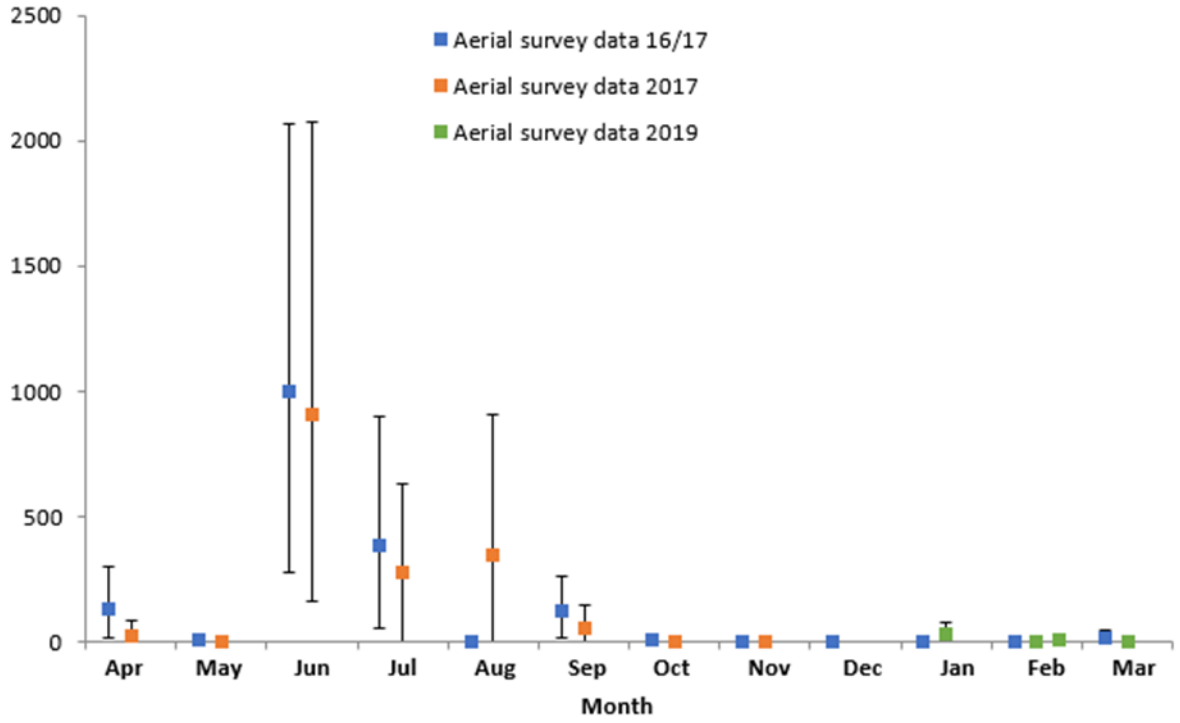

Figure 3.4: Population estimates (plus 95% confidence intervals) of lesser black-backed gull obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Herring gull

3.3.10. Figure 3.5 presents population estimates of herring gull for Hornsea Three plus a 4 km buffer.

3.3.11. Population estimates of herring gull recorded between January and March 2017 were relatively low in all surveys with the species absent in January 2017. The abundance of herring gull was also low during the surveys undertaken in 2019 with the species again absent in January and also in March. In the two surveys conducted in February 2019, the population estimates were similar or lower than the estimate recorded in February 2017. There is no obvious trend in the abundance of herring gull at Hornsea Three plus a 4 km buffer with the population estimates calculated in 2019 further continuing this pattern.

