

# **Population, density and collision rate estimates of seabirds at Neart na Gaoithe**

Distance analysis of ship-based survey data and collision rate modelling using  
the extended Band model.

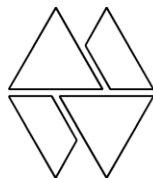
R.C. Fijn  
M.P. Collier  
R-J. Jonkvorst  
M. Japink  
M.J.M. Poot



Population, density and collision rate estimates of seabirds at Neart na Gaoithe

Distance analysis of ship-based survey data and collision rate modelling using the extended Band model.

Ruben C. Fijn  
Mark P. Collier  
Robert Jan Jonkvorst  
Maarten Japink  
Martin J.M. Poot



**Bureau Waardenburg bv**  
Consultants for environment & ecology  
P.O. Box 365, 4100 AJ Culemborg The Netherlands  
Tel. +31 345 51 27 10, Fax +31 345 51 98 49  
E-mail [wbb@buwa.nl](mailto:wbb@buwa.nl) Website: [www.buwa.nl](http://www.buwa.nl)

commissioned by: Mainstream Renewable Power

29 June 2012  
report nr 11-193

Status: Final report  
Report nr.: 11-193  
Date of publication: 29 June 2012  
Title: Population, density and collision rate estimates of seabirds at Neart na Gaoithe  
Subtitle: Distance analysis of ship-based survey data and collision rate modelling using the extended Band model.  
Author: R.C. Fijn MSc.  
Authors: M.P. Collier MSc.  
R-J. Jonkvorst MSc.  
M. Japink Ing.  
M.J.M. Poot MSc.  
Number of pages incl. appendices: 152  
Front page pictures: Jan Dirk Buizer, Ruben Fijn, Mark Collier (Bureau Waardenburg)  
Project nr: 11-561  
Project manager: M.J.M. Poot  
Name & address client: Mainstream Renewable Power  
Zoë Crutchfield  
Offshore Environment Manager  
11th Floor  
140 London Wall,  
London  
EC2Y 5DN  
United Kingdom  
Reference client: Consulting Services Agreement Activity No. CTR001  
Signed for publication: Vice director Bureau Waardenburg bv  
drs. S. Dirksen  
Initials:

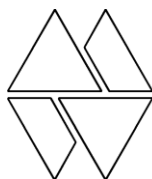


Bureau Waardenburg bv is not liable for any resulting damage, nor for damage which results from applying results of work or other data obtained from Bureau Waardenburg bv; client indemnifies Bureau Waardenburg bv against third-party liability in relation to these applications.

© Bureau Waardenburg bv / Mainstream Renewable Power

This report is produced at the request of the client mentioned above and is his property. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted and/or publicized in any form or by any means, electronic, electrical, chemical, mechanical, optical, photocopying, recording or otherwise, without prior written permission of the client mentioned above and Bureau Waardenburg bv, nor may it without such a permission be used for any other purpose than for which it has been produced.

The Quality Management System of Bureau Waardenburg bv has been certified by CERTIKED according to ISO 9001:2008.



**Bureau Waardenburg bv**  
Consultants for environment & ecology

P.O. Box 365, 4100 AJ Culemborg The Netherlands  
Tel. +31 345 51 27 10, Fax +31 345 51 98 49

E-mail wbb@buwa.nl Website: www.buwa.nl

# Preface

In 2009-2011 ship-based surveys following the European Seabirds at Sea (ESAS) methodology have been carried out as part of the baseline study for wind farm initiatives at Neart na Gaoithe off the east coast of Fife, Scotland.

Mainstream has commissioned Bureau Waardenburg to calculate population estimates and bird densities based on the data collected during the above-mentioned surveys. In addition, collision rate modelling was carried out based on the densities of flying birds recorded during the surveys. This report presents the analysis and results of the population, density and collision rate estimates for birds at Neart na Gaoithe.

The project team of Bureau Waardenburg consisted of and was responsible for:

R.C. Fijn	distance analysis, report
M.P. Collier	collision rate modelling, report
R-J. Jonkvorst	distance analysis, report
M. Japink	database management
M.J.M. Poot	project management, distance analysis, collision rate modelling, report

Cork Ecology, Colin Barton and Claire Pollock, have been particularly helpful with providing their databases and answering questions. This project was commissioned by Mainstream Renewable Energy and coordinated by Zoe Crutchfield, who also ensured that data for the collision rate modelling were available.

Louise Burt from the Centre for Research into Ecological and Environmental Modelling of the University of St. Andrews provided advice and made useful suggestion on the Distance modelling in this project.

Theo Boudewijn provided comments on previous versions of this report. The authors thank everyone who has contributed during discussions over these analyses for their contribution, particularly Colin Barton and Claire Pollock (both Cork Ecology), Digger Jackson (Natural Research), Phil Bloor (Pelagica) and Phil Whitfield (Natural Research).



# Table of contents

Preface .....	3
1 Introduction .....	7
2 Methods .....	9
2.1 Base Material .....	9
2.2 Distance analysis.....	14
2.3 Collision rate modelling.....	15
3 Population estimates and densities at Neart na Gaoithe - Year 1.....	18
3.1 Introduction.....	18
3.2 Northern Fulmar <i>Fulmarus glacialis</i> .....	20
3.3 Sooty Shearwater <i>Puffinus griseus</i> .....	22
3.4 Northern Gannet <i>Morus bassanus</i> .....	24
3.5 Herring Gull <i>Larus argentatus</i> .....	26
3.6 Great Black-backed Gull <i>Larus marinus</i> .....	28
3.7 Little Gull <i>Larus minutus</i> .....	30
3.8 Kittiwake <i>Rissa tridactyla</i> .....	32
3.9 All gull species.....	34
3.10 Little Auk <i>Alle alle</i> .....	36
3.11 Puffin <i>Fratercula arctica</i> .....	38
3.12 Guillemot <i>Uria aalge</i> .....	40
3.13 Razorbill <i>Alca torda</i> .....	42
3.14 Small auk species .....	44
3.15 Large auk species .....	46
3.16 All auk species.....	48
4 Population estimates and densities at Neart na Gaoithe - Year 2.....	50
4.1 Introduction.....	50
4.2 Northern Fulmar <i>Fulmarus glacialis</i> .....	52
4.3 Sooty Shearwater <i>Puffinus griseus</i> .....	54
4.4 Northern Gannet <i>Morus bassanus</i> .....	56
4.5 Herring Gull <i>Larus argentatus</i> .....	58
4.6 Great Black-backed Gull <i>Larus marinus</i> .....	60
4.7 Little Gull <i>Larus minutus</i> .....	62
4.8 Kittiwake <i>Rissa tridactyla</i> .....	64
4.9 All gull species.....	66

4.10	Little Auk <i>Alle alle</i> .....	68
4.11	Puffin <i>Fratercula arctica</i> .....	70
4.12	Guillemot <i>Uria aalge</i> .....	72
4.13	Razorbill <i>Alca torda</i> .....	74
4.14	Small auk species .....	76
4.15	Large auk species .....	78
4.16	All auk species.....	80
5	Populations estimates in predefined sub-zones at Neart na Gaoithe .....	82
5.1	Introduction and methods .....	82
5.2	Northern Fulmar <i>Fulmarus glacialis</i> .....	83
5.3	Sooty Shearwater <i>Puffinus griseus</i> .....	85
5.4	Northern Gannet <i>Morus bassanus</i> .....	87
5.5	Herring Gull <i>Larus argentatus</i> .....	89
5.6	Great Black-backed Gull <i>Larus marinus</i> .....	91
5.7	Little Gull <i>Larus minutus</i> .....	93
5.8	Kittiwake <i>Rissa tridactyla</i> .....	95
5.9	All gull species .....	97
5.10	Little Auk <i>Alle alle</i> .....	99
5.11	Puffin <i>Fratercula arctica</i> .....	101
5.12	Guillemot <i>Uria aalge</i> .....	103
5.13	Razorbill <i>Alca torda</i> .....	105
5.14	Small auk species .....	107
5.15	Large auk species .....	109
5.16	All auk species.....	111
6	Collision rate modelling .....	113
6.1	Introduction.....	113
6.2	Results Year 1 .....	116
6.3	Results Year 2.....	122
6.4	Results Years 1 and 2.....	128
6.5	Results additional species .....	134
7	Discussion .....	141
7.1	Distance analysis.....	141
7.2	Collision rate modelling.....	143
8	Literature.....	147
	Appendix 1.....	149



# 1 Introduction

In 2009-2011 ship-based surveys following the European Seabirds at Sea (ESAS) methodology have been carried out as part of the baseline study for wind farm initiatives at Neart na Gaoithe (NnG) off the east coast of Fife, Scotland.

Mainstream has commissioned Bureau Waardenburg to calculate population estimates and bird densities based on the data collected during the above-mentioned surveys. In addition, collision rate modelling was carried out based on the densities of flying birds recorded during the surveys.

In this report, the analysis and results of the population, density and collision rate estimates for birds at Neart na Gaoithe are presented as determined following the 'Distance methodology' (see §2.2). This report should be regarded as background document to support the understanding of the population, density and collision rate estimates for Neart na Gaoithe. The main goal of this report is to provide a clear overview of the analyses carried out and present the results in a comprehensive and accessible form. The data presented within this report are delivered as electronic data files, enabling the data to be easily processed for presentation in final documents.



## 2 Methods

### 2.1 Base Material

In this section we describe the procedures carried out during the handling of ESAS data collected at Neart na Gaoithe. The data analysed in this report were collected according to ESAS ship-based survey methodology (Tasker *et al.* 1984; Camphuysen *et al.* 2004). Monthly surveys at Neart na Gaoithe were carried out from November 2009 until October 2011 (with the exception of November 2010). Survey conditions and observations *etc.* are given in Mainstream Renewable Power (2012).

#### ***Preparation of database (ESAS model)***

The physical data model was built on a PostgreSQL database server and was based on the 'SAST Coding Manual v 6.pdf' along with some additions (see figure 2.1). All coding lists were imported in tables and survey data from Neart na Gaoithe were imported to the database. Geometric fields for spatial querying of the data are non-projected in WGS84.

During the uploading of the data some fundamental checks were carried out using a Microsoft (MS) Access database as a front-end to the PostgreSQL database. Therefore, all PostgreSQL tables are ODBC-linked in MS Access and the data table-structures for trips, environment, bird and base data are hard copied.

#### ***Processing data (trip, environment, bird, base) ready for analysis***

The different steps of how the base data were processed are described below. The different steps indicated are presented schematically in figure 2.2.

##### *Formatting paradox export files*

Paradox exports are required to be in text format. In this case files were delivered in csv format, therefore, the following steps were undertaken:

- replacing spaces with underscores in column names in the csv files;
- replacing all ',' with ';' as field delimiter.

##### *Read into MS Access front-end*

- All formatted files were read in hard copied MS Access native tables prior to adding to PostgreSQL.
- A record count was made to ensure all data were successfully imported.

##### *Check against coding lists*

- Each field was checked against its coding list to find missing values *etc.*

##### *Upload in database*

During the import some fields were recalculated.

- Latitude and longitude minutes were changed back to '.' separated values.

### *Corrections*

The only corrections made to the data were in the field 'distance'.

- a new field 'flight\_altitude' was populated with the numeric information from the 'distance' field.
- all 'distance' fields with numeric data were replaced with 'F' to indicate flying birds.

### *Additions*

The ESAS database structure has been extended with some extra fields and an extra table.

- a geometry field in the base table was updated with point locations based on the coordinates in latitude and longitude.
- an 'in\_out' field in the base table was updated with a 'study area' number, see figure 2.3 for a visible representation.
- an extra survey table was populated with lines calculated from base points with the following criteria 'count\_type' =1 AND key fields from the Neart na Gaoithe survey data AND 'in\_out' is not null'.
- line lengths were calculated in UTM 30N projection.
- *N.B.* For Distance analyses, line lengths were halved as Distance software assumes that observations along transects are made on two sides.

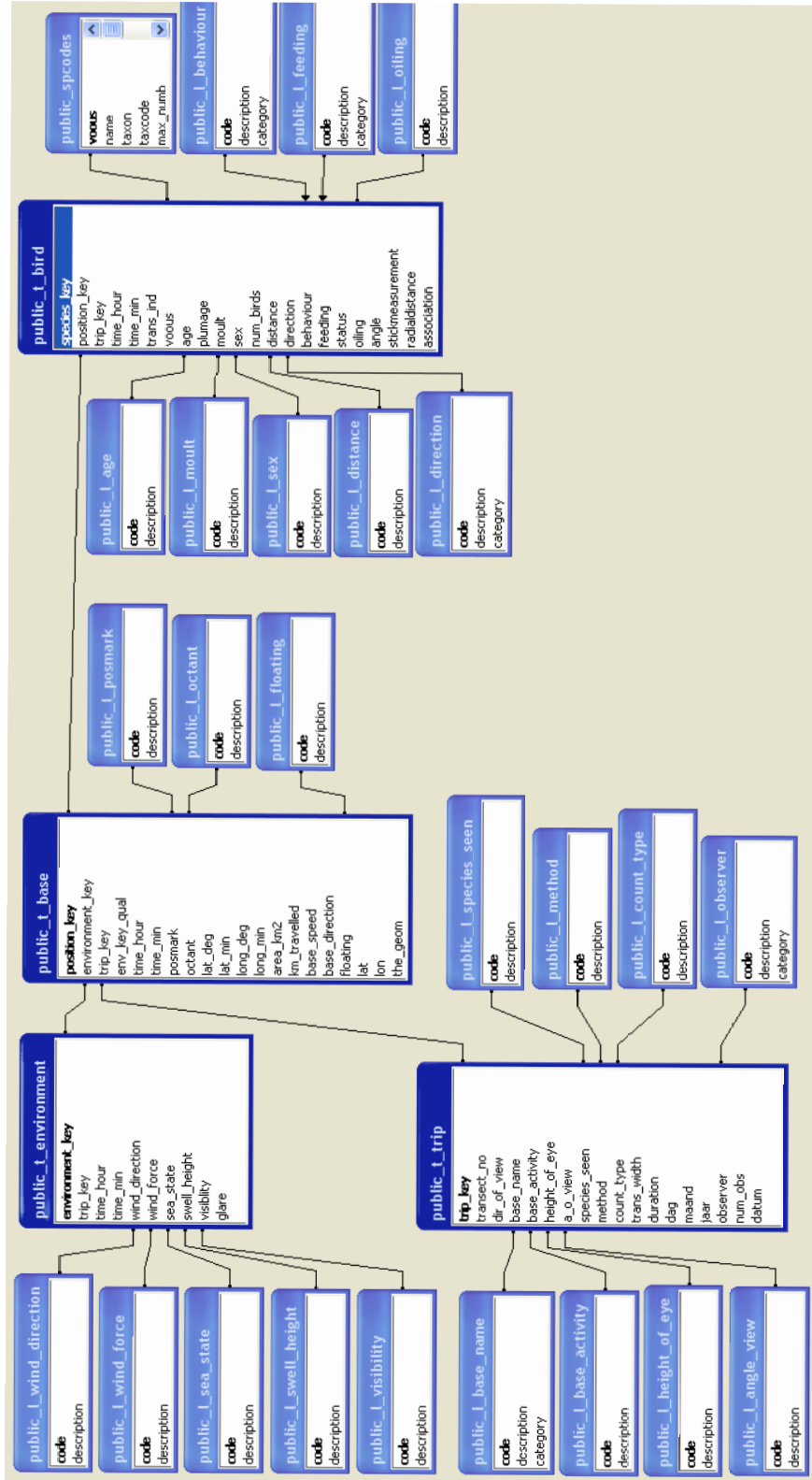
### *SELECT and analyse*

Following loading and checking the data were ready for use in analysis.

- selection of major sea state, wind direction and observer for each survey for each transect.
- selection of flying or 'distance birds'.
- export of required data for Distance and density calculations.

Data used in the collision rate modelling were based on:

- flying birds in transect (in the 'snapshot' count);
- birds not associated with the observer base or similar vessels;
- only birds within the area of interest, *i.e.* Neart na Gaoithe development area.



*Figure 2.1 Overview of the database according the ESAS data model.*

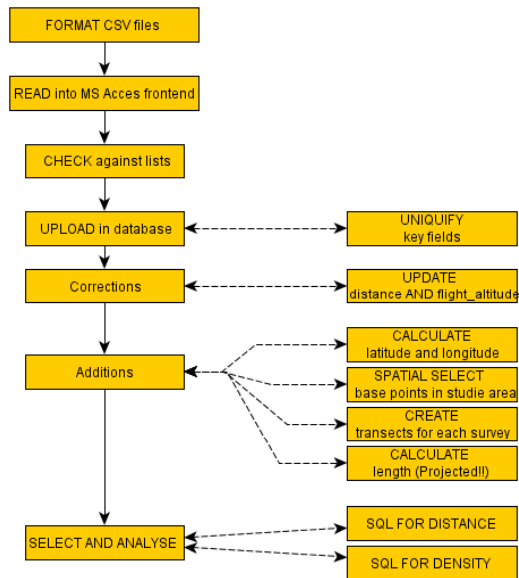


Figure 2.2 Overview of the processing steps to make the data ready for analysis.

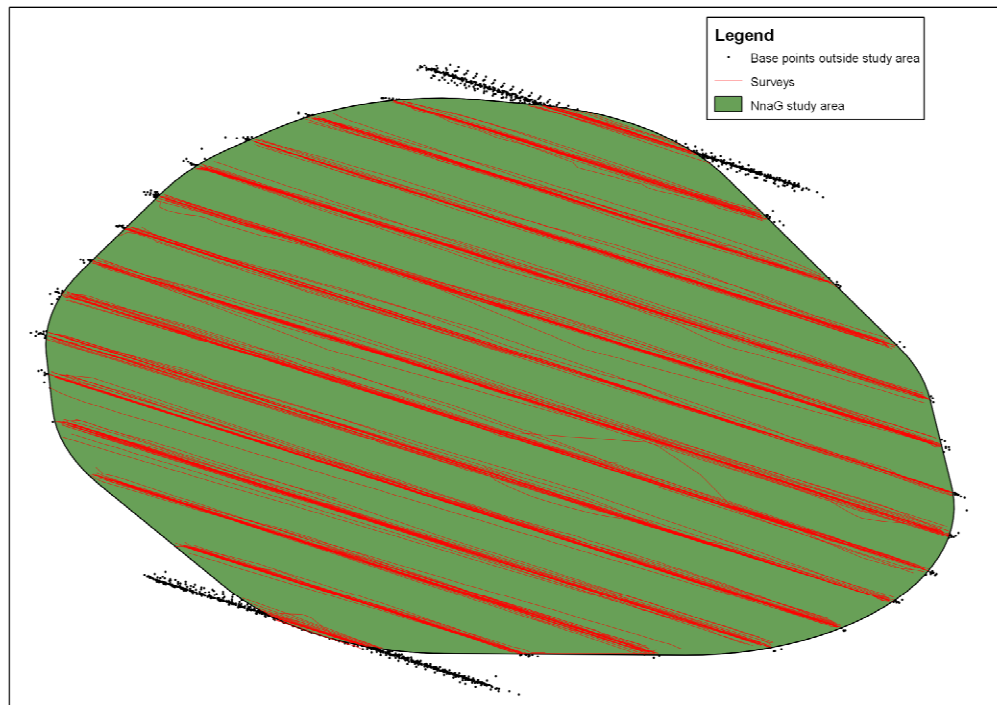


Figure 2.3 For the Distance analysis the observations outside the delimited study area of Neart na Gaoithe (here NnaG) were excluded. The transect lengths were amended accordingly.

