Appendix 11-4:
Offshore Ornithology Collision Risk Modelling

ORIEL WINDFARM
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ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report
Appendix 11-4: Offshore Ornithology Collision Risk Modelling

MDR1520B
EIAR – Appendix 11-4
A1 C01
March 2024

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1 INTRODUCTION

1.1 Purpose of the report

This technical report has been produced for the purpose of describing the collision risk modelling (CRM) methodology and results, in support of chapter 11: Offshore Ornithology of the Oriel Wind Farm Project EIAR (see volume 2B). The collision modelling was initially undertaken by APEM Ltd (hereafter APEM) and updated by RPS based on the seabird densities and abundances presented in appendix 11-1: Offshore Ornithology Technical Report and appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results.

1.2 Project background

Oriel Windfarm Ltd ("the Applicant") is proposing to develop the Oriel Wind Farm Project, hereafter referred to as 'the Project". The offshore wind farm area is located in the Irish Sea, off the coast of County Louth (approximately 22 km east of Dundalk town centre and 18 km east of Blackrock). The closest wind turbine will be approximately 6 km from the closest shore on the Cooley Peninsula. The offshore cable corridor extends approximately 11 km southwest from the wind farm area to the landfall south of Dunany Point. The Project will comprise both onshore and offshore infrastructure including 25 offshore wind turbine generators (WTGs), associated foundations and inter-array cabling, offshore substation, one offshore cable within a defined offshore cable corridor, a landfall, onshore cable route and an onshore substation for connection to the electricity transmission network.

1.3 Collision risk modelling

There is potential risk to birds from offshore wind farms through collision with WTGs and associated infrastructure. There is an increase in potential risk of collision with WTGs if they are located in areas of high bird densities in which there is a high level of flight activity. That high level of flight activity can be associated with locations where food supplies are concentrated or with areas where there is a high turnover of individuals (possibly commuting daily between nesting and feeding areas or passing through the area on seasonal migrations). The potential collision risk can be estimated using CRM.

CRM has been carried out for ornithological receptors that are considered to be potentially vulnerable to collision with WTGs (seabirds in this instance). Five seabird species have been identified as potentially at risk due to their recorded abundance in the offshore wind farm area and their likelihood of flying at potential collision height (PCH) between the lowest and highest sweep of the WTG rotor blades above sea level:

- Gannet (*Morus bassanus*);
- Kittiwake (*Rissa tridactyla*);
- Common gull (*Larus canus*);
- Herring gull (*Larus argentatus*); and
- Great black-backed gull (*Larus marinus*).

2 METHODOLOGY

2.1 Guidance and models

The five species selected for CRM were screened in for assessment based on their perceived vulnerability to collision (Furness *et al*., 2013; Ozsanlav-Harris *et al*., 2023), together with their abundance within the baseline dataset (including 19 months of boat-based surveys and six months of digital aerial surveys (DAS); appendix 11-1: Offshore Ornithology Technical Report and appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results.

Collision risk modelling was undertaken using the stochastic Collision Risk Model (sCRM) developed by Marine Scotland (McGregor *et al.,* 2018). The sCRM provides a user-friendly 'Shiny App' online interface which allows for variability in input parameters to be incorporated into the model, producing predicted collision estimates with associated uncertainty. Models were run deterministically for each seabird species (as set out in Department of Communications, Climate Action & Environment (DCCAE) 2018) guidance), rather than stochastically. Additionally, the sCRM provides a useful audit trail of input parameters and outputs, enabling reviewers to easily assess and reproduce the results of any modelling scenario. The User Guide for the sCRM Shiny App provided by Marine Scotland (Donovan, 2018) has been followed for the modelling of collision impacts predicted for the Mona Array Area.

There is currently no detailed Irish guidance regarding the use of collision risk models or avoidance rates (ARs) in the assessment of offshore wind farms on seabirds. The collision risk model incorporated interim guidance on recommended ARs, bird size, flight speed, flight type and nocturnal activity scores (Natural England, 2022). Throughout the document, outputs will be contrasted with recently published parameters from JNCC (Ozanlav-Harris *et al.,* 2023). All proposed parameters are set out in section 2.2.