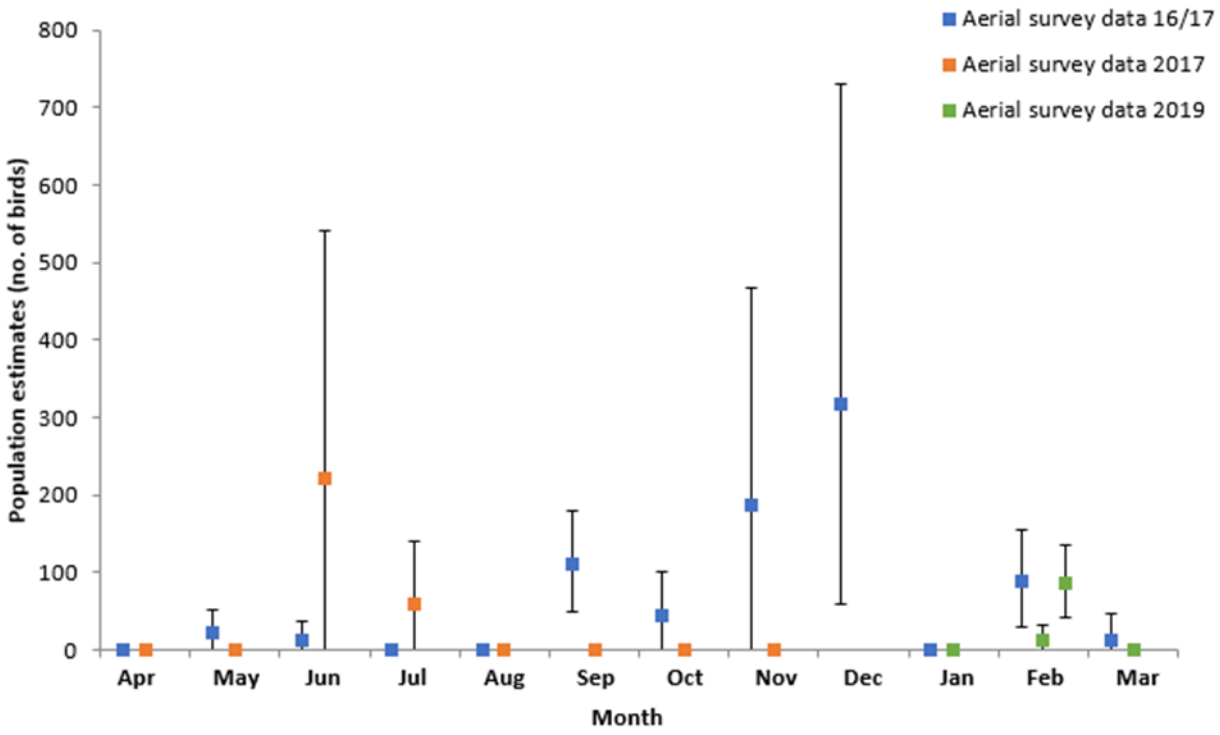

Figure 3.5: Population estimates (plus 95% confidence intervals) of herring gull obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Great black-backed gull

3.3.12. Figure 3.6 presents population estimates of great black-backed gull for Hornsea Three plus a 4 km buffer.

3.3.13. The population estimates calculated for great black-backed gull from the additional surveys undertaken in 2019 are lower than commensurate surveys undertaken in 2017. The estimates fall within the range of estimates calculated for other months and appear to follow the same trend as recorded in 2017 albeit of a lower magnitude in terms of the abundance of great black-backed gull.

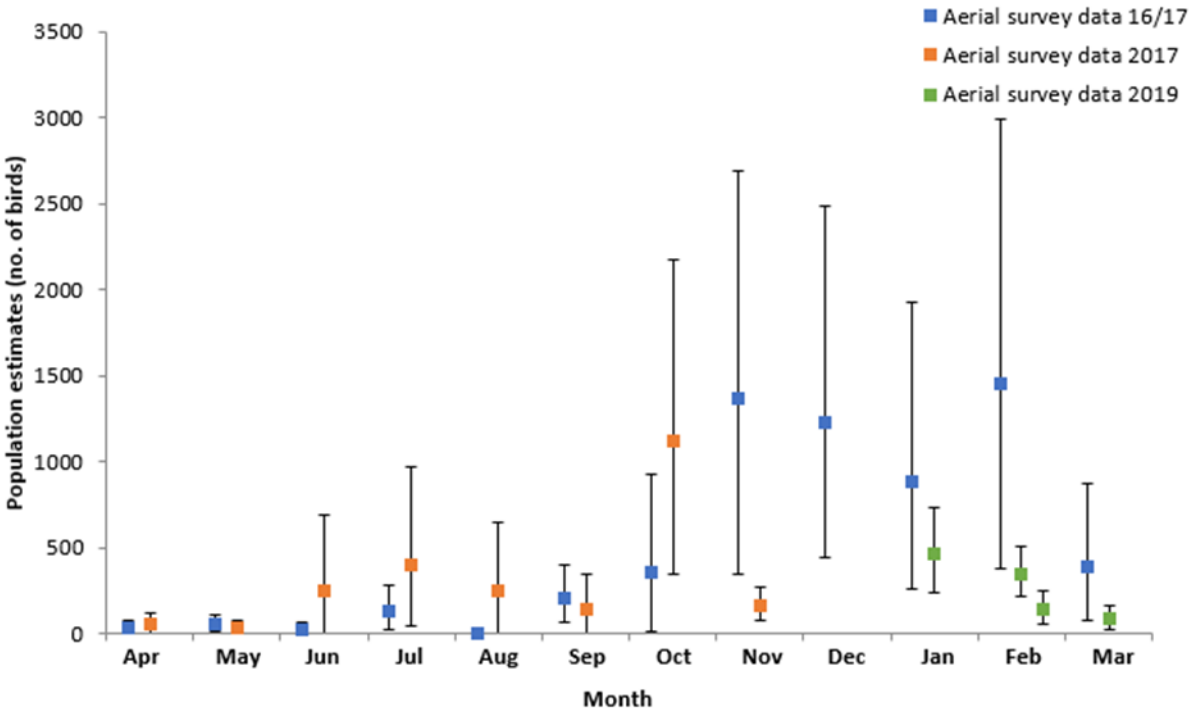

Figure 3.6: Population estimates (plus 95% confidence intervals) of great black-backed gull obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Guillemot

3.3.14. Figure 3.7 presents population estimates of guillemot for Hornsea Three plus a 4 km buffer.

3.3.15. The population estimates of guillemot recorded in the 2019 aerial surveys are higher than those recorded in 2017 in all months except March. The estimates do however, fall within the range of estimates calculated for other months and follow the trend expected in the seasonal abundance of guillemot being low in winter months and beginning to increase throughout the spring (Furness, 2015). The estimates calculated in 2019 show limited variability, when compared to the estimates calculated in 2016, remaining around 5,000 individuals in all four surveys. Further to this, the two surveys undertaken in February 2019 show even less variability.