## 2.2 Distance analysis

The data collected during the ship-based surveys at Neart na Gaoithe formed basis for estimating population sizes and densities of seabirds in the area (see 2.1 for an explanation of data collection and handling). Birds were recorded while steaming along pre-defined transects within the Neart na Gaoithe study area using the ESAS methodology (chapter 1 and 2.1). The detection probability of birds decreases with increasing distance from the transect line. Therefore, reliable estimates of the densities and population sizes of birds can only be estimated with the application of the Distance Sampling Technique (Buckland *et al.* 1993, 2001, 2004). Distance 6.0 software, developed by the Centre for Research into Ecological and Environmental Modelling at the University of St. Andrews (CREEM), uses this technique to fit a species-specific detection curve through the data collected to determine the width of the strip in which species were effectively recorded (Thomas *et al.* 2010). Subsequently, the densities of birds in the study area can be calculated based on those within the area covered (transect line multiplied with the effective strip width).

A key assumption of this technique is that all birds along the transect line ( $g(0) = 1$ ) are detected. This assumption is not always valid due to disturbance of the survey ship causing birds to either dive, swim or fly away from the transect line to more distant transect bands. Furthermore, the calculated densities for species that regularly undertake long dive must be regarded as a lower limit as the proportion under the water remains unknown. In seabirds, the species with potentially lower detection rates ( $g(0) \neq 1$ ) is likely to include auks, and in particular the smaller species. If not all individuals of a certain species are detected ( $g(0) \neq 1$ ), several analytical techniques can be used to correct for this imperfect detection.

The distance analysis included all observations of birds that were not in flight (either swimming or sitting on floating objects) and within transect (up to 300 m) and categorised in one of four observation bands (0-50 m, 50-100 m, 100-200 m and 200-300 m). These four observation bands give average perpendicular distances (used by the Distance 6.0 software) of 25, 75, 150 and 250 m. So, automatically a 'right truncation' of the data was performed at the outer boundary of band D (300 m).

As a robust, conservative approach, hazard-rate detection curves were always chosen first, unless half normal curves would give a more smooth detection curve with a realistic decrease in numbers at larger distance. Model selection was mainly based on the Akaike Information Criteria (AIC), with lower AIC values resembling models with a better fit. In each species account in this report, our assessment of distance curves is explained.

As a general rule at least 60 positive observations are needed in order to be able to fit a reliable detection function. In order to correct for loss of detection due to factors such as sea state *etc.* the number of observations needed increases with a multiple of the number explanatory parameters, including covariates in Distance analysis models.



Therefore, in order to determine the most reliable detection function especially applicable for the scarce species, all available data were used to estimate the detection functions. For Neart na Gaoithe survey data from over a two year period were available and were used to determine a global detection function.

Detection of seabirds on the water surface is influenced by observation conditions due to weather and sea state. The Distance 6.0 software allows the analysis of sea state data as covariates during the modelling process. Also here, model selection was mainly based on the Akaike Information Criteria (AIC) with lower AIC values representing models with a better fit. By applying this criterion, better models could be used to correct population estimates for the effect of sea state, resulting in better estimates with smaller confidence intervals.

### **2.3 Collision rate modelling**

For various bird species, the level of collision-related mortality was estimated by collision rate modelling. The model used was that published by the Crown Estate Strategic Ornithological Support Services group in November 2011 (Band 2011; available from <http://www.bto.org/science/wetland-and-marine/soss/projects>). This model, based on the SNH/Band collision risk model (Band *et al.* 2007; available from <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/assessing-bird-collision-risks/>), has been extended to allow the direct input of density data and to allow the comparison of various avoidance rates on the estimated collision rates.

Based on the physical characteristics of both the turbine and species of bird, a turbine/species-specific probability of collision for a single bird crossing the rotor-swept area can be calculated. This probability is then applied to the number of birds crossing the rotor-swept area of an entire wind farm, which is estimated based on the density of flying birds and the size and number of turbines. Finally, an avoidance factor is applied that accounts for birds avoiding turbines, were they present. The model also allows a correction factor for large arrays, which assumes a decreasing density of birds across the wind farm that is relative to numbers of birds that have been assumed to collide. For the current wind farm scenarios, this correction factor has the effect of reducing the estimates of the numbers of collisions by a fraction of a percent, and has therefore not been applied.

The collision risk model makes a number of assumptions and is further sensitive to changes in avoidance rates (Chamberlain *et al.* 2006), which urge caution when interpreting the results. Here, four different avoidance rates have been applied: 95%, 98%, 99% and 99.5%.

Data for the various wind farm variants and turbine-specific data were provided by Mainstream and are given in section 6.1. Data for species-specific parameters, such

as length, wingspan and flight speed, were obtained from literature. These are also given in section 6.1. Not all data were available for all wind farm scenarios or for all species modelled. Missing data were estimated based on similar turbines or on similar species.

The proportions of each species flying at rotor height were calculated from data recorded during the ship-based surveys (see section 2.1). The heights of flying birds were recorded in 5m categories. For each turbine variant, the proportions of birds recorded in the height categories of the rotor tip at its lowest point to the rotor tip at its highest point were taken as the proportion flying at rotor height.

Only flying birds recorded as 'in transect', thus within the snapshot count, were included in when calculating species-specific densities (see sections 2.1 and 2.2). Monthly densities, and therefore monthly collision rates, were calculated, which were summed to provide annual collision rates.

An additional 22 species were assessed based on a fixed number of passages per year (flux), from which areal densities were calculated. This flux was based on 1,000 birds passing through the development area in a north-south/south-north direction two times a year. The width of the development area was taken as 10km. Areal density was calculated following Annex 2 of the guidance published by the Crown Estate Strategic Ornithological Support Services group. The assumption was made that 1,000 individuals of each species assessed passed through the development area during April and then again in September. This would yield the same results if these birds passed during any time frame within the year. The results of the collision rate modelling for the additional species are given in section 6.5.



## **3 Population estimates and densities at Neart na Gaoithe - Year 1**

### **3.1 Introduction**

In the species accounts below we present the population estimates and densities at Neart na Gaoithe on a monthly basis for the first year of the study period (November 2009 - October 2010). Figures presented are for birds sitting on the water and are based on calculations with the Distance Analysis software (CREEM). Detection functions were built for species or species-groups with at least 60 different sightings (Buckland *et al.* 1993). In every species account rationale is given for the model chosen for use in Distance. Data from the second year of study were also incorporated to strengthen the detection functions. Estimates of population sizes are accompanied by confidence intervals. The average density of flying birds as determined by the snapshot method is also presented along with a population estimate based on this density and the total surface cover of the study area. The two population estimates together provide the estimated total population for the area. In every species account rationale is given for the model chosen for use in Distance.

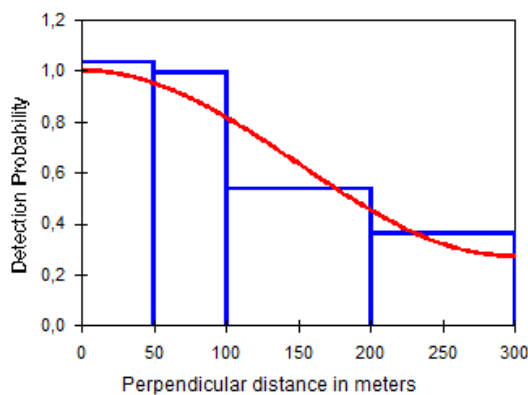


### 3.2 Northern Fulmar *Fulmarus glacialis*

*Observations:*

A total of 87 individual Northern Fulmars were recorded divided over 49 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. The lowest numbers of Northern Fulmars were recorded in late spring and summer. Most sightings of Northern Fulmars were recorded in spring and summer (March/April and September).

*Model selection:*



Model function: Uniform (1)

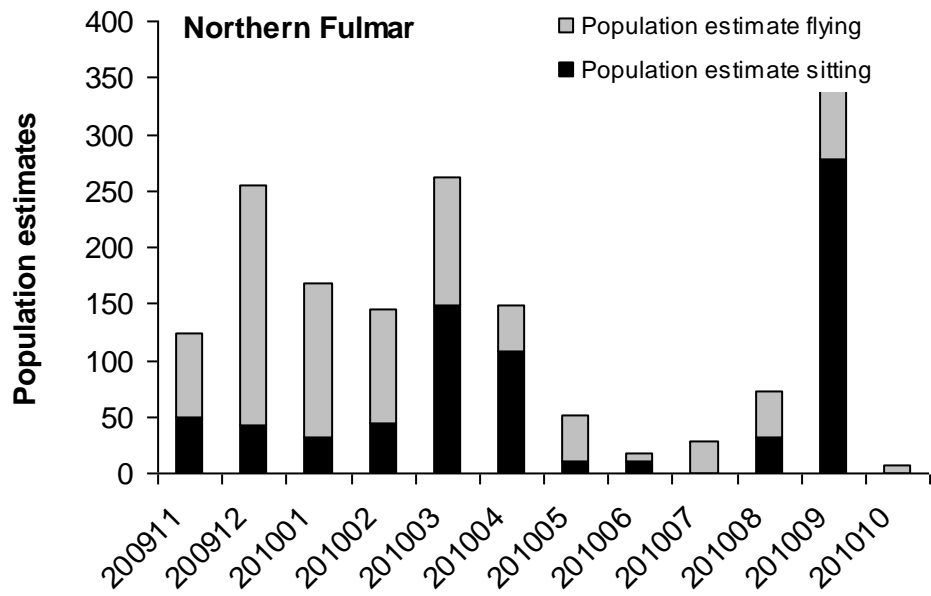
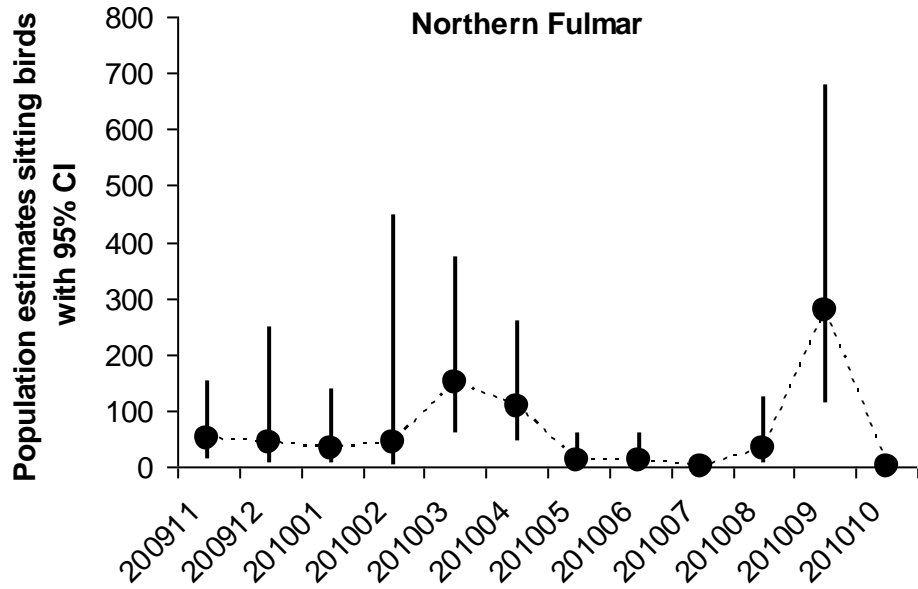
Covariates: n.a.

Remarks: A uniform function with one cosine adjustment term was chosen to build the detection function of Northern Fulmar based on lowest AIC. Hazard rate or half-normal functions including sea state as covariate did not lead to a better model and caused wider confidence intervals.

Effective strip width ( $\pm$  SE):  $190.92 \pm 11.643$   
 CI:  $169.30 <> 215.31$

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.12	75	0.08	49	16	153
200912	0.34	212	0.07	43	7	249
201001	0.22	136	0.05	32	7	139
201002	0.16	101	0.07	44	4	448
201003	0.18	114	0.24	149	59	374
201004	0.06	41	0.17	108	45	261
201005	0.06	41	0.02	11	2	62
201006	0.01	7	0.02	11	2	62
201007	0.04	27	0.00	0	0	0
201008	0.06	41	0.05	32	8	125
201009	0.12	75	0.44	277	114	678
201010	0.01	7	0.00	0	0	0

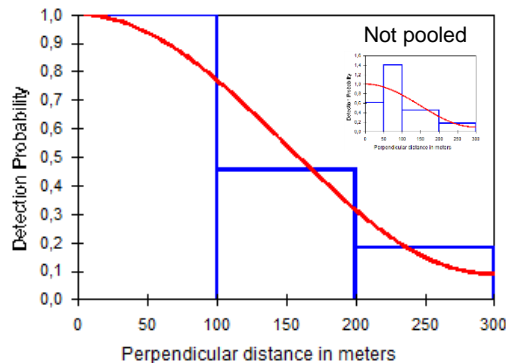


### 3.3 Sooty Shearwater *Puffinus griseus*

#### Observations:

A total of 85 individual Sooty Shearwaters were recorded divided over 39 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Sooty Shearwaters were only present in the autumn. The majority of the sightings were made during the October survey (N = 28) but Sooty Shearwaters were also recorded in August and September.

#### Model selection:



Model function: Uniform (1)

Covariates: n.a.

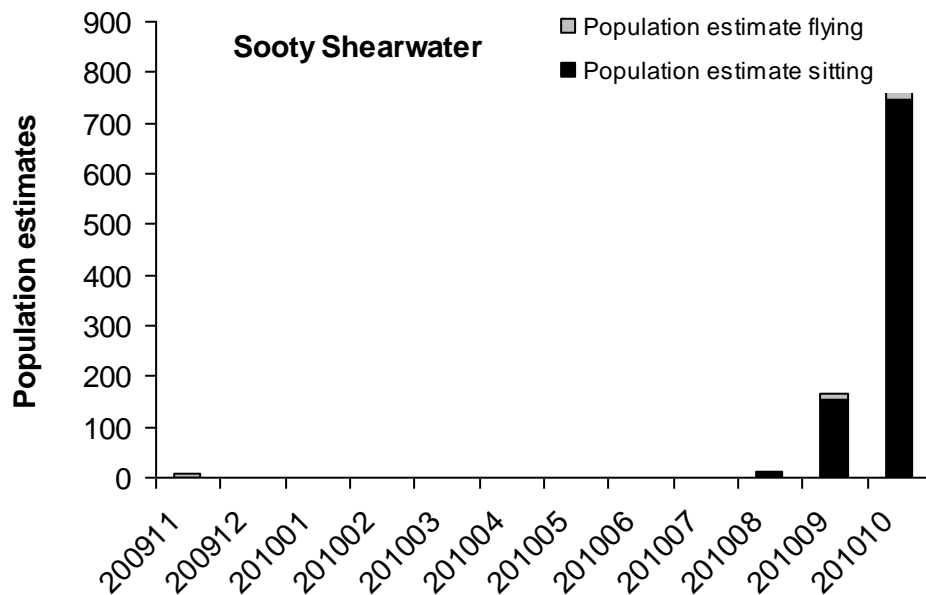
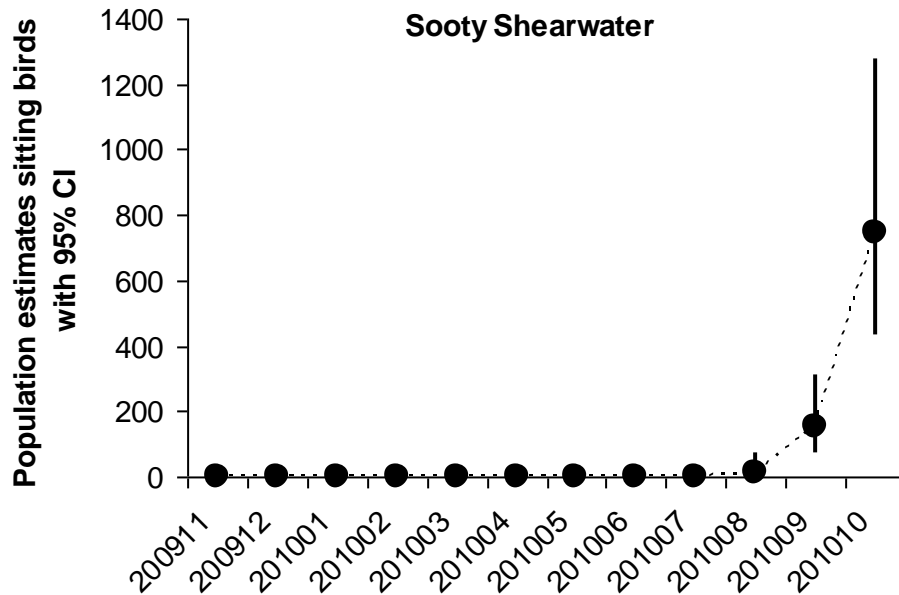
Remarks: In this species avoidance behaviour of birds swimming out of transect A caused by disturbance of the approaching survey ship, was reflected heavily in the detection function. It was therefore decided to pool strip A and B. Then, a half-normal function would have the lowest AIC but overestimated the numbers of birds in the first transect band. A uniform function with one cosine adjustment proved to be the best detection function of Sooty Shearwater.

Effective strip width ( $\pm$  SE): 163.31  $\pm$  12.927 CI: 139.37 <> 191.36

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.01	7	0.00	0	0	0
200912	0.00	0	0.00	0	0	0
201001	0.00	0	0.00	0	0	0
201002	0.00	0	0.00	0	0	0
201003	0.00	0	0.00	0	0	0
201004	0.00	0	0.00	0	0	0
201005	0.00	0	0.00	0	0	0
201006	0.00	0	0.00	0	0	0
201007	0.00	0	0.00	0	0	0
201008	0.00	0	0.02	13	2	73
201009	0.02	14	0.24	153	75	311
201010	0.05	34	1.18	746	435	1280



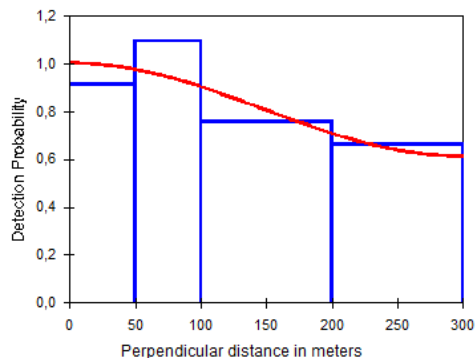


### 3.4 Northern Gannet *Morus bassanus*

*Observations:*

A total of 540 individual Northern Gannets were recorded divided over 374 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Northern Gannets were scarce during winter. Most sightings were recorded during the September survey of 2010 (N = 189) and to a lesser extent during the spring, summer and autumn surveys.