Collision risk models were run using Band Option 1 and 2 of the sCRM. When using Band Option 1, the proportion of birds flying at collision risk height was determined using the results from the site specific boat-based surveys (Table 2-5) The proportion of birds flying at collision risk height was determined using generic flight height data rather than site-based data. These generic data were taken from Johnston *et al.* (2014a; 2014b), who analysed flight height measurements from surveys conducted at 32 sites around the UK.

2.2 CRM input parameters

As the sCRM has been run deterministically, an evidence-led approach was used to determine the parameters used to model collision risk for each species. The values describe the proposed wind farm design, which forms the basis of the impact assessments described in chapter 11: Offshore Ornithology. An overview of the input parameters used for the Applicant's single design scenario are provided in Table 2-1 to Table 2-5.

2.2.1 Offshore Wind Farm project design parameters

Input parameters for the wind turbine specifications used within the CRM are shown in Table 2-1 and Table 2-2. These values are based on the project description, as described in volume 2A, chapter 5: Project Description of the Oriel Wind Farm Project EIAR.

Wind farm width was calculated using the longest distance across the offshore wind farm area, which is used in the CRM to calculate the maximum amount of time a bird could spend in the wind farm if it flew in a straight line through the longest length. The latitude is for the centroid of the offshore wind farm area.

The values presented below are considered the value which equates to the largest impact on the ornithological features. If the parameters were to be marginally altered a lesser impact would be expected. Therefore, the CRM assesses the maximal potential impact on protected species.

Table 2-1: Wind farm specifications used within the CRM.

Input Parameter (units)	Value
Number of turbines	25
WTG model (megawatt (MW))	15
Number of blades	3
Rotor radius (m)	118

Input Parameter (units)	Value
Minimum air gap (m) (lowest astronomical tide (LAT))	27
Maximum blade width (m)	7
Tidal offset (m) (mean sea level (MSL))	2.75
Wind farm width (km)	7.37
Latitude (degrees)	54.05486
Rotation speed (rotations per minute (rpm))	8.1 (± 0.3)
Large array correction	Yes
Pitch (º)	10

Table 2-2: Theoretical operational time of the project turbines as provided by the Applicant.

Month	Wind availability (%)	Expected WTG downtime (%)
January	95	1
February	96	1
March	95	2
April	93	1
May	92	2
June	90	2
July	90	3
August	90	4
September	93	4
October	95	3
November	95	1
December	95	1

2.2.2 Avoidance rates

The species-specific ARs that were applied in the CRM are presented in Table 2-3. The AR for all species follow guidance from Natural England (2022) and the subsequent JNCC report (Ozsanlav-Harris *et al.*, 2023), in the absence of detailed guidance from regulators in Ireland. Within this document, these two ARs will be referred to as "Natural England AR" and "JNCC AR". The standard deviation (SD) is presented alongside the AR, to provide variation around the mean value. The Natural England rates are grouped into species type, with gannet and kittiwake included within the "all gulls rate", herring gull and great black-backed gull as "large gulls" and common gull as "small gulls". Species specific AR are provided within the JNCC report for kittiwake, herring gull and great black-backed gull, but gannet and common gull use the large and small gull, respectively.

Table 2-3: AR used for CRM for all five species.

Species	AR of each species assessed	
	Natural England AR (± 1 SD)	JNCC AR (± 1 SD)
Gannet	0.993 (± 0.0003)	0.9939 (± 0.0004)
Kittiwake	0.993 (± 0.0003)	0.9979 (± 0.0013)
Common Gull	0.995 (± 0.0002)	0.9949 (± 0.0002)
Herring gull	0.994 (± 0.0004)	0.9952 (± 0.0003)
Great black-backed gull	0.994 (± 0.0004)	0.9991 (± 0.0002)

2.2.3 Other species-specific parameters

In addition to the ARs, there are other specific-specific parameters included within the CRM, these are provided in Table 2-4. The biometrics for all species were derived from McGregor *et al*. (2018) and Natural

England (2022). Estimates of flight speeds for kittiwake, herring gull, and great black-backed gull were derived from Cook *et al*. (2014), which presents flight speed values taken from Pennycuick (1997) and Alerstam *et al.* (2007). Flight speed for common gull was derived directly from Alerstam *et al.* (2007), due to a suspected error in the Cook *et al.* (2014) data. Flight speed for gannet was derived from both Cook *et al.* (2014) and more recent data present by Skov *et al.* (2018). The nocturnal activity factor are all based on Garthe & Hüppop (2004) other than gannet which is from Furness *et al*. (2018).