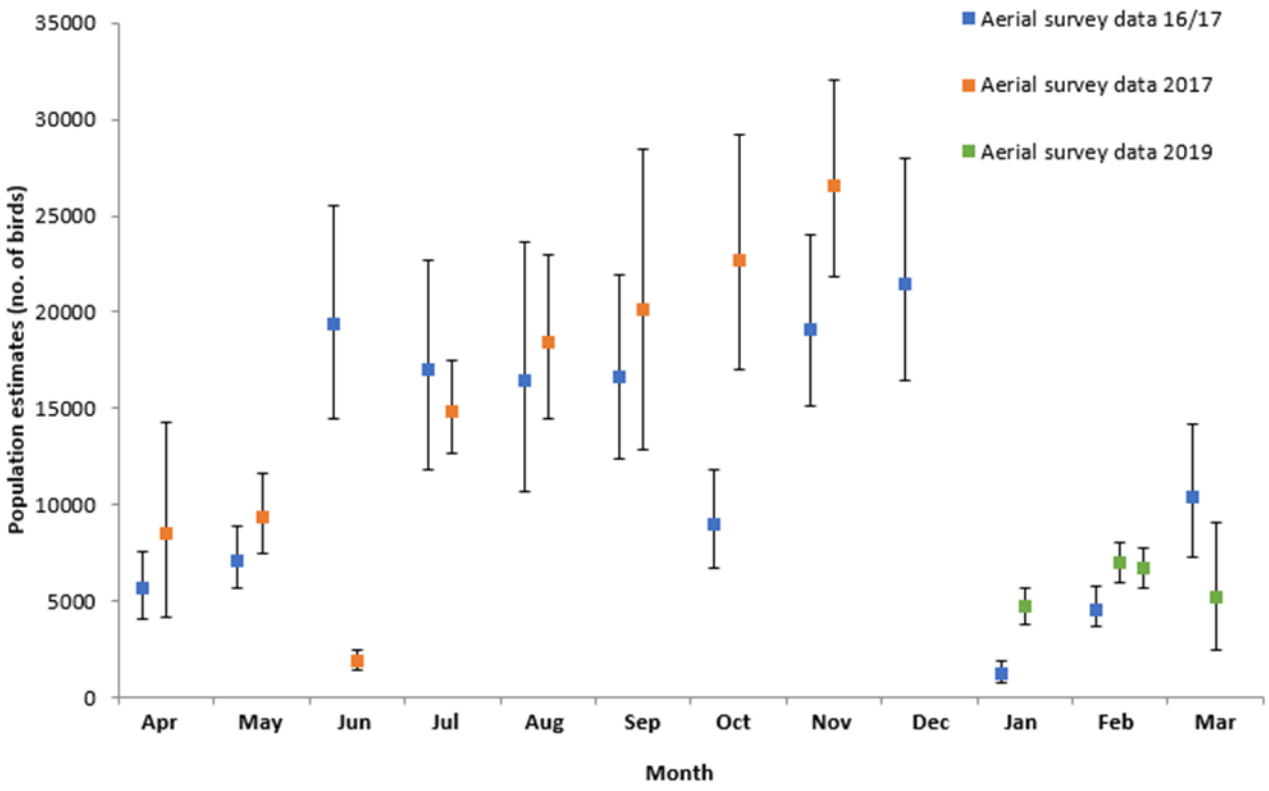

Figure 3.7: Population estimates (plus 95% confidence intervals) of guillemot obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Razorbill

3.3.16. Figure 3.8 presents population estimates of razorbill for Hornsea Three plus a 4 km buffer.

3.3.17. The population estimates of razorbill recorded in the 2019 aerial surveys are higher than those recorded in 2017 in all months except March. However, the estimates fall within the range of estimates calculated for other months. The population estimates calculated in 2019 are only notably different in February, with the estimates calculated for January both relatively low (i.e. below 1000 birds) when compared to other months and the estimates for March similar. The estimates calculated in February in 2019 across two surveys are very similar but are higher than the estimate recorded in February 2017.