*Model selection:*



Model function: Uniform (1)

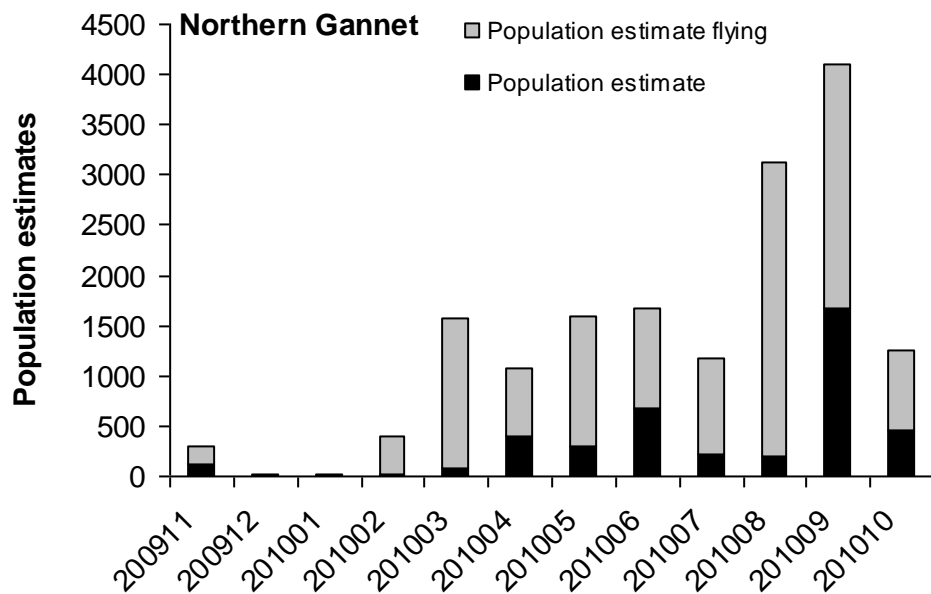
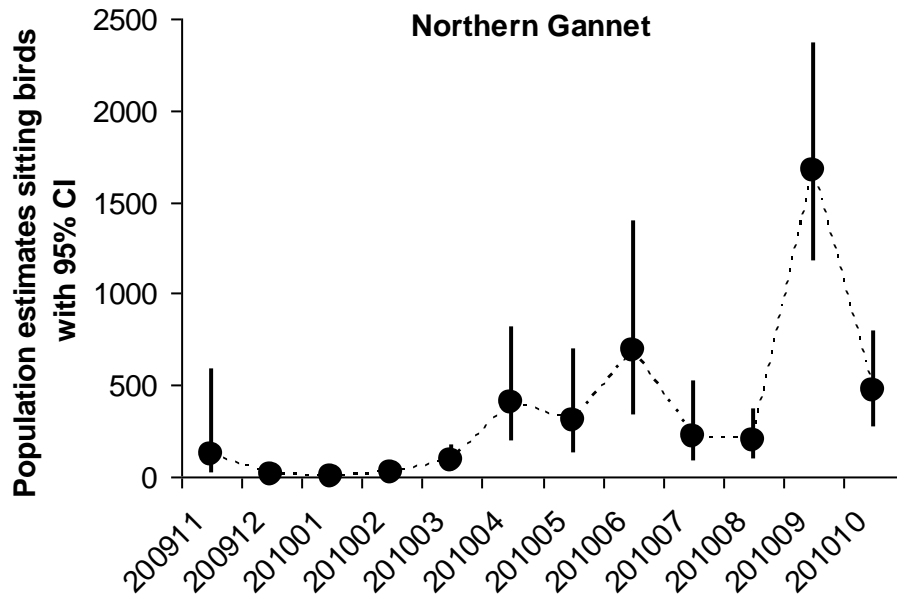
Covariates: n.a.

Remarks: A uniform detection function with one cosine adjustment was chosen (lowest AIC) to predict the detection of Northern Gannets. This model corrects for the disturbance of birds in transect A (0-50 m) caused by the survey ship. Due to their size these birds are better detected at larger distances of the transect line, which means that half normal and hazard rates function are less applicable.

Effective strip width ( $\pm$  SE): 241.82  $\pm$  8.395  
 CI: 225.90 <> 258.86

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

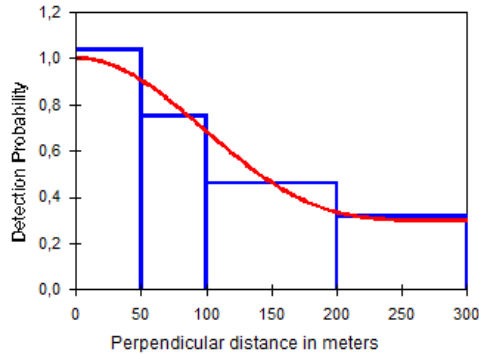
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.29	183	0.18	116	23	594
200912	0.03	21	0.01	8	1	50
201001	0.03	20	0.00	0	0	0
201002	0.60	377	0.03	17	4	65
201003	2.35	1485	0.13	83	38	179
201004	1.08	681	0.64	401	197	818
201005	2.04	1287	0.49	307	136	697
201006	1.58	996	1.08	685	336	1397
201007	1.51	955	0.34	216	88	527
201008	4.64	2930	0.31	193	102	366
201009	3.86	2437	2.64	1668	1174	2370
201010	1.25	787	0.74	466	273	795



### 3.5 Herring Gull *Larus argentatus*

A total of 1,065 individual Herring Gulls were recorded divided over 64 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. On average Herring Gulls were mainly present in winter. Most sightings were during the January survey of 2010 (N = 14) and to a lesser extent during the November survey of 2009.

Model selection:



Model function: Uniform (1)

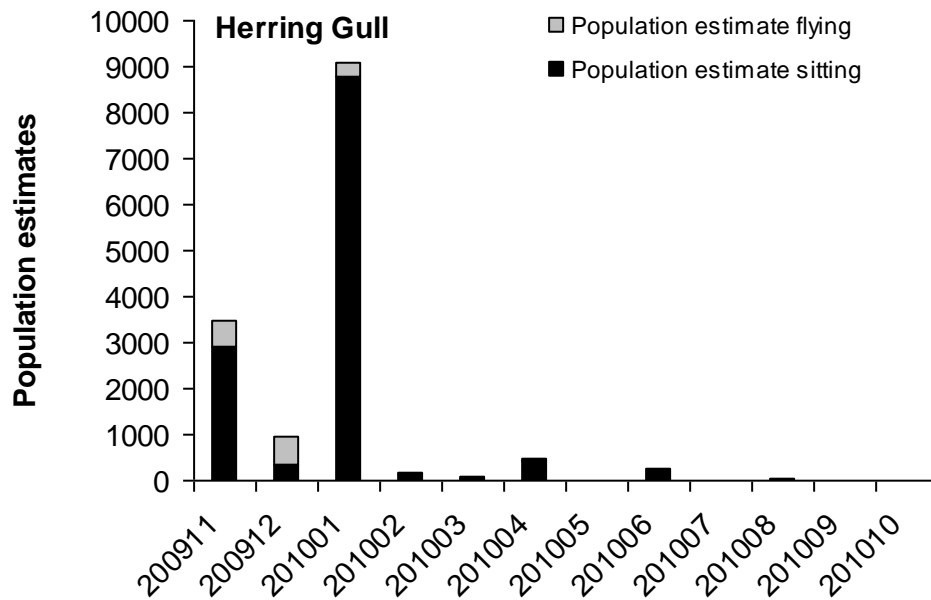
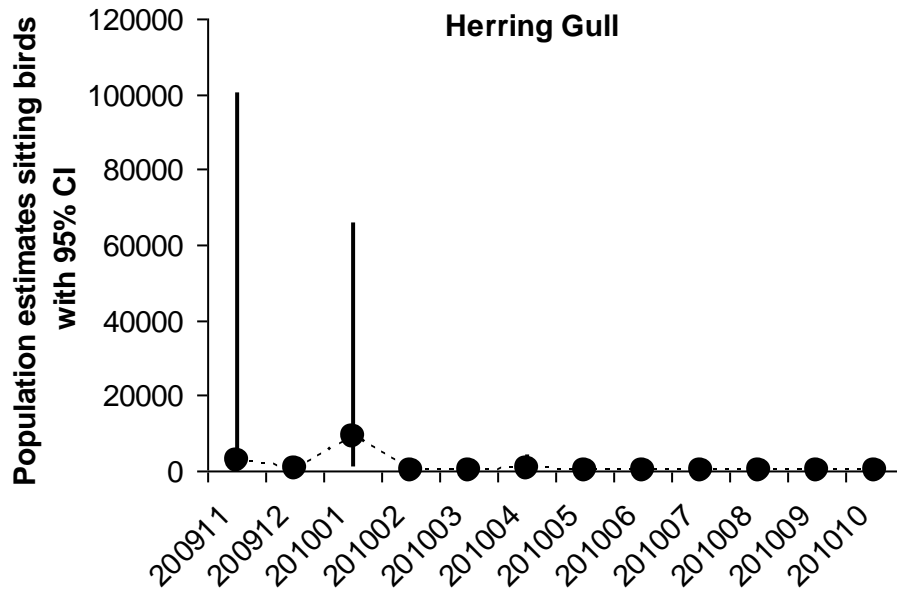
Covariates: n.a.

Remarks: A hazard rate detection function had the lowest AIC, however, this function overestimated the numbers of birds on the transect line considerably. A uniform function with one cosine adjustment had a marginally higher AIC but fitted the data better and was chosen based on the detection function plot.

Effective strip width ( $\pm$  SE): 167.08  $\pm$  20.410 CI: 131.29<> 212.64

Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

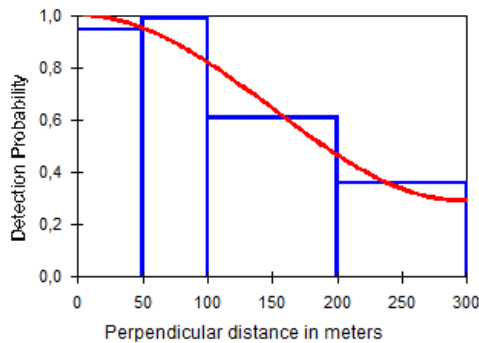
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.89	563	4.60	2909	85	100120
200912	0.92	582	0.58	366	77	1752
201001	0.49	313	13.88	8768	1166	65937
201002	0.06	40	0.18	113	29	436
201003	0.12	74	0.04	24	7	86
201004	0.06	41	0.71	450	45	4475
201005	0.02	14	0.00	0	0	0
201006	0.04	27	0.39	247	82	743
201007	0.01	7	0.00	0	0	0
201008	0.00	0	0.06	37	6	214
201009	0.01	7	0.00	0	0	0
201010	0.01	7	0.02	12	2	73



### 3.6 Great Black-backed Gull *Larus marinus*

A total of 320 individual Great Black-backed Gulls were recorded divided over 51 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Great Black-backed Gulls were largely absent during most of the surveys. Most sightings were recorded during the January survey of 2010 (N= 17) and to a lesser extent during the November survey of 2009 and the October survey of 2010.

Model selection:



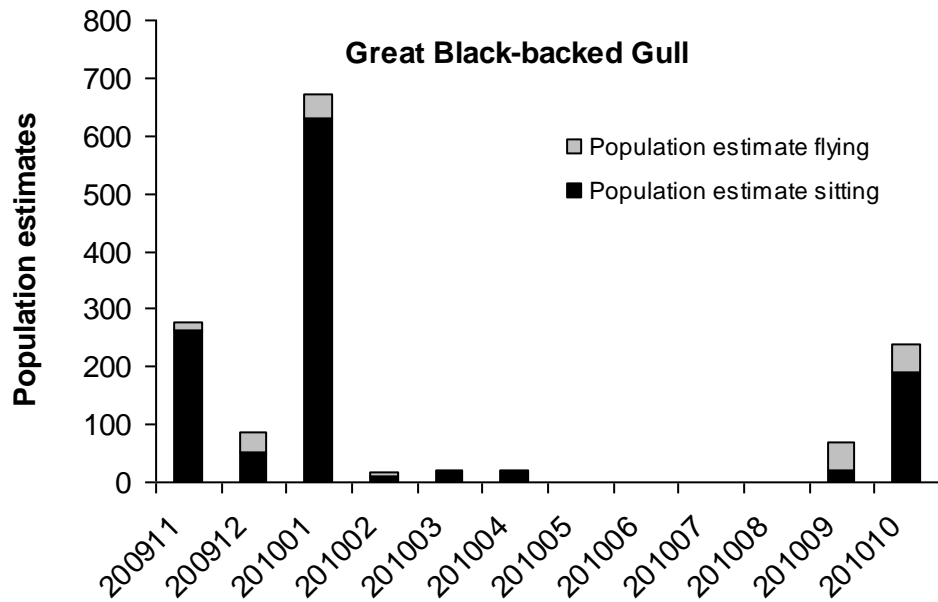
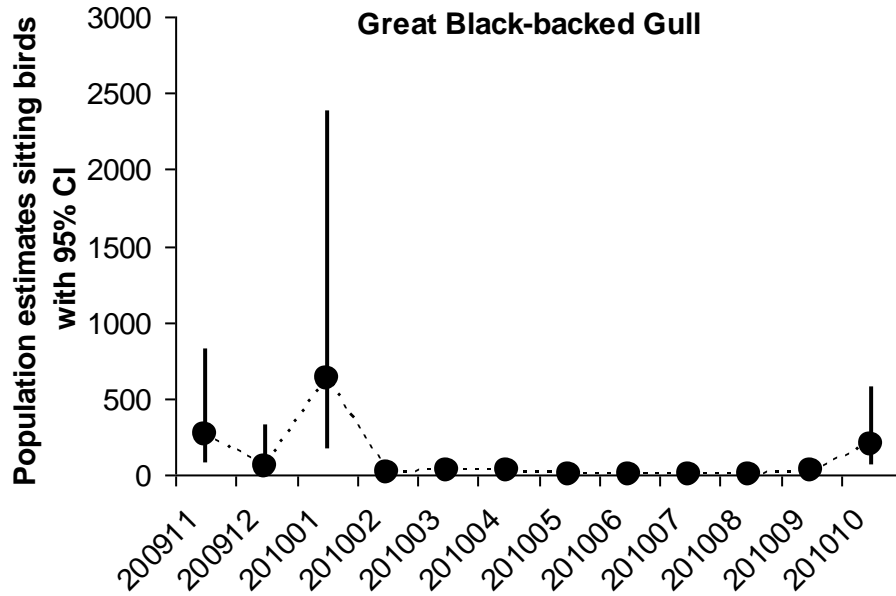
Model function: Uniform (1)  
Covariates: n.a.

Remarks: A uniform detection function with one cosine adjustment was chosen based on the lowest AIC criterion.

Effective strip width ( $\pm$  SE): 193.59  $\pm$  17.741  
CI: 161.41 <> 232.19

Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

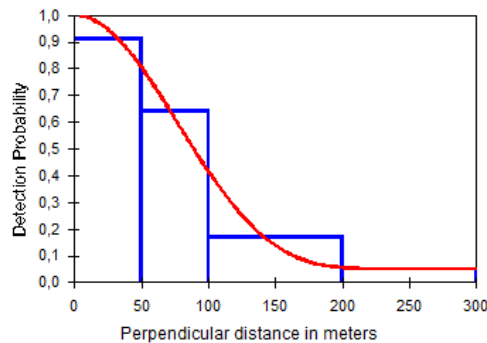
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.02	14	0.42	263	84	824
200912	0.05	34	0.08	53	9	322
201001	0.06	41	1.00	631	167	2388
201002	0.01	7	0.02	10	2	62
201003	0.00	0	0.03	21	5	80
201004	0.00	0	0.03	21	5	81
201005	0.00	0	0.00	0	0	0
201006	0.00	0	0.00	0	0	0
201007	0.00	0	0.00	0	0	0
201008	0.00	0	0.00	0	0	0
201009	0.08	48	0.03	21	5	81
201010	0.08	47	0.30	192	65	573



### 3.7 Little Gull *Larus minutus*

A total of 106 individual Little Gulls were recorded divided over 45 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Little Gulls were largely absent during most of the surveys. Most sightings were recorded during the October survey of 2010 (N = 40) and some low numbers of sightings during the November survey of 2009 and the July survey of 2010.

*Model selection:*



Model function: Uniform (1) \*  
Covariates: n.a.

Remarks: A hazard rate detection function had the lowest AIC, however, this overestimated greatly the numbers in the transect bands A and B. Some avoidance might be expected for this species but overestimation in the first band should be limited. Therefore, a uniform detection function with one cosine adjustment term was chosen.

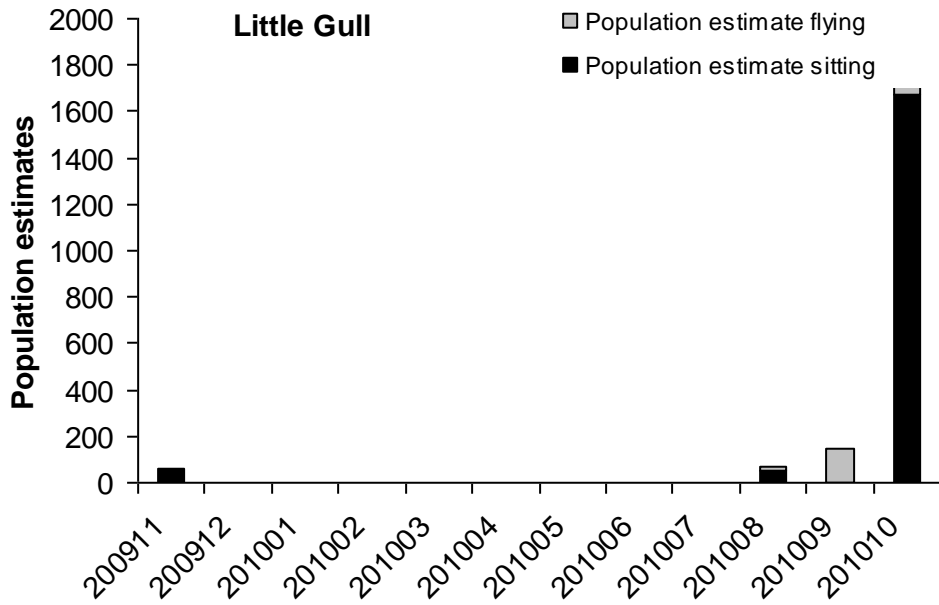
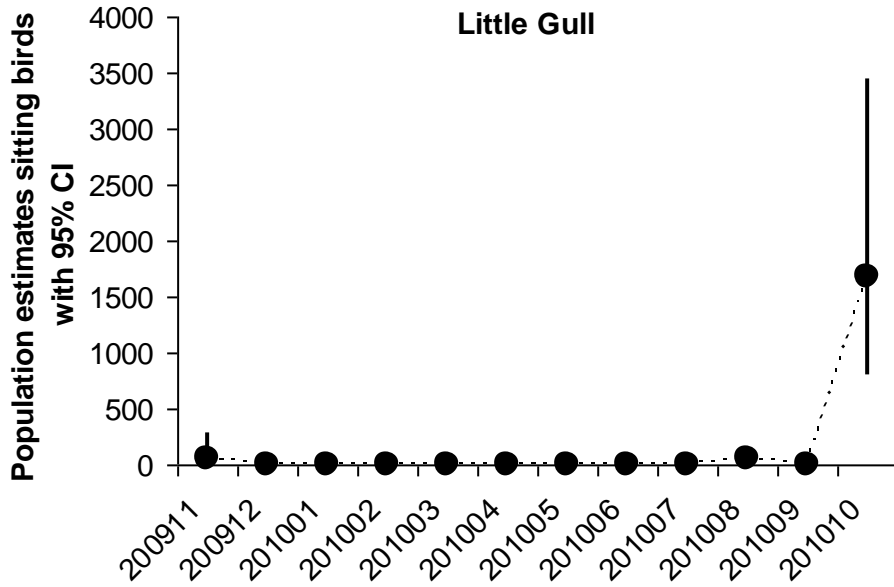
Effective strip width ( $\pm$  SE): 190.92  $\pm$  11.643  
CI: 169.30 <> 215.31

\* The number of sightings for which this detection curve was built was 59 groups; where a minimum of N = 60 for sample size is usually regarded as a general requirement, however, the detection curve conforms to expectations and shows no abnormal characteristics.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.00	0	0.10	61	13	279
200912	0.00	0	0.00	0	0	0
201001	0.00	0	0.00	0	0	0
201002	0.00	0	0.00	0	0	0
201003	0.00	0	0.00	0	0	0
201004	0.00	0	0.00	0	0	0
201005	0.00	0	0.00	0	0	0
201006	0.00	0	0.00	0	0	0
201007	0.00	0	0.00	0	0	0
201008	0.03	20	0.08	52	18	149
201009	0.24	149	0.00	0	0	0
201010	0.17	109	2.65	1672	811	3444

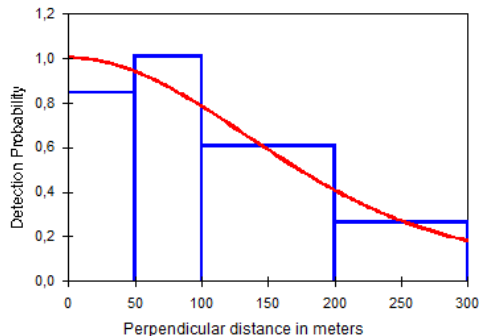




### 3.8 Kittiwake *Rissa tridactyla*

A total of 1,826 individual Kittiwakes were recorded divided over 173 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Kittiwakes were largely absent during most of the surveys. Most sightings were recorded during the autumn surveys of 2010, with a peak in October (N= 63).