Table 2-4: Species biometrics used for CRM.

Species	Species-specific parameters			
	Body Length (m)	Wingspan (m)	Flight speed (ms^{-1})	Nocturnal activity
Gannet	0.94 (±0.0325)	1.72 (±0.0375)	14.9 (± 0)	0.08 (±0.1)
Kittiwake	0.39 (±0.005)	1.08 (±0.0625)	13.1 (± 0.4)	0.375 (±0.0637)
Common gull	0.41 (±0.005)	1.20 (±0.05)	13.4 (± 0.4)	0.375 (±0.0637)
Herring gull	0.595 (±0.0225)	1.44 (±0.03)	12.8 (± 1.8)	0.375 (±0.0637)
Great black-backed gull	0.71 (±0.035)	1.58 (±0.0375)	12.8 (± 1.2)	0.375 (±0.0637)

2.2.4 Proportion at potential collision risk height (PCH)

From the boat-based site-specific surveys, the proportion of individuals flying at PCH for use in Band Option 1 for each species were obtained providing a generic PCH per species which is used in this model (Table 2-5).

Species recorded in flight were assigned to the following height bands; 0-5 m, 5-10 m, 10-20 m, 20-30 m, 30-40 m, 40-50 m and above 50 m. To calculate PCH, the number of records across the year and from the flight height category “20-30 m” and above, were summed and divided by the total recorded for each species.

Table 2-5: Proportion at PCH used for Band Option 1 for the boat-based survey data modelling.

Species	PCH (%)
Gannet	17.3
Kittiwake	8.4
Common gull	9.0
Herring gull	21.1
Great black-backed gull	22.4

2.2.5 Density of birds in flight

Density estimates ± SD were determined for the Project using data collected from 19 months of baseline boat-based surveys (carried out between May 2018 and May 2020) and six months of DAS (carried out between April 2020 and September 2020), the results of which are presented in appendix 11-1: Offshore Ornithology Technical Report and appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results. The density data presented in Table 2-6 and Table 2-7 are inclusive of apportionment of unidentified birds and corrections for availability bias, where appropriate.

SDs were estimated using the following equation:

$$1 \text{ SD} \approx (\text{Upper CL} - \text{Lower CL})/4$$

For boat-based survey data with more than one survey in a calendar month, the mean density estimate of the two surveys was used. For calculation of SDs the maximum estimate of the two upper confidence limits and the minimum of the two lower confidence limits were selected.

For the DAS data, species which were subject to apportionment between sitting and flying birds, the upper and lower confidence intervals of flying birds were estimated assuming the ratio between the mean and the upper/lower confidence limit remained the same between un-apportioned and apportioned estimates for flying birds.

For the DAS, no common gull or herring gull were recorded within the six month survey period, therefore collision risk was assessed for the remaining three species only.

Additionally, the guidance provided by Natural England (2022) states that in order to account for macro-avoidance, the densities of gannet used for collision risk modelling should be reduced by 65 to 85% to account for macro-avoidance which is not incorporated into the ARs. To address this Natural England propose reducing input densities by 70%. A specific scenario where densities within the Oriel Array Area were reduced by 70% for northern gannet is therefore also presented.

Table 2-6: Mean density of each species (± SD) during the boat-based surveys used with the CRM.