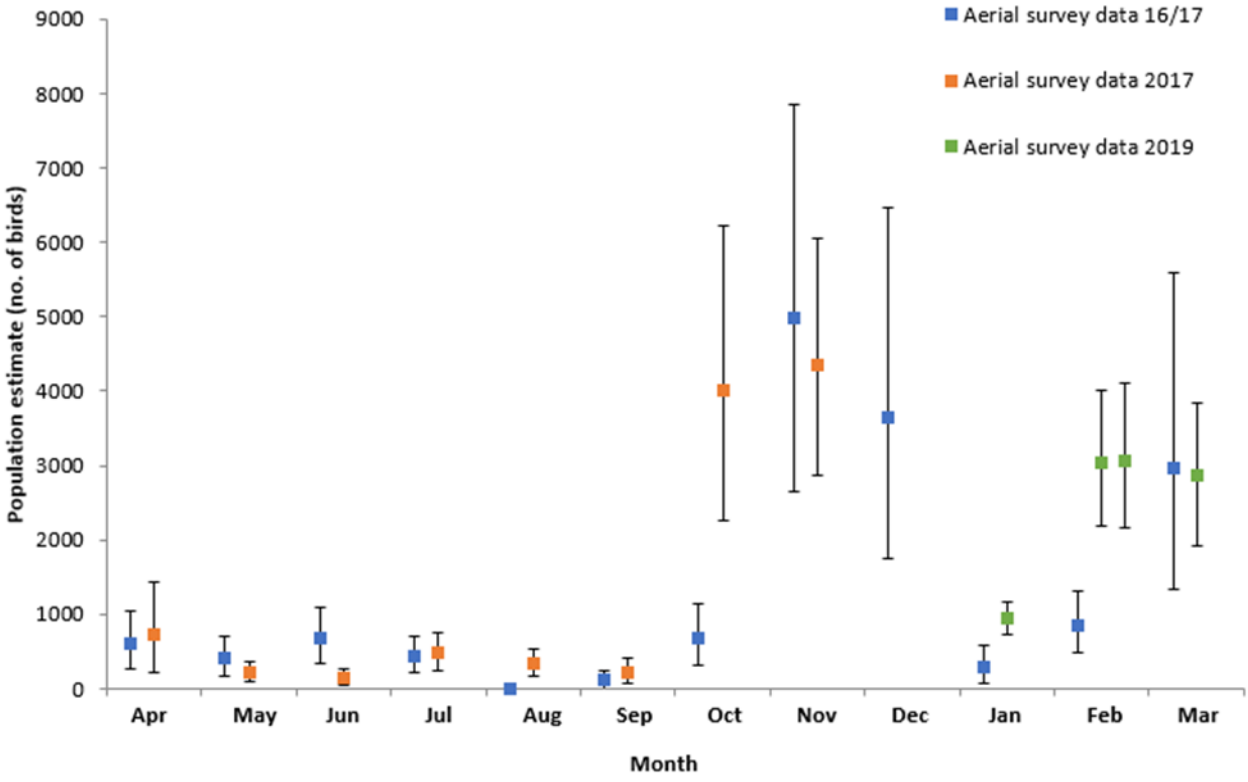

Figure 3.8: Population estimates (plus 95% confidence intervals) of razorbill obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

Puffin

3.3.18. Figure 3.9 presents population estimates of puffin for Hornsea Three plus a 4 km buffer.

3.3.19. The population estimates of puffin recorded in 2019 are higher in February but slightly lower in March when compared to the population estimates recorded in 2017. No puffins were recorded at Hornsea Three plus a 4 km buffer in January in both 2017 and 2019. The estimates fall within the range of estimates calculated for other months and follow the trend expected in the seasonal abundance of puffin at Hornsea Three being low throughout the year except in April and May. In March, there is little difference between the population estimates calculated in 2017 and 2019. In February, no puffins were recorded at Hornsea Three during 2017 whereas up to 73 birds were estimated from the surveys undertaken in February 2019. The populations estimated however, are still relatively low when compared to other times of the year (e.g. April and May).

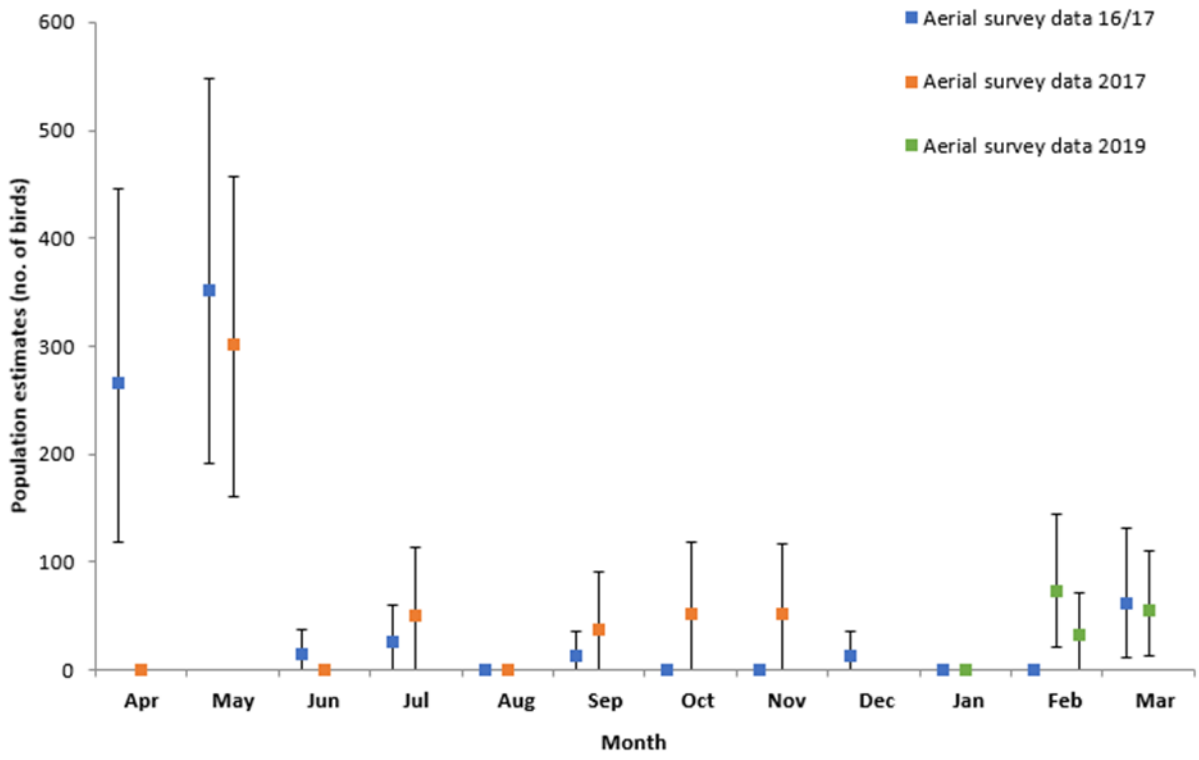

Figure 3.9: Population estimates (plus 95% confidence intervals) of puffin obtained from aerial surveys undertaken across Hornsea Three plus a 4 km buffer