Model selection:



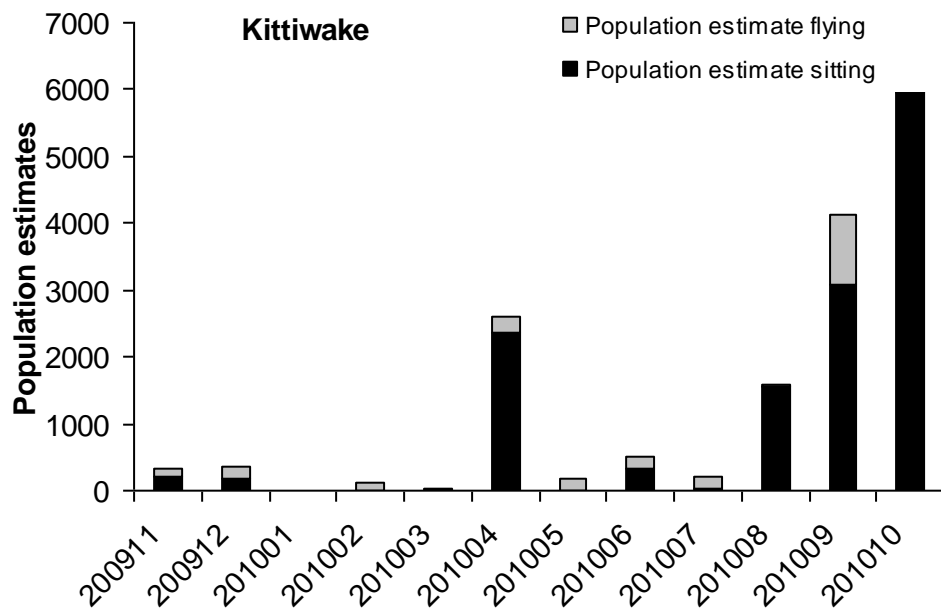
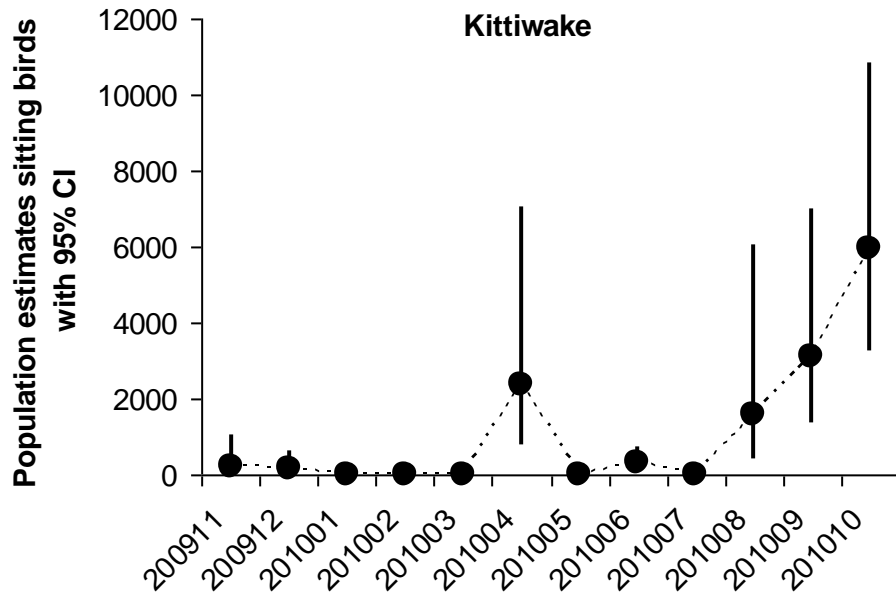
Model function: Half-normal  
Covariates: Sea state (Variate)

Remarks: A half-normal detection curve without cosine adjustments but with sea state as covariate yielded the best fit for Kittiwake (lowest AIC). This model corrects for the expected effects of disturbance of birds in transect A caused by the survey ship.

Effective strip width ( $\pm$  SE): 181.13  $\pm$  6.184  
CI: 169.37 <> 193.71

Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

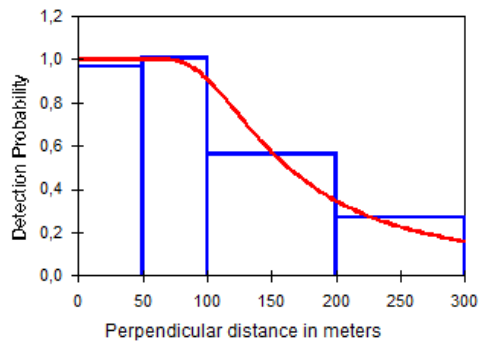
Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.19	122	0.34	217	45	1055
200912	0.28	178	0.29	181	54	606
201001	0.00	0	0.00	0	0	0
201002	0.17	108	0.02	11	2	65
201003	0.06	40	0.00	0	0	0
201004	0.39	245	3.73	2356	787	7048
201005	0.25	157	0.02	11	2	68
201006	0.29	183	0.54	338	153	749
201007	0.27	172	0.04	23	6	86
201008	0.05	34	2.47	1557	401	6051
201009	1.63	1032	4.89	3091	1363	7010
201010	1.04	658	9.44	5967	3282	10849



### 3.9 All gull species

A total of 3,344 individual Gulls were recorded divided over 344 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. This group comprises all species of gull (Herring, Great Black-backed, Lesser Black-backed, Common and Little Gulls) as well as unidentified gulls (Black-backed Gull spp. and Large gull spp.). Gulls show an erratic abundance pattern. Most sightings of gulls were recorded during autumn 2010 with a peak in October.

Model selection:



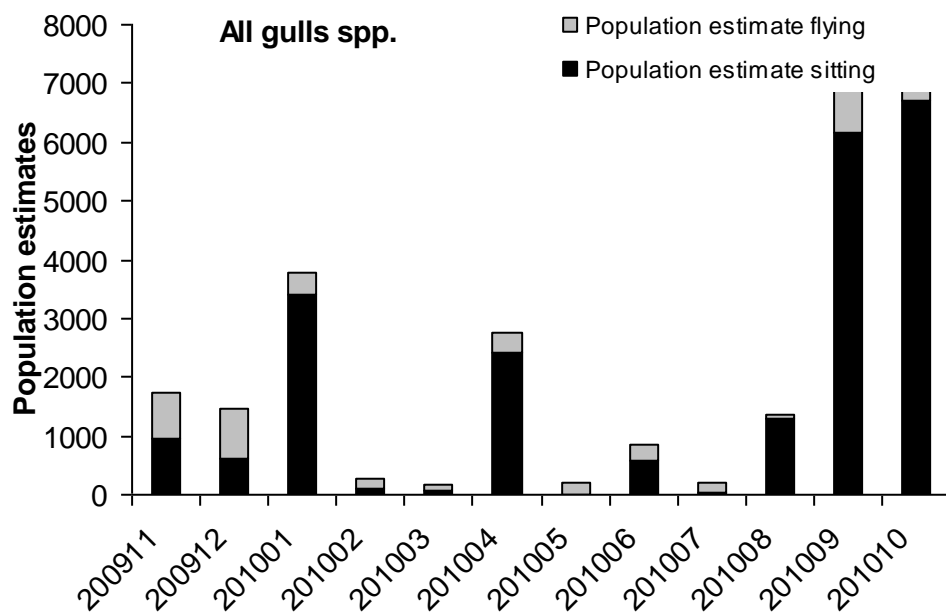
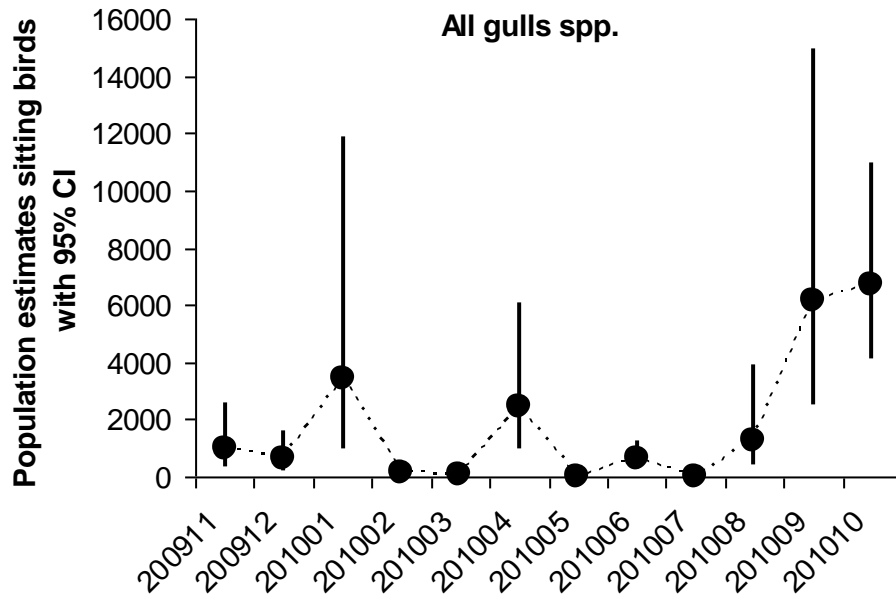
Model function: Hazard Rate (0)  
Covariates: Sea state (Factor)

Remarks: A hazard rate detection curve without cosine adjustments but with sea state as covariate yielded the best fit for all gull species together (lowest AIC). This model corrects for the expected effects of disturbance of birds in transect A caused by the survey ship.

Effective strip width ( $\pm$  SE): 184.19  $\pm$  4.710  
CI: 175.17 <> 193.68

Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

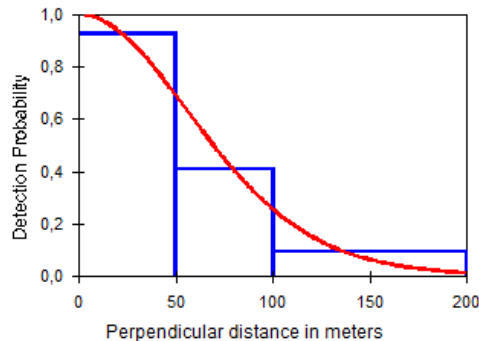
Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	1.23	780	1.53	967	365	2565
200912	1.34	848	0.95	600	220	1639
201001	0.58	367	5.40	3412	982	11856
201002	0.25	155	0.18	111	32	378
201003	0.18	114	0.09	54	21	139
201004	0.51	320	3.85	2430	967	6107
201005	0.29	184	0.02	11	2	67
201006	0.40	251	0.94	595	283	1249
201007	0.29	186	0.05	34	12	97
201008	0.12	75	2.03	1282	418	3932
201009	1.96	1236	9.75	6158	2538	14945
201010	1.38	875	10.62	6712	4099	10992



### 3.10 Little Auk *Alle alle*

A total of 117 individual Little Auk were recorded divided over 71 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Little Auks were absent during most of the surveys being recorded only in winter. Most sightings were recorded during the November survey of 2009 (N = 34) and February survey of 2010.

*Model selection:*



Model function: Half-normal (0)

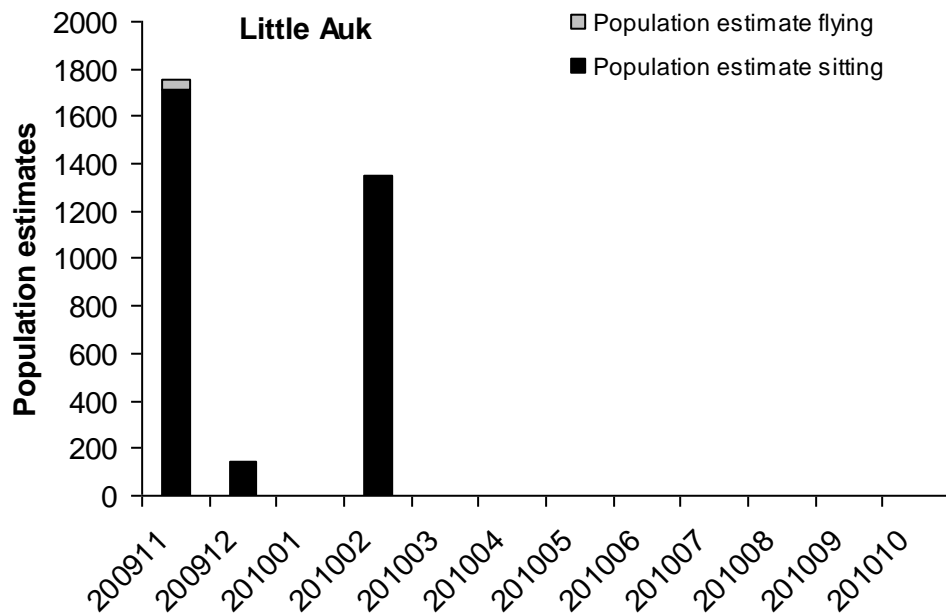
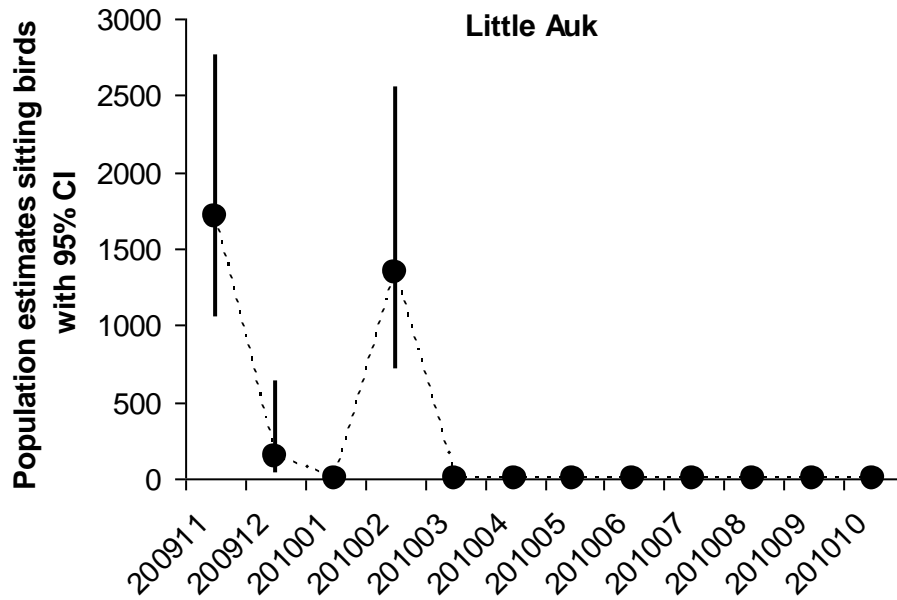
Covariates: Sea state (Variate)

Remarks: A half-normal detection curve without cosine adjustments but with sea state as covariate yielded the best fit for Little Auk (lowest AIC). Also a right truncation was performed as no observations beyond 200 m were in the database. This model corrects for the expected effects of disturbance of birds in transect A caused by the survey ship. In this small diving species  $G(0)$  is expected to be less than 1. Sea state was included as covariate as detection of this small species is heavily influenced by sea state.

Effective strip width ( $\pm$  SE):  $76.28 \pm 6.154$  CI:  $65.02 <> 89.45$

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

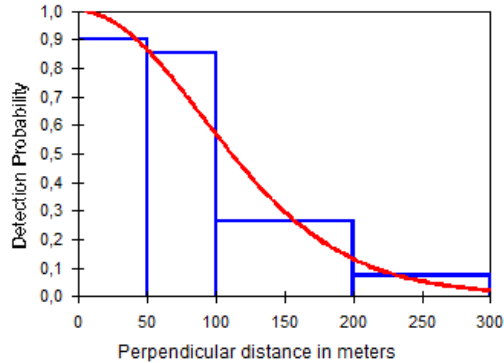
Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.08	47	2.71	1711	1060	2762
200912	0.00	0	0.23	145	33	635
201001	0.00	0	0.00	0	0	0
201002	0.00	0	2.14	1350	713	2555
201003	0.00	0	0.00	0	0	0
201004	0.00	0	0.00	0	0	0
201005	0.00	0	0.00	0	0	0
201006	0.00	0	0.00	0	0	0
201007	0.00	0	0.00	0	0	0
201008	0.00	0	0.00	0	0	0
201009	0.00	0	0.00	0	0	0
201010	0.00	0	0.00	0	0	0



### 3.11 Puffin *Fratercula arctica*

A total of 7,147 individual Puffins were recorded divided over 1,338 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Puffins were most common in summer and autumn. Most sightings were recorded during the autumn of 2010 with a peak in October (N = 410).

Model selection:



Model function: Hazard rate (0)

Covariates: Sea state (Factor)

Remarks: A hazard rate function with sea state (factor) as covariate has the lowest AIC. This model corrects for the expected  $G(0) < 1$  effect in this small diving species. Sea state was included as covariate as detection of this small species is heavily influenced by sea state.