Month	Gannet	Gannet (70 % macro-avoidance)	Kittiwake	Common gull	Herring gull	Great black-backed gull
Jan	0 (0 - 0)	0 (0 - 0)	0.27 (0 - 0.55)	0.4 (0.22 - 0.58)	0.9 (0 - 1.82)	0.65 (0 - 2.16)
Feb	0 (0 - 0)	0 (0 - 0)	7.65 (6.7 - 8.6)	2.56 (2.11 - 3.01)	0.43 (0.14 - 0.72)	1.73 (0.76 - 2.71)
Mar	0.83 (0.62 - 1.04)	0.25 (0.19 - 0.31)	0.72 (0.44 - 1)	0.29 (0.15 - 0.42)	1.84 (1.33 - 2.35)	0.4 (0.13 - 0.67)
Apr	0.76 (0.45 - 1.06)	0.23 (0.14 - 0.32)	0.04 (0 - 1.91)	0 (0 - 0)	0.29 (0.18 - 0.4)	0.11 (0.04 - 0.18)
May	0.09 (0 - 0.21)	0.03 (0 - 0.06)	0.31 (0.07 - 0.54)	0 (0 - 0)	0 (0 - 0)	0.11 (0.06 - 0.15)
Jun	0.22 (0 - 0.47)	0.07 (0 - 0.14)	0.74 (0.26 - 1.22)	0 (0 - 0)	0.72 (0.62 - 0.82)	0.07 (0.03 - 0.12)
Jul	0.49 (0.14 - 0.84)	0.15 (0.04 - 0.25)	0.02 (0 - 0.17)	0 (0 - 0)	0.25 (0.18 - 0.32)	0.18 (0.11 - 0.25)
Aug	2.35 (0.9 - 3.79)	0.71 (0.27 - 1.14)	0.22 (0 - 1.06)	0 (0 - 0)	0.29 (0 - 2.13)	0.76 (0 - 2.11)
Sep	3.07 (2.67 - 3.46)	0.92 (0.80 - 1.04)	0.72 (0.32 - 1.12)	0 (0 - 0)	0.4 (0 - 1.57)	0.11 (0 - 0.93)
Oct	1.12 (0.44 - 1.79)	0.34 (0.13 - 0.54)	0.4 (0.1 - 0.69)	0.85 (0.54 - 1.15)	0.13 (0 - 0.6)	0.41 (0 - 1.69)
Nov	0 (0 - 0)	0 (0 - 0)	5.27 (3.64 - 6.89)	0.25 (0.19 - 0.32)	0.43 (0.11 - 0.76)	0.07 (0 - 0.32)
Dec	0 (0 - 0)	0 (0 - 0)	0.79 (0 - 1.61)	0.72 (0.47 - 0.97)	4.64 (1.15 - 8.13)	1.37 (0 - 5.12)

Table 2-7: Mean density of each species (± SD) during the DAS used with the CRM.

Month	Gannet	Gannet (70 % macro-avoidance)	Kittiwake	Great black-backed gull
Jan	No Survey			
Feb	No Survey			
Mar	No Survey			
Apr	0 (0 - 0)	0 (0 - 0)	0.11 (0.05 - 0.17)	0.18 (0.1 - 0.26)
May	1.37 (0.86 - 1.89)	0.41 (0.26 - 0.57)	0.51 (0.31 - 0.7)	0 (0 - 0)
Jun	0.11 (0.05 - 0.17)	0.03 (0.02 - 0.05)	0 (0 - 0)	0 (0 - 0)
Jul	1.08 (0.63 - 1.53)	0.32 (0.19 - 0.46)	0.4 (0.14 - 0.66)	0 (0 - 0)
Aug	0.58 (0.33 - 0.82)	0.17 (0.10 - 0.25)	0 (0 - 0)	0 (0 - 0)
Sep	0.79 (0.27 - 1.32)	0.24 (0.08 - 0.40)	0.61 (0.22 - 1.01)	0.11 (0.05 - 0.17)
Oct	No Survey			
Nov	No Survey			
Dec	No Survey			

3 RESULTS

This section provides the standard outputs from the CRM for each of the five seabird species modelled. Tabulated monthly results are presented in Table 3-1 to Table 3-10. Each table is colour coded into the different season (pre-breeding migration [green], breeding [blue], post-breeding migration [yellow] and non-breeding season [grey]) for ease of comparison within chapter 11: Offshore Ornithology whereby assessment of impact assessment is separated into specific season.

3.1 Gannet (no macro-avoidance)

3.1.1 Boat-based estimates

Table 3-1 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the boat-based survey density input data. Both the Natural England and JNCC AR are presented within Table 3-1.