3.4 Collision risk modelling

3.4.1. In the Hornsea Three application collision risk modelling (CRM) was conducted utilizing monthly densities for birds in flight from Hornsea Three alone. Where multiple densities were obtained for a month during aerial surveys (April to November) these were averaged to provide a single density value. Densities for December to March were calculated using the original aerial survey data alongside a meta-analysis of data collected as part of the boat-based survey programme for Hornsea project One and Two. For the purposes of collision risk modelling in this report, the recent survey data replaces the densities derived from the meta-analysis for January, February and March in this section with these densities averaged alongside the densities obtained from the original aerial surveys for these months.

3.4.2. Table 3.1 presents the densities for January to March used in CRM as part of the application and those calculated using the additional data for all species included in CRM. The densities used in the Hornsea Three application were calculated using the meta-analysis whereas for the additional data, the densities from the recent surveys have been averaged alongside the densities from the aerial surveys undertaken as part of the original baseline survey programme. The recent surveys did not cover December and therefore in the collision risk modelling conducted in this report, the density from the aerial survey in December 2016 is used. This approach is consistent with that applied in the collision risk modelling conducted to support the submission of REP6-042, REP-043 and REP-047 during the Hornsea Three examination.

Table 3.1: Comparison between densities (birds/km^2) used for collision risk modelling as part of the Hornsea Three application and as calculated when incorporating additional data

Species	Dataset	Jan	Feb	Mar
Gannet	Original	0.02	0.14	0.08
	Additional	0.03	0.01	0.10
Kittiwake	Original	0.47	0.18	1.34
	Additional	0.46	0.34	1.44
Lesser black-backed gull	Original	0.00	0.00	0.00
	Additional	0.02	0.00	0.00
Herring gull	Original	0.00	0.04	0.00
	Additional	0.00	0.04	0.00
Great black-backed gull	Original	0.13	0.04	0.03
	Additional	0.16	0.04	0.03

3.4.3. For three of the species (kittiwake, lesser black-backed gull and great black-backed gull) included in the CRM undertaken for the Hornsea Three assessments, the updated density values suggest that collision risk estimates may increase, although quantifying this change requires further CRM. For gannet, there are increases and decreases in the updated density values and, therefore, without further CRM it is not clear how collision risk estimates may change. For herring gull there is no change in the monthly density values and therefore this species is not considered further.

3.4.4. To further investigate the potential changes CRM has been conducted for gannet, kittiwake, lesser black-backed gull and great black-backed gull. The modelling has used three turbine scenarios with different lower rotor tip heights (i.e. the base case (33.17 m), 37.5 m and 40 m) as incorporated into the Applicant's submissions from Deadline 7 onwards. The modelling has also incorporated the parameter scenarios defined in REP6-042[1] reflecting the Applicant's position, in REP6-043[2] reflecting the Applicant's interpretation of Natural England's position and the altering scenarios in between. The parameter scenario requested by the Examining Authority in REP9-047[3] has also been included. The parameters used for each parameter scenario are presented in Appendix 1.

Gannet

3.4.5. Collision risk estimates for gannet using all parameter scenarios and the original and additional datasets are presented in Table 3.2, Table 3.3 and Table 3.4 for the three turbine scenarios, respectively. For the majority of scenarios there is no change in the number of collisions predicted but in a few cases, there is an increase of one collision/annum. It is considered that an increase of this magnitude is immaterial in assessment terms.

3.4.6. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or Report to Information Appropriate Assessment (RIAA) for the relevant Biologically Defined Minimum Population Scales (BDMPS) populations or Flamborough and Filey Coast Special Protection Area (FFC SPA) population of gannet, respectively when using any of the parameter scenarios and turbine scenarios.

[1] Hornsea Project Three (2019) Appendix 28 to Deadline 6 submission - Position of the Applicant in relation to collision risk modelling issued by the Planning Inspectorate into the Hornsea Project Three Examination.

[2] Hornsea Project Three (2019) Appendix 29 to Deadline 6 submission -Applicant's interpretation of Natural England's position in relation to collision risk modelling issued by the Planning Inspectorate into the Hornsea Project Three Examination

[3] Hornsea Project Three (2019) Appendix 19 to Deadline 9 submission – Response to ExA FQ3.1 Rule 17 – Collision Risk Modelling issued by the Planning Inspectorate into the Hornsea Project Three Examination.