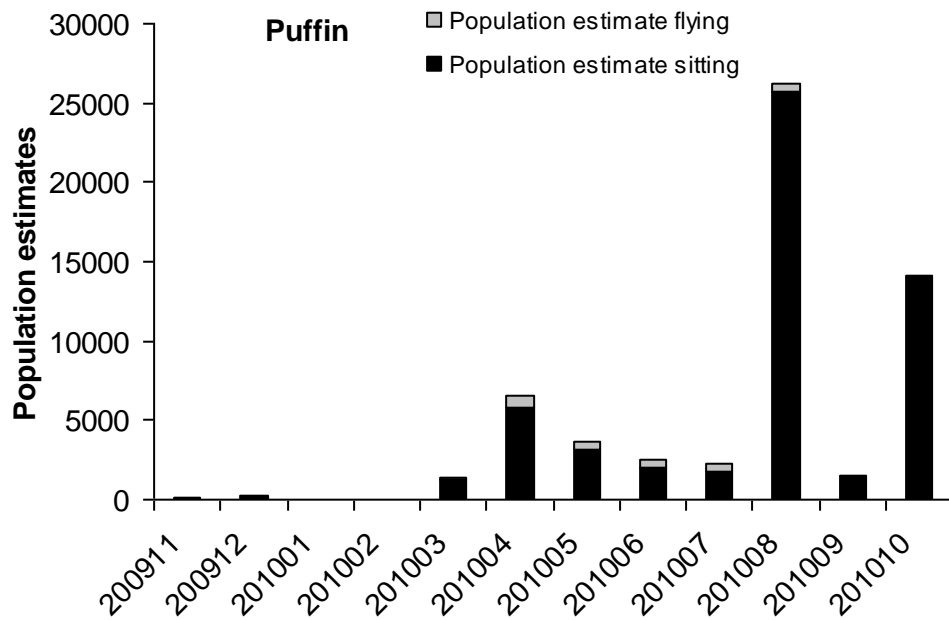
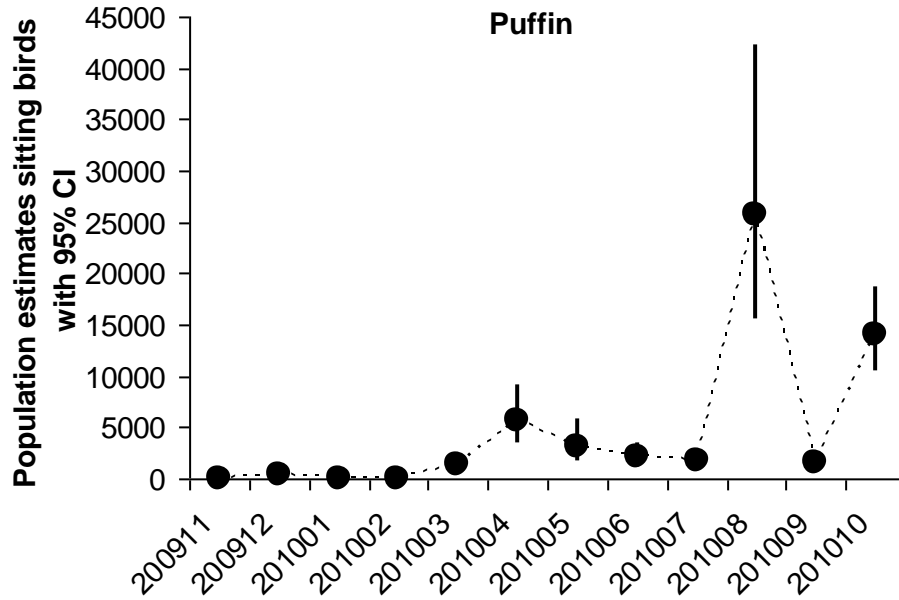
Effective strip width ( $\pm$  SE):  $131.59 \pm 1.794$

CI:  $128.12 <> 135.15$

Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.00	0	0.12	78	24	255
200912	0.00	0	0.47	296	60	1469
201001	0.00	0	0.00	0	0	0
201002	0.00	0	0.00	0	0	0
201003	0.04	27	2.09	1323	942	1858
201004	1.34	844	9.09	5746	3602	9166
201005	0.73	463	4.98	3149	1696	5846
201006	0.62	393	3.28	2071	1257	3412
201007	0.78	495	2.75	1739	1100	2749
201008	0.71	450	40.74	25739	15664	42296
201009	0.00	0	2.34	1476	1001	2176
201010	0.00	0	22.27	14067	10530	18790

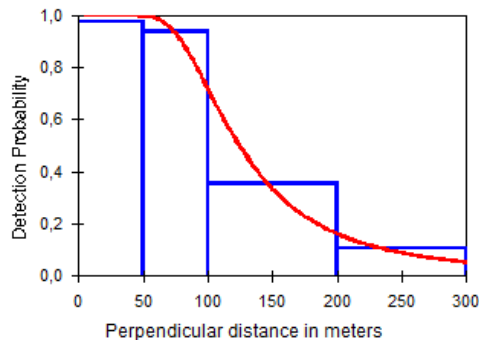




### 3.12 Guillemot *Uria aalge*

A total of 5,558 individual Guillemots were recorded divided over 1,972 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Guillemots were present almost year-round but with fewest sightings in winter. Most sightings were recorded during the autumn with a peak in the October survey of 2010 (N = 611).

*Model selection:*



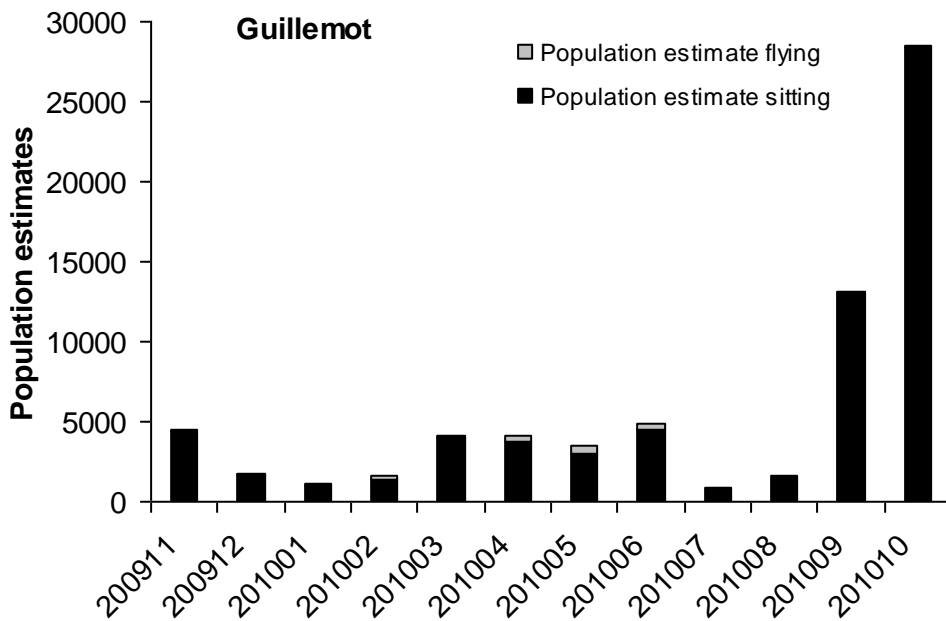
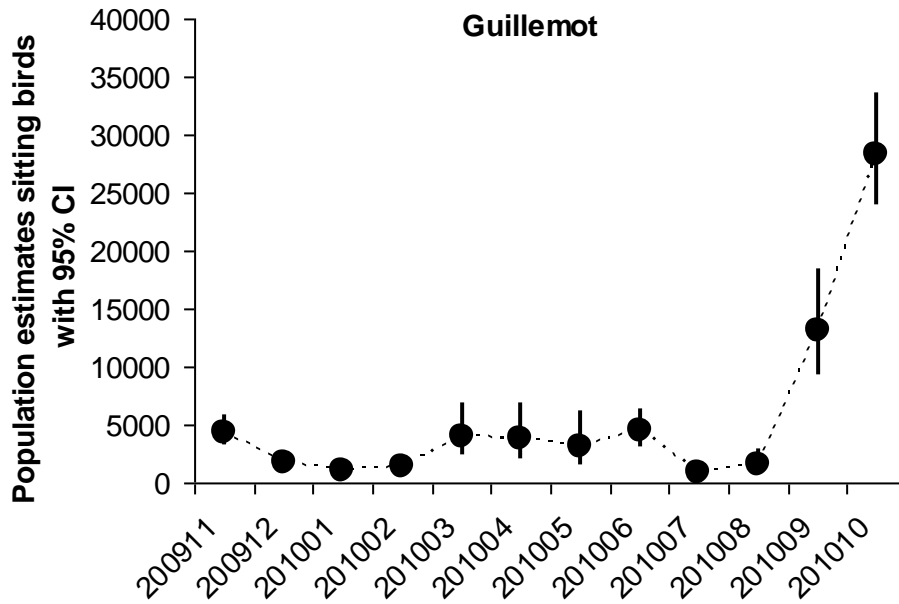
Model function: Hazard Rate  
Covariates: Sea state (Factor)

Remarks: A hazard rate function with no adjustment terms was chosen (lowest AIC) for the detection probability of Guillemot. Sea state was included as covariate as detection of this species is influenced by sea state in more distant strips. Including sea state as a factor the model corrects for the effect of sea state.

Effective strip width ( $\pm$  SE): 142.34  $\pm$  1.529  
CI: 139.38 <> 145.37

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

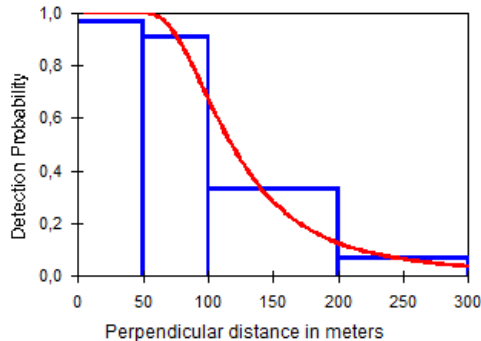
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.13	81	6.92	4374	3253	5883
200912	0.08	48	2.61	1652	1026	2660
201001	0.13	82	1.61	1016	509	2026
201002	0.38	243	2.11	1331	803	2206
201003	0.14	87	6.41	4051	2399	6842
201004	0.65	409	5.97	3770	2068	6872
201005	0.70	443	4.85	3062	1498	6259
201006	0.59	372	7.05	4456	3094	6418
201007	0.03	21	1.37	866	607	1235
201008	0.00	0	2.50	1579	828	3014
201009	0.00	0	20.72	13093	9299	18437
201010	0.17	109	44.86	28342	23951	33538



### 3.13 Razorbill *Alca torda*

A total of 3,018 individual Razorbills were recorded divided over 795 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Razorbills were largely absent throughout the year with the exception of autumn. Most sightings were recorded during the October survey of 2010 (N = 310).

*Model selection:*



Model function: Hazard Rate (0)

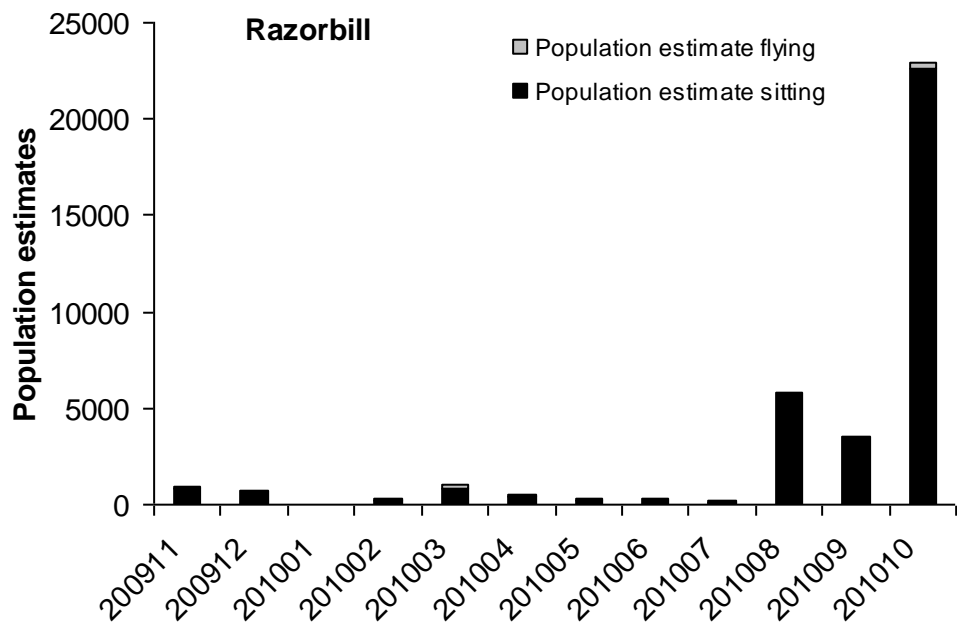
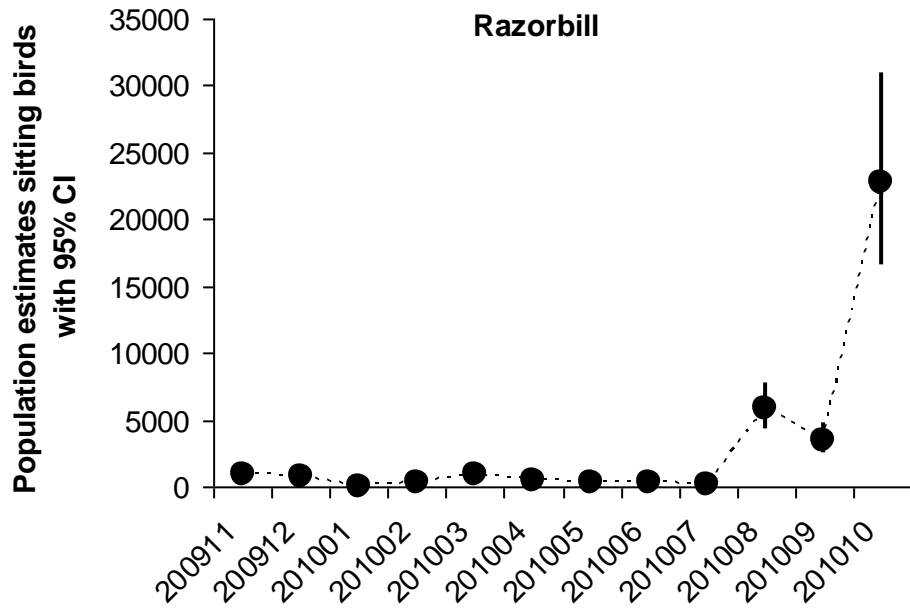
Covariates: Sea state (Factor)

Remarks: A hazard rate function with no adjustment terms was chosen (lowest AIC) for the detection probability of Guillemot. Sea state was included as covariate as detection of this species is influenced by sea state in more distant strips. Including sea state as a factor the model corrects for the effect of sea state.

Effective strip width ( $\pm$  SE): 135.14  $\pm$  2.698  
CI: 129.95 <> 140.54

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

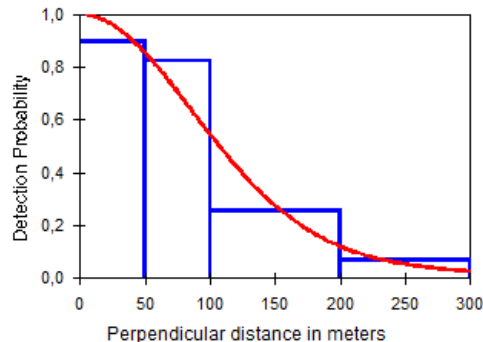
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.10	61	1.38	873	541	1408
200912	0.02	14	1.10	695	358	1352
201001	0.02	14	0.02	15	3	90
201002	0.16	101	0.38	241	108	534
201003	0.32	201	1.32	835	502	1387
201004	0.17	109	0.60	376	220	643
201005	0.08	48	0.41	257	110	597
201006	0.05	34	0.43	273	131	570
201007	0.09	55	0.24	152	64	358
201008	0.03	20	9.24	5839	4397	7755
201009	0.02	14	5.56	3511	2572	4793
201010	0.45	285	35.87	22661	16562	31007



### 3.14 Small auk species

Small auks as a species group consist of unidentified small auks, Little Auk and Puffin. A total of 7,267 individual small auks were recorded divided over 1,411 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Small auks were fairly common throughout the year with the exception of winter. Most sightings were recorded during the August and October surveys of 2010.

*Model selection:*



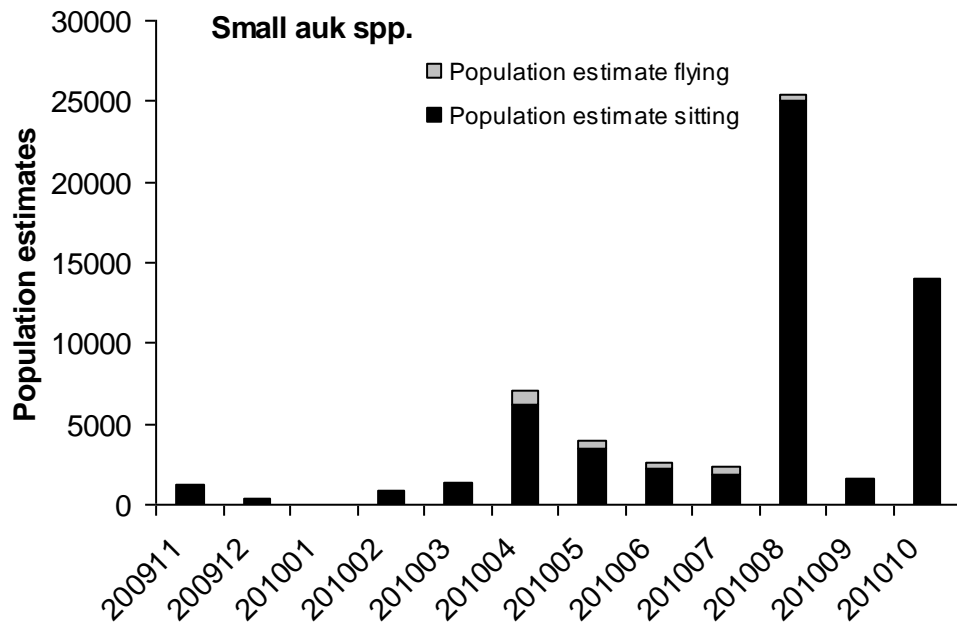
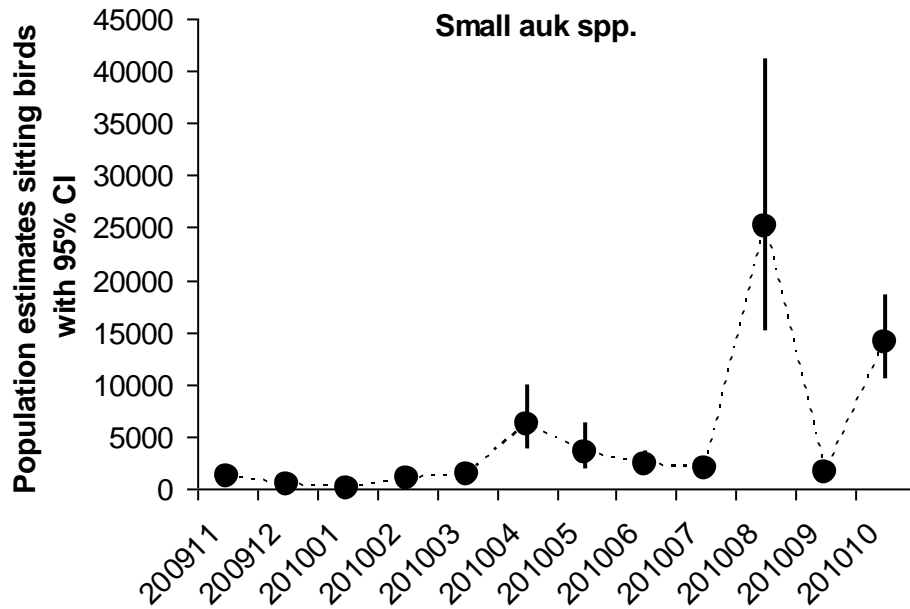
Model function: Half normal (3)  
Covariates: Sea state (Factor)

Remarks: A half normal detection function with 3 cosine adjustment terms was chosen based on lowest AIC and it corrects in the first surveyed strip for the expected  $G(0)$  to be smaller than 1. Sea state was included as covariate as the detection of small auk species is heavily influenced by sea state.