Table 3-1: Mean number of gannet collisions per month for Band Option 1 & 2 from boat-based density estimates.

	Natural England AR		JNCC AR	
Month	Band Option 1	Band Option 2	Band Option 1	Band Option 2
January	0	0	0	0
February	0	0	0	0
March	5.80	2.85	5.14	2.51
April	5.98	2.94	5.22	2.55
May	1.01	0.50	0.90	0.44
June	2.53	1.25	2.19	1.04
July	4.80	2.35	4.15	2.01
August	20.06	9.86	17.38	8.43
September	21.28	10.43	18.36	8.92
October	7.57	3.74	6.52	3.18
November	0	0	0	0
December	0	0	0	0
Annual	**69.04**	**33.91**	**59.87**	**29.09**

3.1.2 DAS estimates

Table 3-2 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the DAS density input data. Both the Natural England and JNCC AR are presented within Table 3-2.

Table 3-2: Mean number of gannet collisions per month for Band Option 2 from DAS density estimates.

	Natural England AR	JNCC AR
Month	Band Option 2	Band Option 2
January	No survey	
February	No survey	
March	No survey	
April	0	0
May	6.14	5.46
June	0.48	0.42
July	4.74	4.15

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
August	2.33	2.01
September	2.62	2.29
October	No survey	
November	No survey	
December	No survey	
Total collisions	**16.32**	**14.32**

3.2 Gannet (70 % macro-avoidance)

3.2.1 Boat-based estimates

Table 3-3 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the boat-based survey density input data and applying a 70 % reduction, due to macro-avoidance (displacement). Both the Natural England and JNCC AR are presented within Table 3-3.

Table 3-3: Mean number of gannet collisions per month for Band Option 1 & 2 from boat-based density estimates and applying 70 % macro-avoidance.

	Natural England rates		JNCC rates	
Month	Band Option 1	Band Option 2	Band Option 1	Band Option 2
January	0	0	0	0
February	0	0	0	0
March	1.74	0.86	1.54	0.75
April	1.79	0.88	1.57	0.77
May	0.30	0.15	0.27	0.13
June	0.76	0.38	0.66	0.31
July	1.44	0.71	1.25	0.60
August	6.02	2.96	5.21	2.53
September	6.38	3.13	5.51	2.68
October	2.27	1.12	1.96	0.95
November	0	0	0	0
December	0	0	0	0
Annual	**20.71**	**10.18**	**17.96**	**8.72**

3.2.2 DAS estimates

Table 3-4 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the DAS density input data. Both the Natural England and JNCC AR are presented within Table 3-4.

Table 3-4: Mean number of gannet collisions per month for Band Option 2 from DAS density estimates and applying 70 % macro-avoidance.

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
January	No survey	
February	No survey	
March	No survey	
April	0	0

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
May	1.84	1.64
June	0.14	0.13
July	1.42	1.25
August	0.70	0.60
September	0.79	0.69
October	No survey	
November	No survey	
December	No survey	
Total collisions	**4.89**	**4.30**

3.3 Kittiwake

3.3.1 Boat-based estimates

Table 3-5 presents the monthly and annual predicted kittiwake collision rates for Band Option 1 and 2 using the boat-based survey density input data. Both the Natural England and JNCC AR are presented within Table 3-5.

Table 3-5: Mean number of kittiwake collisions per month for Band Option 1 & 2 from boat-based density estimates.

	Natural England rates		JNCC rates	
Month	**Band Option 1**	**Band Option 2**	**Band Option 1**	**Band Option 2**
January	0.91	1.05	0.28	0.32
February	19.75	22.73	6.04	6.90
March	2.20	2.53	0.68	0.78
April	0.16	0.19	0.05	0.06
May	1.21	1.40	0.37	0.42
June	2.69	3.10	0.81	0.93
July	0.09	0.10	0.03	0.03
August	0.90	1.04	0.26	0.30
September	2.20	2.53	0.65	0.74
October	1.31	1.50	0.40	0.46
November	13.80	15.88	4.27	4.87
December	2.60	3.00	0.82	0.94
Annual	**47.83**	**55.05**	**14.66**	**16.75**

3.3.2 DAS estimates

Table 3-6 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the DAS density input data. Both the Natural England and JNCC AR are presented within Table 3-6.