Table 3.2: Collision risk estimates for gannet using a turbine lower rotor tip height of 33.17 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	49	45	21	9			8	8-10
Updated	49	46	21	10			8	8-10
HRA scale								
Original	18	16	7	3	2	2	2	3-4
Updated	18	17	8	3	2	2	2	3-4

Table 3.3: Collision risk estimates for gannet using a turbine lower rotor tip height of 37.5 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	31	29	13	9			8	8-10
Updated	31	29	13	10			8	8-10
HRA scale								
Original	11	10	5	3	2	2	2	3-4
Updated	11	11	5	3	2	2	2	3-4

Table 3.4: Collision risk estimates for gannet using a turbine lower rotor tip height of 40 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	24	22	10	9			8	8-10
Updated	24	22	10	10			8	8-10
HRA scale								
Original	9	8	4	3	2	2	2	3-4
Updated	9	8	4	3	2	2	2	3-4

Kittiwake

3.4.7. Collision risk estimates for kittiwake using all parameter scenarios and the original and additional datasets are presented in Table 3.5, Table 3.6 and Table 3.7 for the three turbine scenarios, respectively. Collision risk estimates increase when using some of the more precautionary parameter scenarios using all three turbine scenarios. However, even when using the worst-case scenario for all parameters this increase represents only six collisions/annum or approximately a 2% increase, which remains insignificant in assessment terms. When using the parameters advocated by the Applicant or provided by the Examining Authority, there is no difference in the number of collisions predicted for all three turbine scenarios.

3.4.8. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or RIAA for the relevant BDMPS populations or FFC SPA population of kittiwake, respectively when using any of the parameter scenarios and turbine scenarios.

Table 3.5: Collision risk estimates for kittiwake using turbine lower rotor tip height of 33.17 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	297	218	198	38			30	43-51
Updated	303	222	202	38			31	44-52
HRA scale								
Original	181	132	120	23	11	8	7	13-15
Updated	183	134	122	23	11	8	7	13-15

Table 3.6: Collision risk estimates for kittiwake using a turbine lower rotor tip height of 37.5 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	196	144	131	28			23	33-39
Updated	200	146	133	29			23	33-39
HRA scale								
Original	119	87	79	17	8	6	5	10-11
Updated	121	89	81	17	8	6	5	10-11

Table 3.7: Collision risk estimates for kittiwake using a turbine lower rotor tip height of 40 m

Collision risk estimates	Parameter scenario							
	Natural England	1	2	3	4	5	6 (Applicant)	Examining Authority
EIA scale								
Original	154	113	102	28			23	33-39
Updated	157	115	105	29			23	33-39
HRA scale								
Original	94	69	62	17	8	6	5	10-11
Updated	95	70	63	17	8	6	5	10-11

Lesser black-backed gull

3.4.9. Collision risk estimates for lesser black-backed gull using all parameter scenarios and the original and additional datasets are presented in Table 3.8 for the three turbine scenarios, respectively. For the majority of scenarios there is no change in the number of collisions predicted but in a few cases, there is an increase of one collision/annum, which is considered insignificant in assessment terms.

3.4.10. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA for the North Sea population of lesser black-backed gull, when using any of the parameter or turbine scenarios.

Table 3.8: Collision risk estimates for lesser black-backed gull using three turbine lower rotor tip heights

Collision risk estimates	Parameter scenario				
	Natural England	1	3	6 (Applicant)	Examining Authority
33.17 m lower rotor tip height					
Original	17	14	12	12	7
Updated	18	15	12	12	8
37.5 m lower rotor tip height					
Original	13	11	12	12	6
Updated	13	11	12	12	6
40 m lower rotor tip height					
Original	11	9	12	12	5
Updated	11	9	12	12	5

Great black-backed gull

3.4.11. Collision risk estimates for great black-backed gull using all parameter scenarios and the original and additional datasets are presented in Table 3.9 for the three turbine scenarios, respectively. For the majority of scenarios there is no change in the number of collisions predicted but in a few cases, there is an increase of one collision/annum, which is considered insignificant in assessment terms.

3.4.12. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA for the North Sea population of great black-backed gull when using any of the parameter or turbine scenarios.

Table 3.9: Collision risk estimates for great black-backed gull using three turbine lower rotor tip heights

Collision risk estimates	Parameter scenario				
	Natural England	1	3	6 (Applicant)	Examining Authority
33.17 m lower rotor tip height					
Original	66	53	26	26	33
Updated	67	54	26	26	34
37.5 m lower rotor tip height					
Original	52	42	20	20	26
Updated	53	42	20	20	27
40 m lower rotor tip height					
Original	45	36	20	20	23
Updated	46	37	20	20	23

3.5 Displacement analysis

3.5.1. Table 3.10 presents the seasonal mean-peak population estimates used for all species included in displacement analysis. Only those seasonal population estimates that are affected by those months for which additional data have been collected are considered. The seasonal mean-peak populations used in the Hornsea Three application were calculated using the meta-analysis, which incorporated survey data from historical boat-based surveys that covered Hornsea Three, to calculate population estimates for the four months. The recent survey data were incorporated into the calculation by assuming they represented the second year of aerial survey data, replacing the populations calculated using the meta-analysis.

Table 3.10: Comparison of seasonal mean-peak population estimates as used in the Hornsea Three application and calculated incorporating additional data

Species	Season	Original estimate	Updated estimate
Fulmar	Pre-breeding	525	1,049
Gannet	Pre-breeding	406	527
Guillemot	Breeding	13,374	13,374
	Non-breeding	17,772	17,772
Razorbill	Pre-breeding	1,236	2,062
Puffin	Non-breeding	127	137

3.5.2. For all species except guillemot the introduction of additional data increases the respective seasonal mean-peak populations. This would lead to a commensurate increase in the predicted displacement mortality which would be directly proportional to the magnitude of increase. The consequences of these increases, however, are likely to be immaterial in assessment terms, when put in an EIA context where the Hornsea Three displacement mortality numbers are a fraction of the baseline mortality of such large populations. For RIAA purposes, resulting impacts are apportioned to relevant SPA populations with the apportioning values used in non-breeding seasons derived by calculating the contribution of the focal population (e.g. the population present at a given breeding colony) to a much larger BDMPS population. This leads to a small proportion of any predicted impact being apportioned back to the focal SPA population.