Effective strip width ( $\pm$  SE): 120.11  $\pm$  1.660  
CI: 116.90 <> 123.41

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

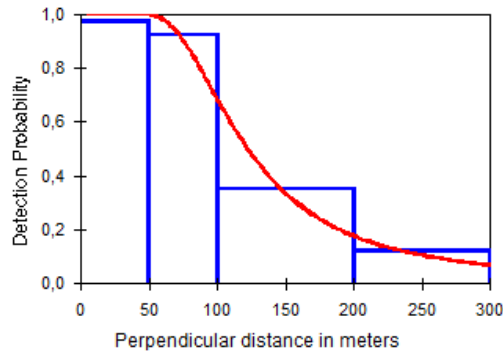
Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.08	47	1.89	1195	802	1780
200912	0.00	0	0.64	402	129	1250
201001	0.00	0	0.00	0	0	0
201002	0.00	0	1.38	873	483	1577
201003	0.04	27	2.19	1386	987	1946
201004	1.34	844	9.85	6221	3900	9925
201005	0.73	463	5.46	3451	1859	6408
201006	0.62	393	3.54	2235	1356	3683
201007	0.78	495	3.01	1900	1202	3004
201008	0.71	450	39.57	25000	15206	41102
201009	0.00	0	2.50	1580	1072	2329
201010	0.00	0	22.08	13953	10445	18639



### 3.15 Large auk species

The species group large auks consist of birds recorded as guillemot/razorbill, Guillemots and Razorbills. A total of 11,681 individual Large auks were recorded divided over 2,916 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Large auks were seen throughout the year with a peak in autumn. Most birds were recorded during the October survey of 2010.

*Model selection:*



Model function: Hazard Rate (0)  
Covariates: Sea state (Factor)

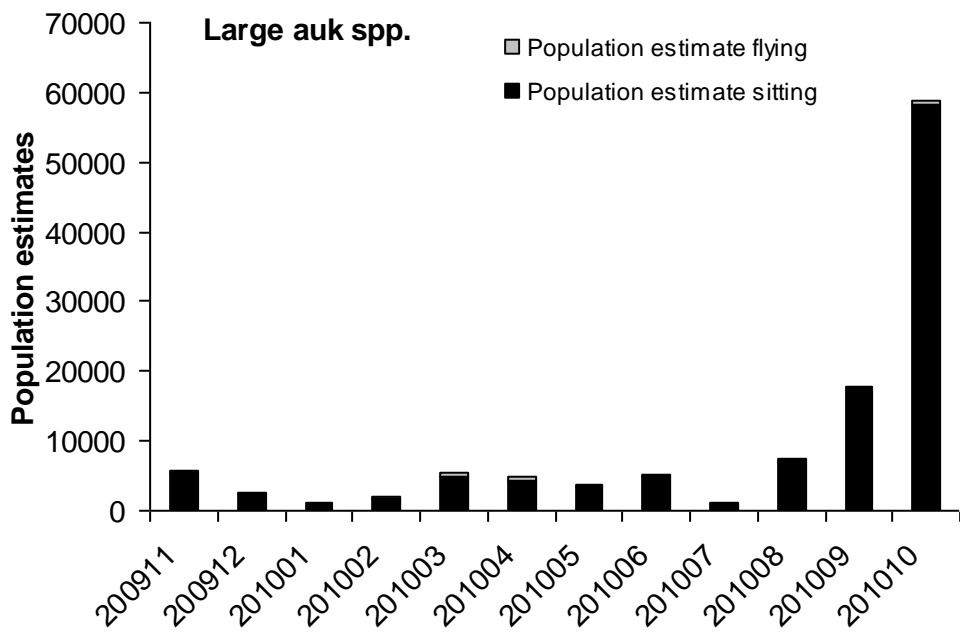
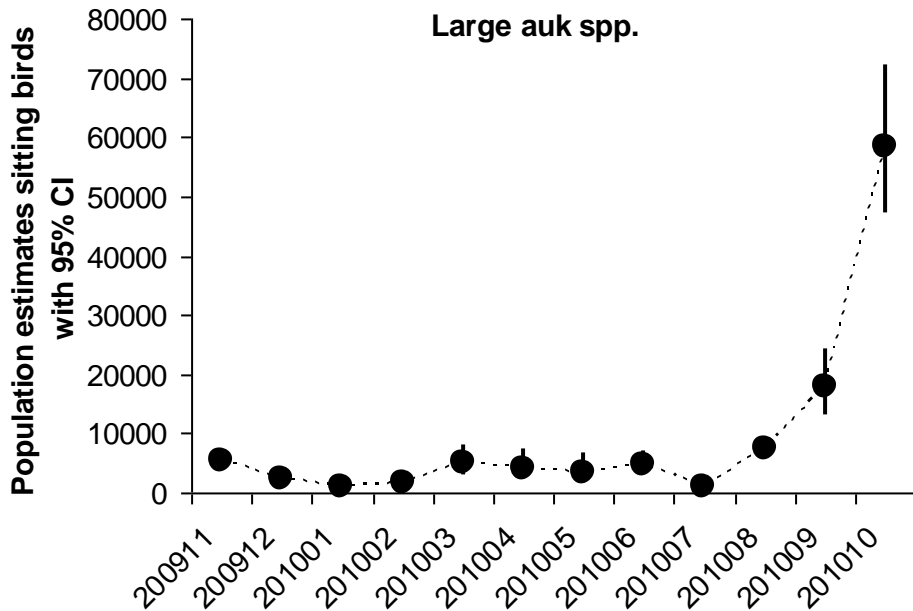
Remarks: A half normal detection probability would yield the lowest AIC, however, the detection function shows an abnormal shape ('hump' at greater distances) and was therefore rejected. Instead a plain hazard rate function was chosen. Sea state was included as covariate as detection of auk species is influenced by sea state. Including sea state as a factor the model corrects for the effect of sea state.

Effective strip width ( $\pm$  SE):  $140.45 \pm 1.312$   
CI:  $137.91 <> 143.05$

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.29	183	8.58	5420	4024	7299
200912	0.16	103	3.81	2405	1559	3711
201001	0.19	122	1.64	1037	527	2040
201002	0.60	377	2.70	1706	1056	2757
201003	0.58	368	7.88	4980	3001	8264
201004	0.91	572	6.59	4165	2367	7329
201005	0.78	490	5.33	3368	1686	6728
201006	0.64	406	7.73	4883	3411	6991
201007	0.12	76	1.61	1019	725	1433
201008	0.05	34	11.69	7384	5930	9194
201009	0.02	14	28.20	17815	13020	24375
201010	0.74	468	92.41	58381	47163	72268

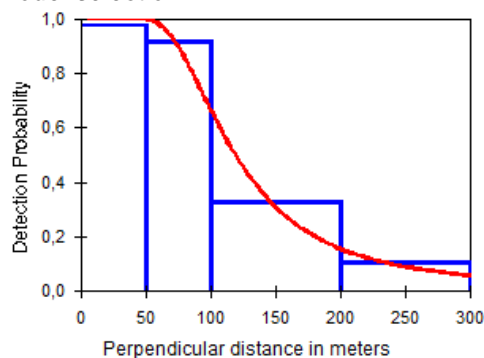




### 3.16 All auk species

The species group all auk species consist of all categories of species in the groups Small auk species and Large auk species as well as the category 'unidentified auks' (of which observers did not give an indication that the birds either belonged to the group of small or large auks). A total of 18,948 individual auks were recorded divided over 4,327 sightings during the ship-based surveys in the first study year at Neart na Gaoithe. Auks were common throughout the year with a peak in autumn. Most sightings were recorded during the October survey of 2010.

*Model selection:*



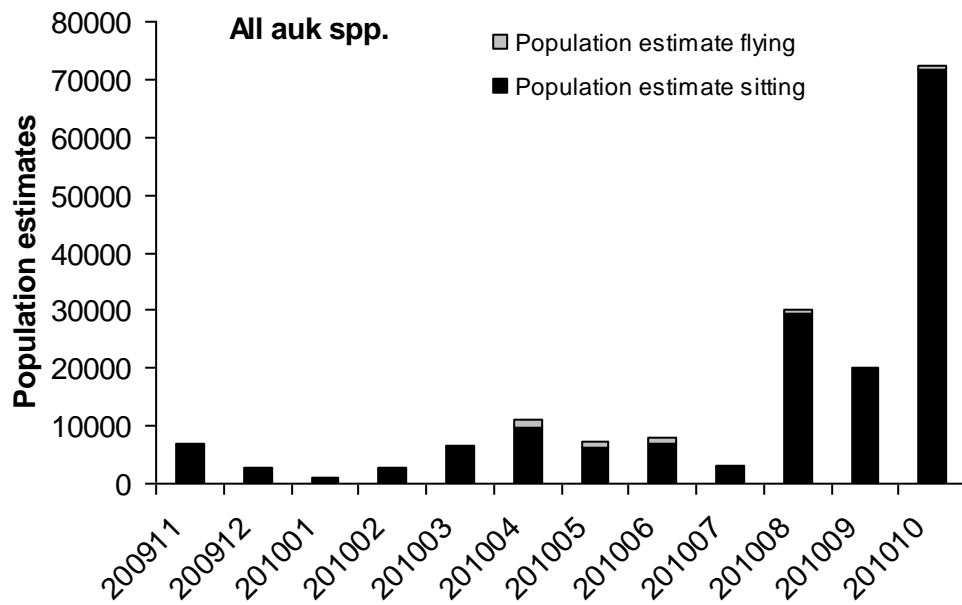
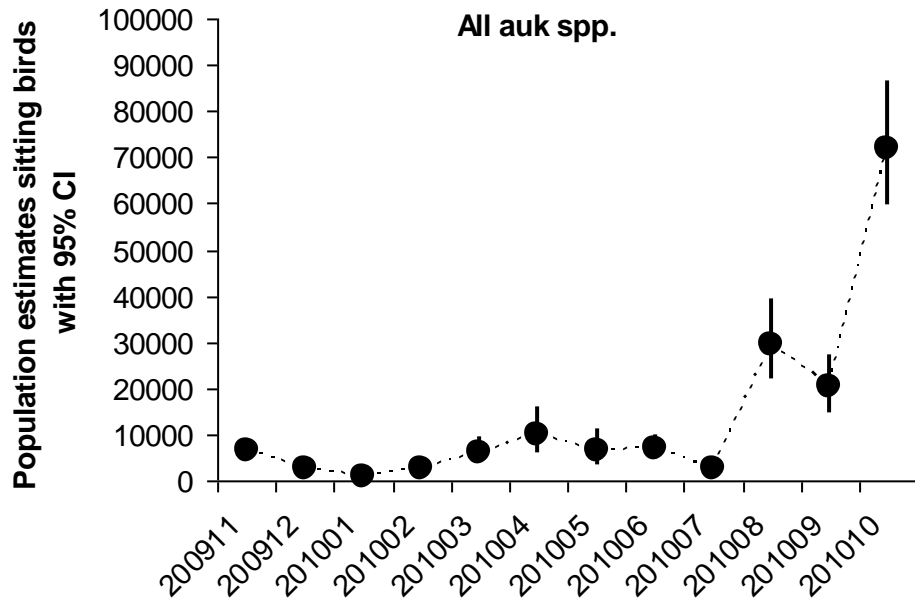
Model function: Hazard rate (0)  
Covariates: Sea state (Factor)

Remarks: A half normal detection probability would yield the lowest AIC, however, the detection function shows an abnormal shape ('hump' at greater distances) and was therefore rejected. Instead a plain hazard rate function was chosen. Sea state was included as covariate as detection of auk species is influenced by sea state. Including sea state as a factor the model corrects for the effect of sea state.

Effective strip width ( $\pm$  SE): 139.41  $\pm$  1.056  
CI: 137.35 <> 141.49

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
200911	0.37	231	10.53	6652	5030	8797
200912	0.16	103	4.39	2773	1789	4297
201001	0.19	122	1.67	1055	536	2074
201002	0.60	377	3.95	2498	1822	3425
201003	0.62	395	9.81	6201	4125	9322
201004	2.24	1416	15.57	9834	6002	16113
201005	1.51	953	10.08	6371	3648	11127
201006	1.26	799	11.19	7070	4928	10143
201007	0.90	570	4.22	2666	1852	3837
201008	0.77	484	46.80	29565	22119	39519
201009	0.02	14	31.90	20155	14799	27449
201010	0.74	468	113.62	71784	59644	86394



## **4 Population estimates and densities at Neart na Gaoithe - Year 2**

### **4.1 Introduction**

In the species accounts below we present the population estimates and densities at Neart na Gaoithe on a monthly basis for the second year of the study period (December 2010 - October 2011). Figures presented are for birds sitting on the water and are based on calculations with the Distance Analysis software (CREEM). Detection functions were built for species or species-groups with at least 60 different sightings (Buckland *et al.* 1993). In every species account rationale is given for the model chosen for use in Distance. Data from the second year of study were also incorporated to strengthen the detection functions. Estimates of population sizes are accompanied by confidence intervals. The average density of flying birds as determined by the snapshot method is also presented along with a population estimate based on this density and the total surface cover of the study area. The two population estimates together provide the estimated total population for the area. In every species account rationale is given for the model chosen for use in Distance.



## 4.2 Northern Fulmar *Fulmarus glacialis*

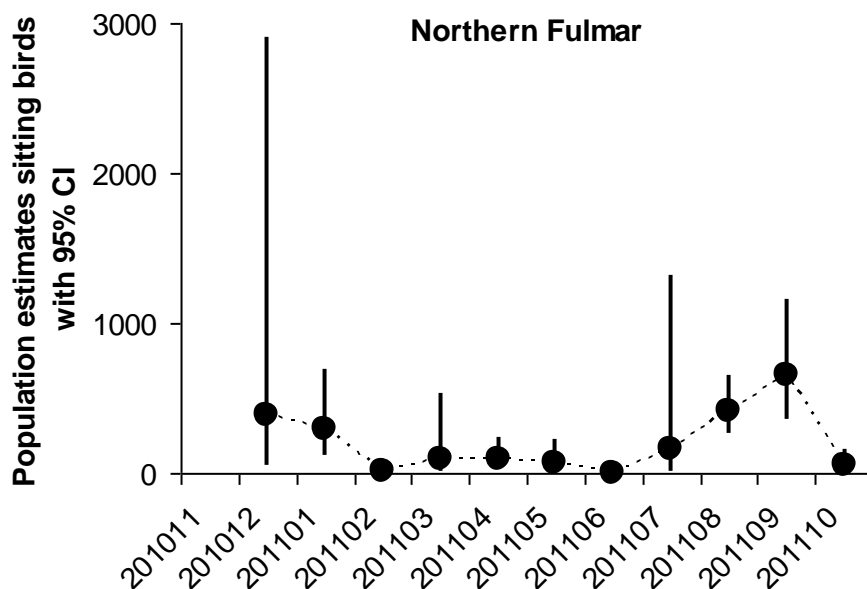
### Observations:

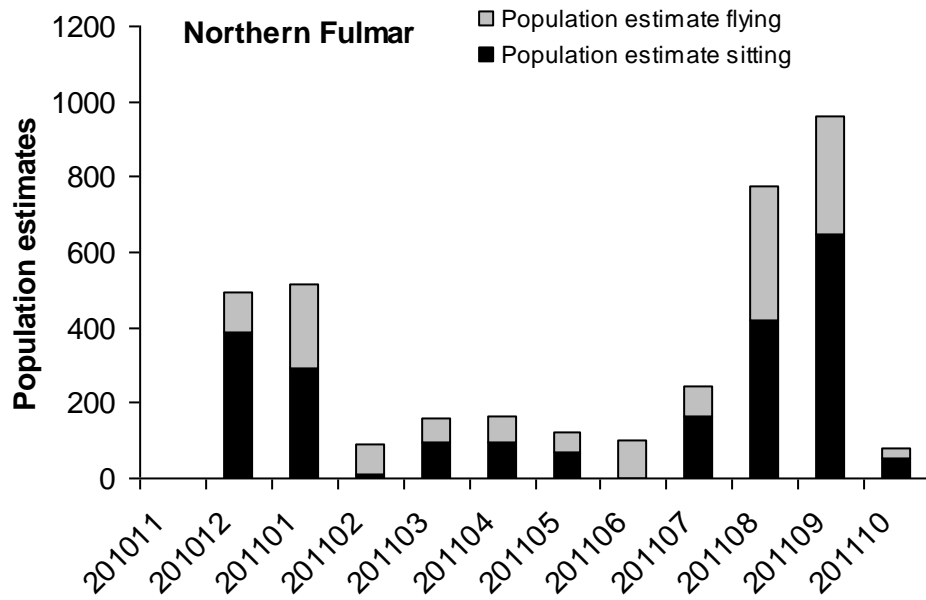
A total of 196 individual Northern Fulmars were recorded divided over 136 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Fulmars were recorded throughout the year with highest numbers in spring, autumn and winter.

### Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.17	105	0.61	388	52	2904
201101	0.36	224	0.46	292	123	697
201102	0.13	82	0.02	11	2	62
201103	0.10	66	0.15	94	17	530
201104	0.11	68	0.15	96	39	237
201105	0.09	54	0.11	70	22	225
201106	0.16	102	0.00	0	0	0
201107	0.13	81	0.26	165	20	1321
201108	0.56	355	0.66	420	267	659
201109	0.49	311	1.03	648	362	1160
201110	0.04	27	0.08	53	18	156

### Monthly population estimates of sitting and flying birds:





### 4.3 Sooty Shearwater *Puffinus griseus*

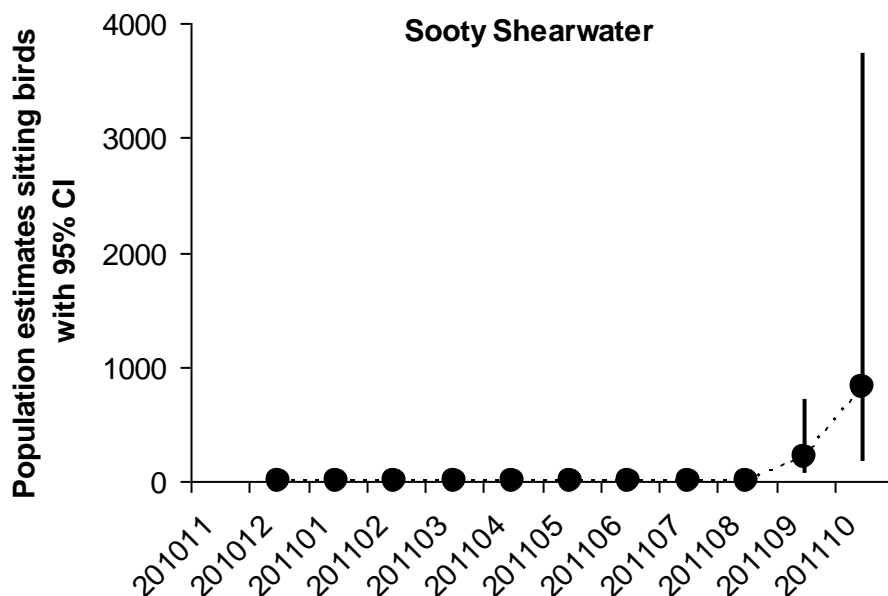
*Observations:*

A total of 67 individual Sooty Shearwaters were recorded divided over 15 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Sooty Shearwaters were only recorded in September and October.