Table 3-6: Mean number of kittiwake collisions per month for Band Option 2 from DAS density estimates.

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
January	No survey	
February	No survey	
March	No survey	

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
April	0.40	0.12
May	2.14	0.65
June	0	0
July	1.54	0.47
August	0	0
September	2.05	0.63
October	No survey	
November	No survey	
December	No survey	
Total collisions	**6.13**	**1.88**

3.4 Common gull

3.4.1 Boat-based estimates

Table 3-7 presents the monthly and annual predicted kittiwake collision rates for Band Option 1 and 2 using the boat-based survey density input data. Both the Natural England and JNCC AR are presented within Table 3-7.

Table 3-7: Mean number of common gull collisions per month for Band Option 1 & 2 from boat-based density estimates.

	Natural England rates		JNCC rates	
Month	**Band Option 1**	**Band Option 2**	**Band Option 1**	**Band Option 2**
January	0.85	1.60	0.86	1.62
February	5.24	9.92	5.25	9.96
March	0.71	1.34	0.71	1.34
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	1.93	3.65	1.98	3.75
November	0.52	0.98	0.52	0.98
December	1.46	2.76	1.46	2.78
Annual	**10.71**	**20.27**	**10.78**	**20.45**

3.5 Herring gull

3.5.1 Boat-based estimates

Table 3-8 presents the monthly and annual predicted kittiwake collision rates for Band Option 1 and 2 using the boat-based survey density input data. Both the Natural England and JNCC AR are presented within Table 3-8.

Table 3-8: Mean number of herring gull collisions per month for Band Option 1 & 2 from boat-based density estimates.

	Natural England rates		JNCC rates	
Month	Band Option 1	Band Option 2	Band Option 1	Band Option 2
January	7.36	8.75	5.77	6.94
February	2.96	3.52	2.24	2.68
March	13.42	15.99	10.74	12.86
April	2.22	2.64	1.75	2.09
May	0	0	0	0
June	5.82	6.93	4.65	5.56
July	2.05	2.44	1.61	1.92
August	2.81	3.34	2.24	2.69
September	3.57	4.26	2.91	3.47
October	1.17	1.40	0.96	1.15
November	3.06	3.64	2.43	2.91
December	32.67	38.89	26.33	31.23
Annual	**77.10**	**91.80**	**61.61**	**73.50**

3.6 Great black-backed gull

3.6.1 Boat-based estimates

Table 3-9 presents the monthly and annual predicted kittiwake collision rates for Band Option 1 and 2 using the boat-based survey density input data. Both the Natural England and JNCC AR are presented within Table 3-9.

Table 3-9: Mean number of great black-backed gull collisions per month for Band Option 1 & 2 from boat-based density estimates.

	Natural England rates		JNCC rates	
Month	Band Option 1	Band Option 2	Band Option 1	Band Option 2
January	5.96	7.39	0.91	1.13
February	12.74	15.81	1.95	2.42
March	3.60	4.47	0.54	0.67
April	1.01	1.26	0.15	0.19
May	1.03	1.28	0.15	0.19
June	0.67	0.82	0.10	0.12
July	1.64	2.04	0.25	0.31
August	8.33	10.30	1.30	1.63
September	1.13	1.40	0.17	0.21
October	4.18	5.19	0.61	0.75
November	0.65	0.81	0.10	0.12
December	12.21	15.14	1.81	2.24
Annual	**53.16**	**65.91**	**8.03**	**9.98**

3.6.2 DAS estimates

Table 3-10 presents the monthly and annual predicted gannet collision rates for Band Option 1 and 2 using the DAS density input data. Both the Natural England and JNCC AR are presented within Table 3-10.

Table 3-10: Mean number of great black-backed gull collisions per month for Band Option 2 from DAS density estimates.

Month	Natural England AR Band Option 2	JNCC AR Band Option 2
January	No survey	
February	No survey	
March	No survey	
April	2.00	0.30
May	0	0
June	0	0
July	0	0
August	0	0
September	1.09	0.17
October	No survey	
November	No survey	
December	No survey	
Total collisions	**3.09**	**0.47**

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