3.5.3. To determine the magnitude of increase and therefore the potential implications for EIA and RIAA conclusions, displacement analysis has been conducted for all species for which there has been an increase in seasonal mean-peak populations.

Fulmar

3.5.4. Displacement analysis for fulmar using the displacement and mortality rates advocated by the Applicant and Natural England is presented in Table 3.11. The increases in baseline mortality are negligible when applying either set of assumptions (i.e., the Applicant's or Natural England's) and for both the North Sea and the FFC SPA populations of fulmar.

3.5.5. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or RIAA for either the North Sea population or FFC SPA population of fulmar when using the assumptions advocated by either the Applicant or Natural England.

Table 3.11: Displacement analysis for fulmar assessed at EIA and HRA scales

Dataset	Displacement/mortality rate (%)		Displacement mortality		Increase in baseline mortality (%)	
	Applicant	Natural England	Applicant	Natural England	Applicant	Natural England
North Sea population (EIA) (Pre-breeding BDMPS = 957,502 individuals[4])						
Original	10-30 / 1	10 / 1-10	1-2	1-5	<0.01	<0.01-0.01
Additional			1-3	1-10	<0.01-0.01	<0.01-0.02
FFC SPA (HRA) (FFC SPA population = 2,894 individuals)						
Original	10-30 / 1	10 / 1-10	0	0	<0.01	<0.01-0.01
Additional			0	0	<0.01	<0.01-0.01

[4] All BDMPS populations presented in this report have been taken from Furness (2015) with baseline mortality rates sourced from Horswill and Robinson (2015)

3.5.6. The following species-specific sections present displacement analysis for all species for which displacement impacts were assessed in the Hornsea Three application. Natural England provided no advice in relation to their advocated displacement and mortality rates and therefore Natural England's advice to other projects has been followed where available for each species. Where this advice is not available the advice in JNCC *et al.* (2017) has been followed.

Gannet

3.5.7. Displacement analysis for gannet using the displacement and mortality rates advocated by the Applicant and Natural England is presented in Table 3.12. There is a negligible increase in the displacement mortality predicted in EIA terms when applying the displacement and mortality rates advocated by the Applicant and the lower end of the range of displacement and mortality rates advocated by Natural England. When applying the upper end of the rate range advocated by Natural England, the increase is slightly greater (11 birds), although in the context of the impact on gannet of no significance, as illustrated by the negligible change in the increase in baseline mortality of the North Sea population of gannet. For the FFC SPA population the increases in baseline mortality are immaterial in assessment terms.

3.5.8. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or RIAA for the North Sea population or FFC SPA population of gannet, respectively when using the assumptions advocated by either the Applicant or Natural England.

Table 3.12: Displacement analysis for gannet assessed at EIA and HRA scales

Dataset	Displacement/mortality rate (%)		Displacement mortality		Increase in baseline mortality (%)	
	Applicant	Natural England	Applicant	Natural England	Applicant	Natural England
North Sea population (EIA) (Pre-breeding BDMPS = 248,385 individuals)						
Original	30-70 / 1	30-70 / 1-10	1-3	1-28	0.01	0.01-0.14
Additional			2-4	2-37	0.01-0.02	0.01-0.18
FFC SPA (HRA) (FFC SPA population = 16,938 individuals)						
Original	30-70 / 1	30-70 / 1-10	0	0-2	0.01	0.01-0.13
Additional			0	0-2	0.01-0.02	0.01-0.17

Razorbill

3.5.9. Displacement analysis for razorbill using the displacement and mortality rates advocated by the Applicant and Natural England is presented in Table 3.13. In assessment terms, there is a negligible increase in the displacement mortality predicted when applying the displacement and mortality rates advocated by the Applicant and the lower end of the range of displacement and mortality rates advocated by Natural England. This is also true when applying the upper end of the rate range advocated by Natural England with this illustrated by the increase in baseline mortality of the North Sea population of razorbill. The original displacement mortality (87 birds) represents a 0.14% increase in baseline mortality with the displacement mortality calculated using the additional dataset representing a 0.23% increase in baseline mortality. For the FFC SPA population the increases in baseline mortality are also immaterial in assessment terms.

3.5.10. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or RIAA for the North Sea population or FFC SPA population of razorbill, respectively when using the assumptions advocated by either the Applicant or Natural England.

Table 3.13: Displacement analysis for razorbill assessed at EIA and HRA scales

Dataset	Displacement/mortality rate (%)		Displacement mortality (EIA)		Displacement mortality(RIAA) (%)	
	Applicant	Natural England	Applicant	Natural England	Applicant	Natural England
North Sea population (EIA) (Pre-breeding BDMPS = 591,874 individuals)						
Original	40 / 2	30-70 / 1-10	10	4-87	0.02	0.01-0.14
Additional			16	6-144	0.03	0.01-0.23
FFC SPA (HRA) (FFC SPA population = 21,140 individuals)						
Original	40 / 2	30-70 / 1-10	0	0-3	0.02	0.01-0.13
Additional			1	0-5	0.03	0.01-0.22

Puffin

3.5.11. Displacement analysis for puffin using the displacement and mortality rates advocated by the Applicant and Natural England is presented in Table 3.14. The increases in baseline mortality are negligible when applying either set of assumptions (Applicant or Natural England) and for both the North Sea population of puffin and the FFC SPA population of puffin.