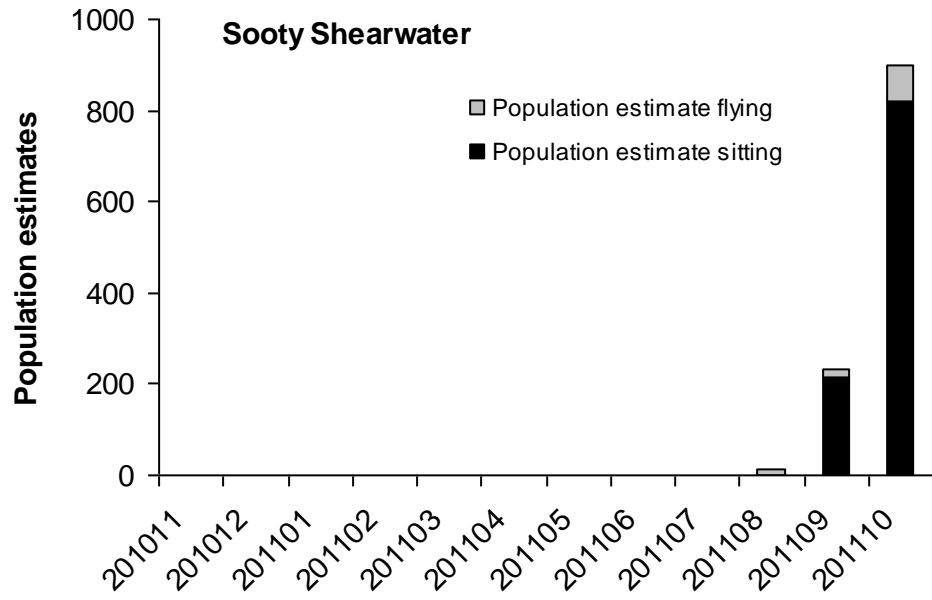
*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.00	0	0.00	0	0	0
201101	0.00	0	0.00	0	0	0
201102	0.00	0	0.00	0	0	0
201103	0.00	0	0.00	0	0	0
201104	0.00	0	0.00	0	0	0
201105	0.00	0	0.00	0	0	0
201106	0.00	0	0.00	0	0	0
201107	0.00	0	0.00	0	0	0
201108	0.02	14	0.00	0	0	0
201109	0.03	20	0.34	214	65	708
201110	0.13	81	1.29	818	179	3733

*Monthly population estimates of sitting and flying birds:*







#### 4.4 Northern Gannet *Morus bassanus*

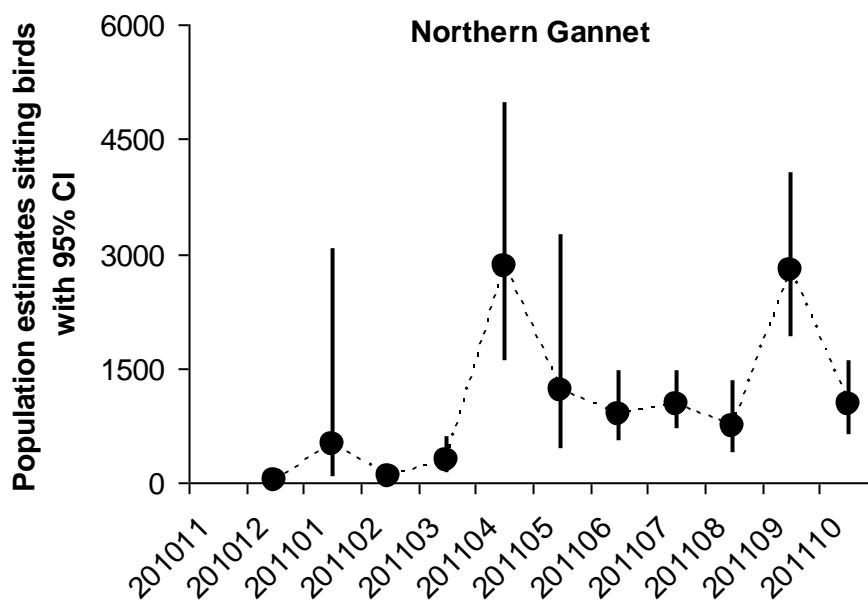
*Observations:*

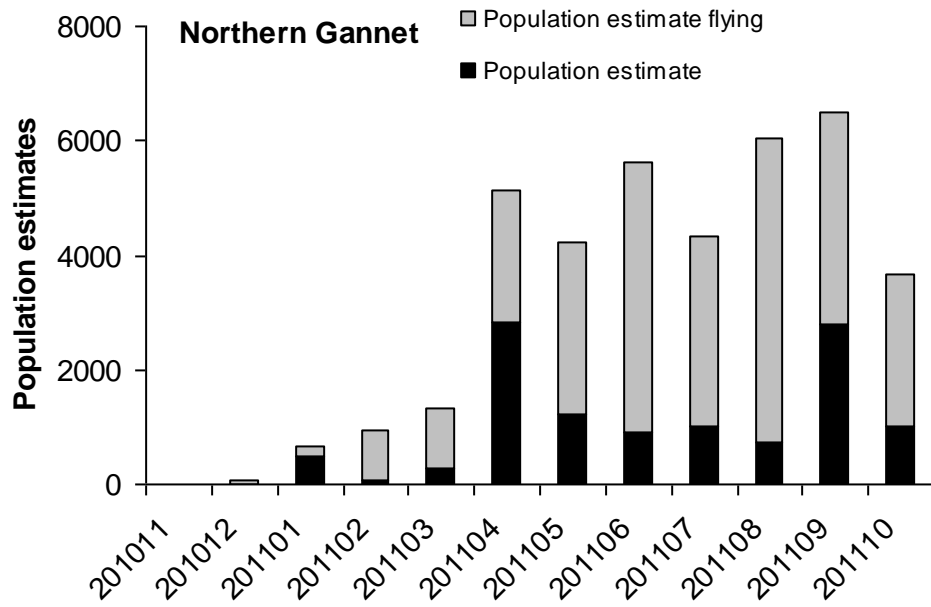
A total of 1,729 individual Northern Gannets were recorded divided over 756 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Northern Gannets were scarce during winter and most abundant during spring, summer and autumn.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.10	63	0.03	17	3	100
201101	0.28	177	0.77	488	77	3078
201102	1.39	878	0.12	76	32	179
201103	1.63	1031	0.45	285	134	607
201104	3.66	2314	4.46	2819	1593	4989
201105	4.75	3004	1.91	1209	451	3240
201106	7.50	4740	1.41	892	539	1476
201107	5.25	3320	1.63	1027	716	1474
201108	8.39	5299	1.16	733	400	1342
201109	5.90	3728	4.41	2785	1914	4053
201110	4.23	2675	1.60	1010	634	1606

*Monthly population estimates of sitting and flying birds:*





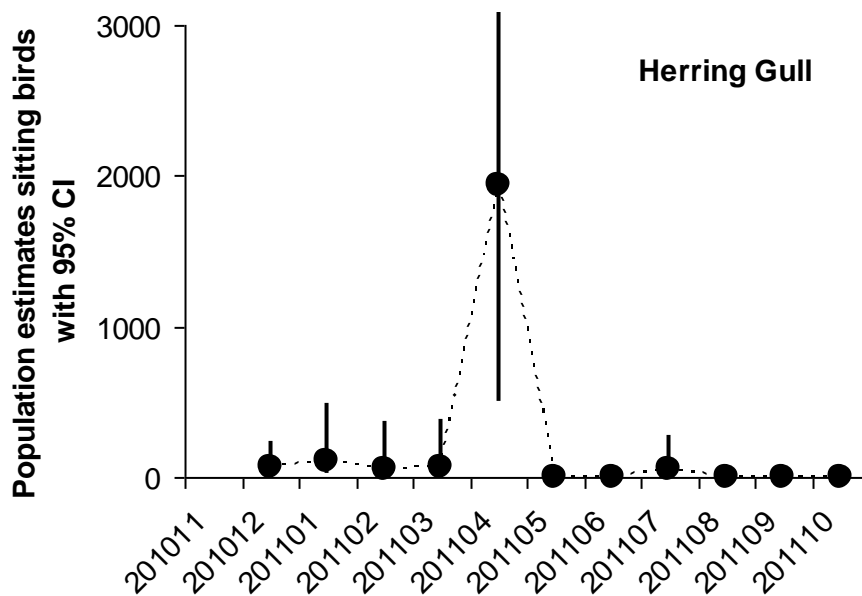
#### 4.5 Herring Gull *Larus argentatus*

A total of 608 individual Herring Gulls were recorded divided over 53 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. On average, Herring Gulls were mostly present in winter. Most sightings were during the January survey of 2010 (N = 14) and to a lesser extent during the November survey of 2009.

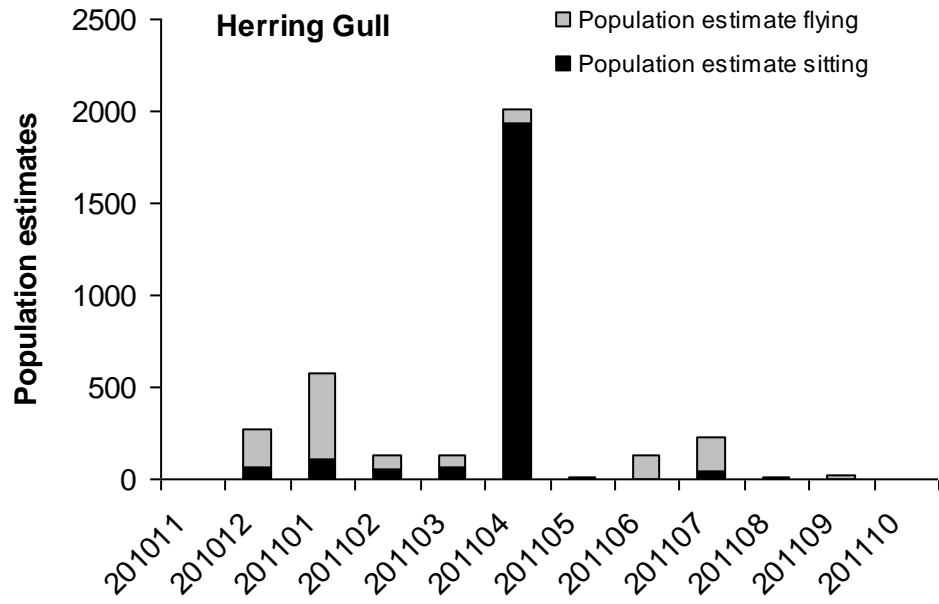
*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.33	210	0.10	66	19	234
201101	0.74	469	0.17	109	25	485
201102	0.12	75	0.09	57	9	371
201103	0.10	66	0.09	60	9	391
201104	0.13	82	3.06	1933	505	7403
201105	0.02	13	0.00	0	0	0
201106	0.21	135	0.00	0	0	0
201107	0.28	175	0.08	48	8	281
201108	0.01	7	0.00	0	0	0
201109	0.04	27	0.00	0	0	0
201110	0.00	0	0.00	0	0	0

*Monthly population estimates of sitting and flying birds:*



\* Note that for clarity reasons the Y-axis has been truncated.



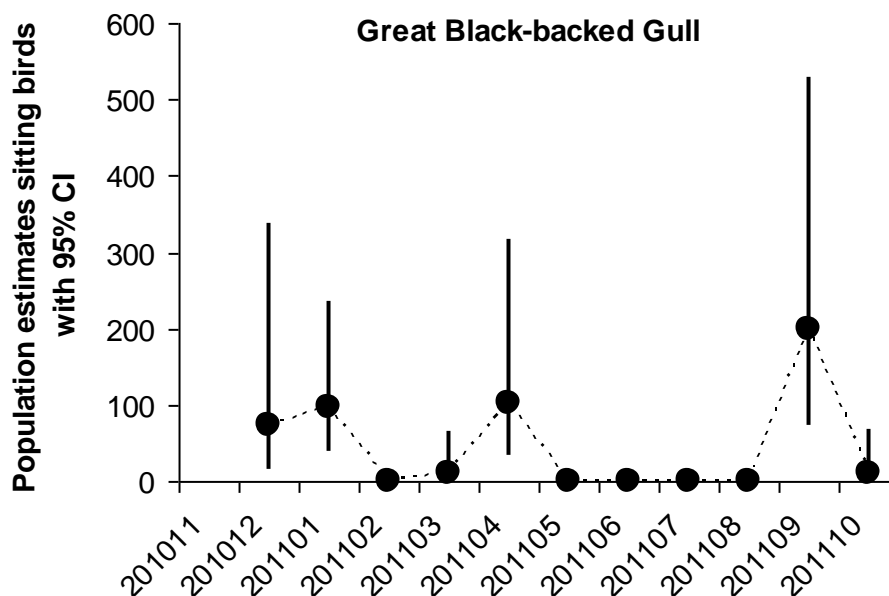
#### 4.6 Great Black-backed Gull *Larus marinus*

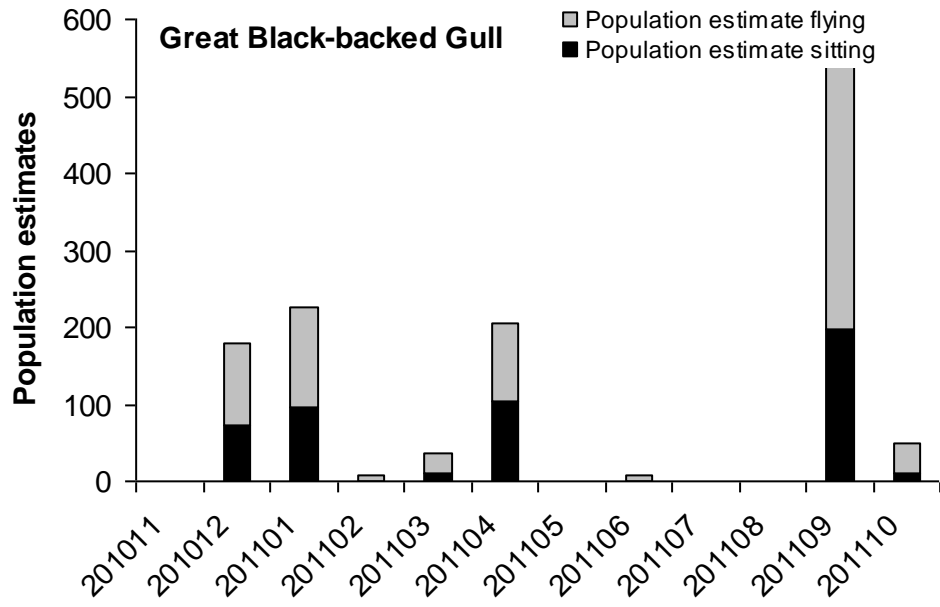
A total of 102 individual Great Black-backed Gulls were recorded divided over 35 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. The highest numbers of Great Black-backed Gulls were recorded in September. Great Black-backed gulls were largely absent in late spring and summer.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.17	105	0.12	74	16	339
201101	0.20	129	0.15	97	40	237
201102	0.01	7	0.00	0	0	0
201103	0.04	26	0.02	10	2	66
201104	0.16	102	0.16	103	34	317
201105	0.00	0	0.00	0	0	0
201106	0.01	7	0.00	0	0	0
201107	0.00	0	0.00	0	0	0
201108	0.00	0	0.00	0	0	0
201109	0.56	351	0.31	198	74	529
201110	0.06	41	0.02	10	2	68

*Monthly population estimates of sitting and flying birds:*





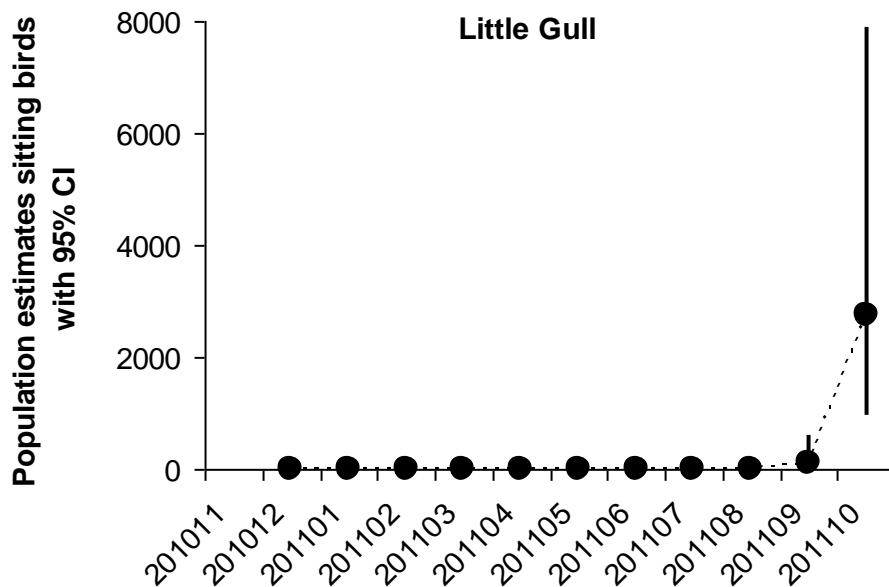
#### 4.7 Little Gull *Larus minutus*

A total of 92 individual Little Gulls were recorded divided over 14 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Little Gulls were absent during most of the surveys. Most sightings were recorded during the September and October surveys.