3.5.12. The results obtained when using the additional aerial survey data would not alter the conclusions reached in the EIA or RIAA for the North Sea population or FFC SPA population of puffin, respectively when using the assumptions advocated by either the Applicant or Natural England.

Table 3.14: Displacement analysis for puffin assessed at EIA and HRA scales

Dataset	Displacement/mortality rate (%)		Displacement mortality (EIA)		Displacement mortality (RIAA) (%)	
	Applicant	Natural England	Applicant	Natural England	Applicant	Natural England
North Sea population (EIA) (Non-breeding BDMPS = 231,957 individuals)						
Original	50 / 1	30-70 / 1-10	1	0-9	<0.01	<0.01-0.04
Additional			1	0-10	<0.01	<0.01-0.04
FFC SPA (HRA) (FFC SPA population = 1,960 individuals)						
Original	50 / 1	30-70 / 1-10	0	0	<0.01	<0.01-0.02
Additional			0	0	<0.01	<0.01-0.02

4. Conclusions

4.1.1. The data collected from the additional aerial surveys provide confirmation that the baseline dataset used as part of the Hornsea Three application captured the variability present in seabird populations present at Hornsea Three. The population estimates calculated from the additional surveys for Hornsea Three plus a 4 km buffer are very similar to those collected during the original survey programme and, in all cases, within the variability that was assumed for that time of year. This variability in the abundance of birds during this period of the annual cycle is limited, as stated by the Applicant in its application and examination submissions.

4.1.2. The additional overall population estimates indicate limited variability in the abundance of birds at Hornsea Three between December and March. CRM and displacement analyses have been conducted incorporating the additional data to identify the implications of using the additional data for the assessments presented in the application and examination submissions.

4.1.3. Comparisons between collision risk estimates presented as part of examination submissions and calculated incorporating the additional aerial survey data show changes of negligible magnitude for all species. When applying the modelling parameters provided by the Examining Authority the majority of collision risk estimates are identical and for those that do change the increase is negligible (one collision/annum). The use of the additional data would therefore not alter the conclusions reached in either the EIA or RIAA for Hornsea Three. The findings in this report also support the Applicant's case during the application and examination, including the sensitivity testing submitted to the examination at Deadline 1 (REP1-141). The impact magnitudes calculated in this report fall within the variability expected during the period December to March and within the confidence intervals considered as part of the assessments presented throughout the application and examination.

4.1.4. Similar comparisons for displacement mortality also show that the use of the additional aerial survey data has no effect on the conclusions reached in the EIA and RIAA. The comparisons presented use the increase in baseline mortality to determine the magnitude of change with the increases in this metric considered immaterial in assessment terms for all species.

4.1.5. For all species, the data confirm the conclusions drawn in the EIA and RIAA in relation to limited variability in the abundance of each species and relative lower importance of these months when compared to the abundance recorded in breeding months, for example. Whilst the densities obtained for some species are slightly higher, they do not make a material difference to the overall collision rates or the displacement mortality predicted. As a result, the conclusions of the EIA/RIAA are unaffected.

5. References

Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report NECR164.

Horswill, C. & Robinson R. A. (2015). Review of seabird demographic rates and density dependence. JNCC Report No. 552. Joint Nature Conservation Committee, Peterborough.

JNCC, Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England and Scottish Natural Heritage, (2017). Joint SNCB Interim Displacement Advice Note. [Online]. Available at: http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf (Accessed May 2017).

Appendix 1 - Parameter scenarios for collision risk modelling

Parameter	Species	Natural England (REP6-043)		Applicant (REP6-042)		Examining Authority (REP9-047)	
1. Flight speed	Gannet	14.9	Pennycuick (1987)	13.33	Skov *et al.* (2018)	14.9	Pennycuick (1987)
	Kittiwake	13.1	Alerstam *et al.* (2007)	8.71		13.1	Alerstam *et al.* (2007)
	Lesser black-backed gull	13.1		9.8		13.1	
	Great black-backed gull	13.7				13.7	
2. Avoidance rate (%)	Gannet	98.9	JNCC *et al.* (2014)	99.5	Bowgen and Cook (2018)	99.5	Bowgen and Cook (2018)
	Kittiwake	98.9		99.0		99.0	
	Large gulls	99.5		99.5		99.3	
3. Band Model Option	Gannet	2		1/3		1	
	Kittiwake					1	
	Large gulls					3	
4. Breeding season apportioning (%)	Gannet	Unknown – range applied	REP1-211	40.4	APP-054	63.3	
	Kittiwake			41.7		41.7	
	Large gulls	N/A					
5. Seasonality	Gannet	REP1-211		APP-054		REP1-211	
	Kittiwake	REP1-211		APP-054		REP1-211	
	Large gulls	Furness (2015)					
6. Nocturnal activity factors	Gannet	1-2	REP1-211	Breeding = 8% Non-breeding = 3%	Furness *et al.* (2018)	1-2	
	Kittiwake	2-3		Breeding = 20% Non-breeding = 17%	MacArthur Green (2018)/Furness (unpub)	2-3	
	Large gulls	2-3		3	Garthe and Hüppop (2004)	3	