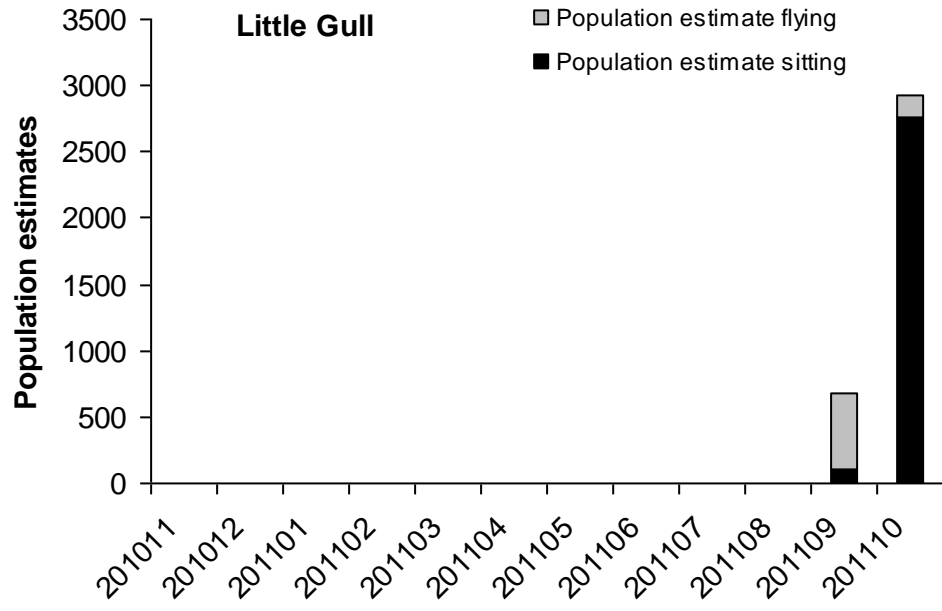
*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.00	0	0.00	0	0	0
201101	0.00	0	0.00	0	0	0
201102	0.00	0	0.00	0	0	0
201103	0.00	0	0.00	0	0	0
201104	0.00	0	0.00	0	0	0
201105	0.00	0	0.00	0	0	0
201106	0.00	0	0.00	0	0	0
201107	0.00	0	0.00	0	0	0
201108	0.00	0	0.00	0	0	0
201109	0.92	581	0.16	102	17	615
201110	0.25	156	4.38	2767	970	7893

*Monthly population estimates of sitting and flying birds:*







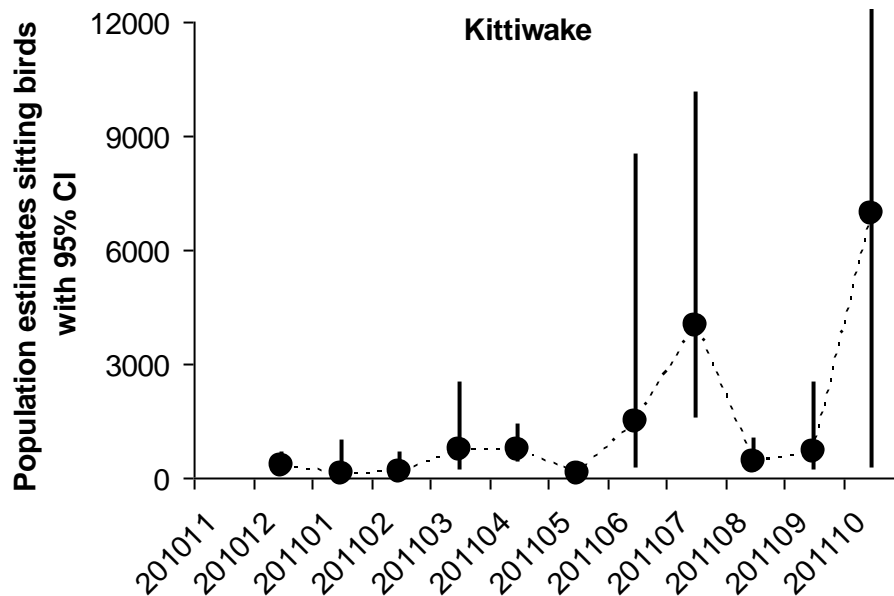
#### 4.8 Kittiwake *Rissa tridactyla*

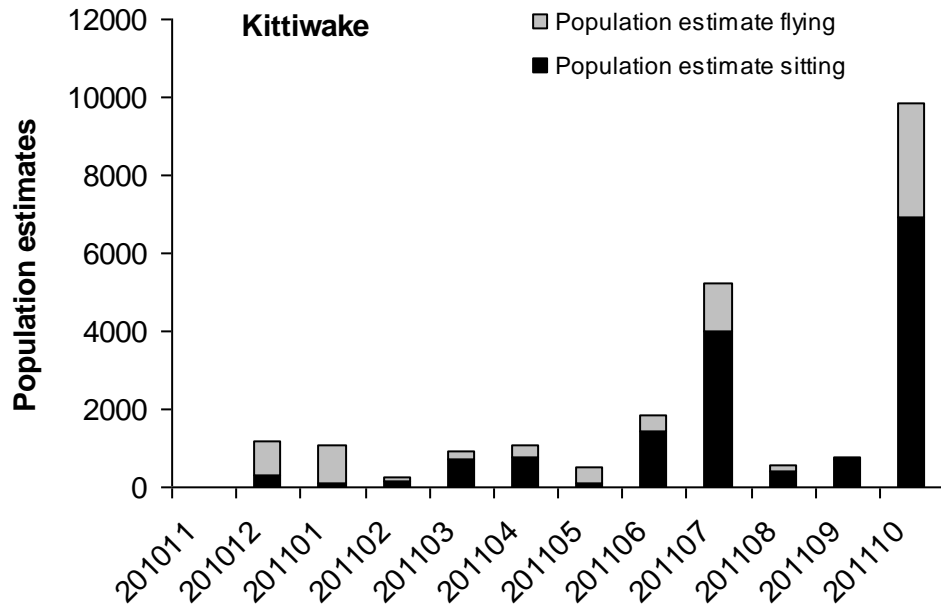
A total of 1,055 individual Kittiwakes were recorded divided over 180 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Most Kittiwakes were recorded in summer and autumn although the species was present year-round.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	1.40	883	0.49	310	139	691
201101	1.56	986	0.18	112	12	1025
201102	0.09	54	0.28	178	46	683
201103	0.28	177	1.17	737	217	2503
201104	0.47	299	1.20	758	402	1430
201105	0.61	383	0.18	112	43	288
201106	0.58	366	2.31	1458	250	8517
201107	1.97	1242	6.32	3992	1573	10133
201108	0.21	130	0.68	427	171	1065
201109	0.14	88	1.10	698	194	2514
201110	4.63	2925	10.96	6926	267	179930

*Monthly population estimates of sitting and flying birds:*





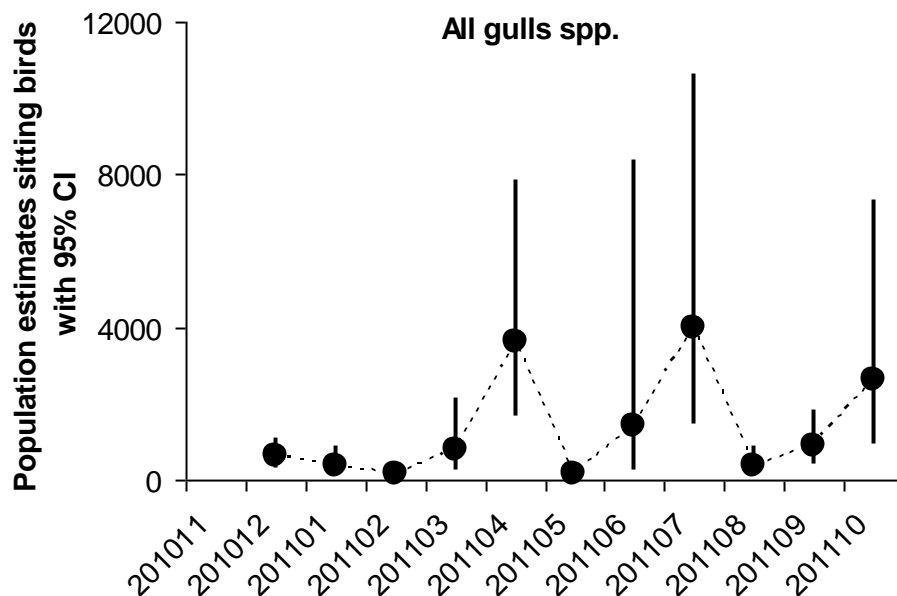
## 4.9 All gull species

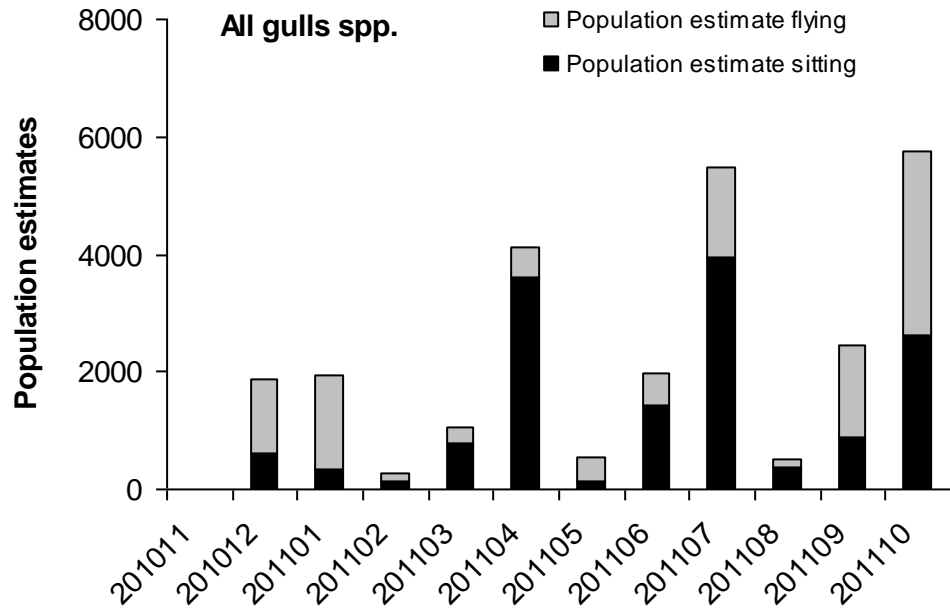
A total of 1,925 individual gulls were recorded divided over 297 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. This group comprises all gull species (Herring, Great Black-backed, Lesser Black-backed, Common and Little Gulls) as well as unidentified gulls (Black-backed Gull spp. and Large gull spp.). Gulls show an erratic abundance pattern. Most gulls were recorded in spring and summer .

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	2.02	1275	0.96	608	328	1126
201101	2.53	1598	0.55	346	133	902
201102	0.22	136	0.23	146	45	470
201103	0.43	269	1.25	791	287	2174
201104	0.79	497	5.72	3613	1663	7849
201105	0.63	396	0.21	132	50	346
201106	0.84	528	2.27	1434	245	8374
201107	2.38	1505	6.27	3961	1476	10635
201108	0.24	150	0.57	360	145	894
201109	2.46	1553	1.41	893	439	1816
201110	4.94	3121	4.14	2616	936	7311

*Monthly population estimates of sitting and flying birds:*





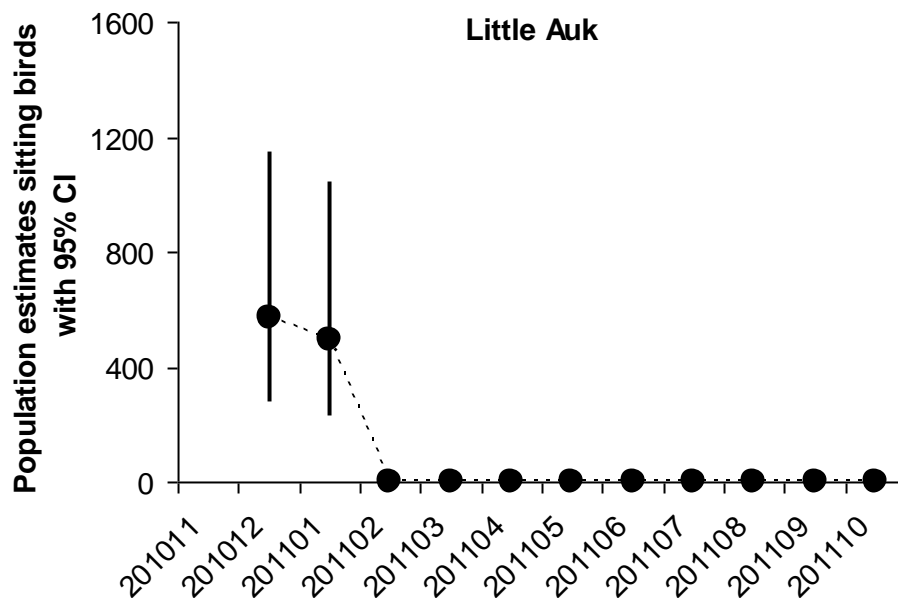
#### 4.10 Little Auk *Alle alle*

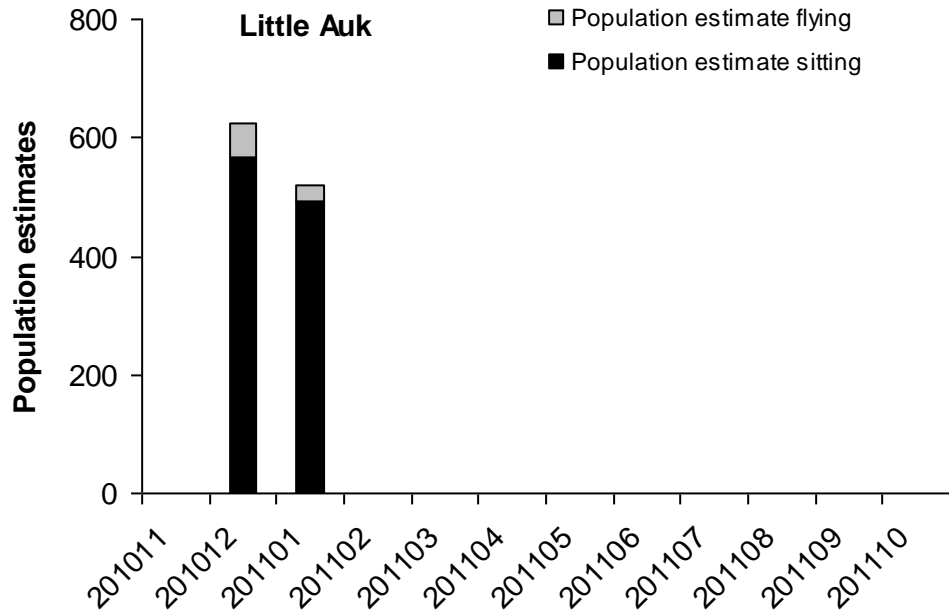
A total of 45 individual Little Auks were recorded divided over 33 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Little Auks were absent during most of the surveys, being only present in winter.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.09	56	0.90	568	281	1150
201101	0.04	27	0.78	492	232	1041
201102	0.00	0	0.00	0	0	0
201103	0.00	0	0.00	0	0	0
201104	0.00	0	0.00	0	0	0
201105	0.00	0	0.00	0	0	0
201106	0.00	0	0.00	0	0	0
201107	0.00	0	0.00	0	0	0
201108	0.00	0	0.00	0	0	0
201109	0.00	0	0.00	0	0	0
201110	0.00	0	0.00	0	0	0

*Monthly population estimates of sitting and flying birds:*





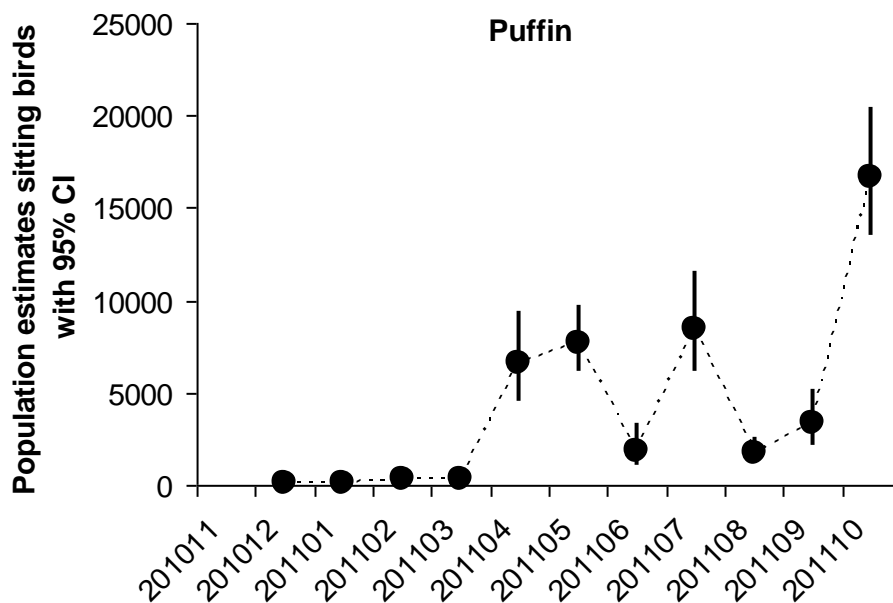
#### 4.11 Puffin *Fratercula arctica*

A total of 3,494 individual Puffins were recorded divided over 1,895 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Puffins were most abundant in spring, summer and autumn. Puffins were largely absent from December to March with the highest numbers encountered in October.

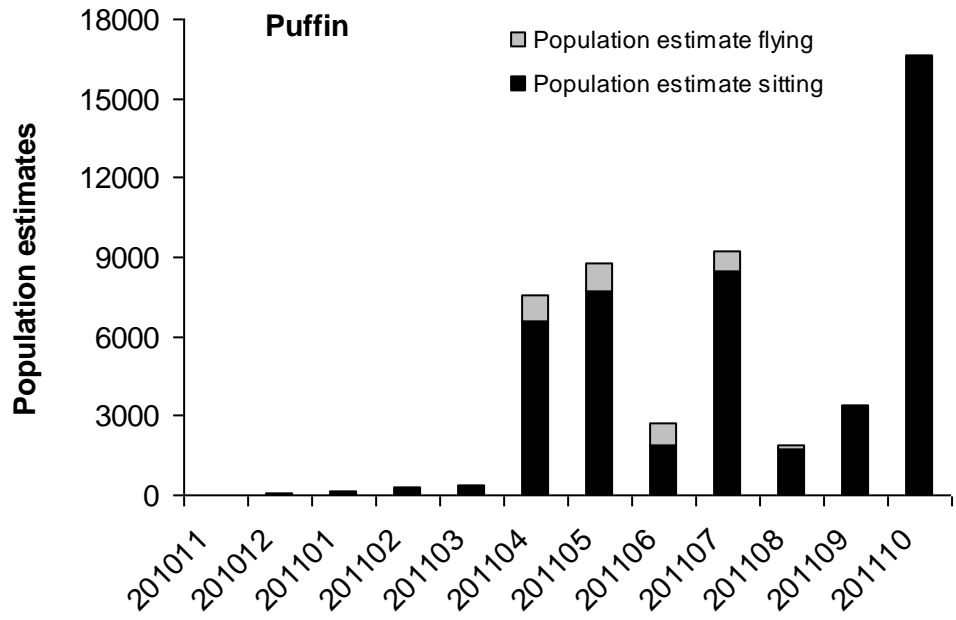
*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.00	0	0.10	64	20	203
201101	0.00	0	0.20	128	49	334
201102	0.02	14	0.44	279	214	365
201103	0.04	26	0.56	354	177	706
201104	1.59	1007	10.40	6568	4585	9408
201105	1.66	1048	12.24	7734	6134	9752
201106	1.41	894	2.95	1866	1032	3375
201107	1.14	722	13.42	8475	6213	11561
201108	0.34	212	2.70	1705	1142	2547
201109	0.07	47	5.31	3358	2171	5193
201110	0.01	7	26.37	16661	13555	20479

*Monthly population estimates of sitting and flying birds:*







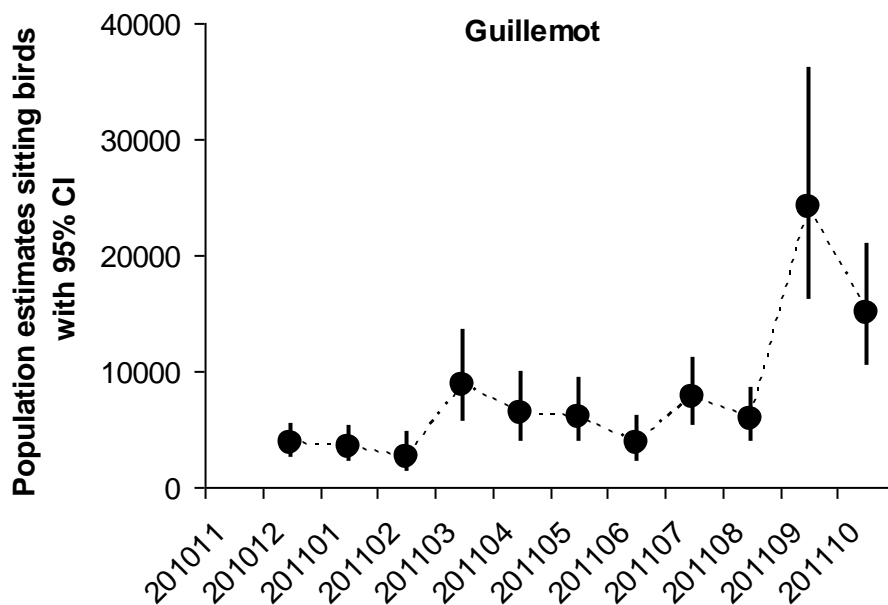
#### 4.12 Guillemot *Uria aalge*

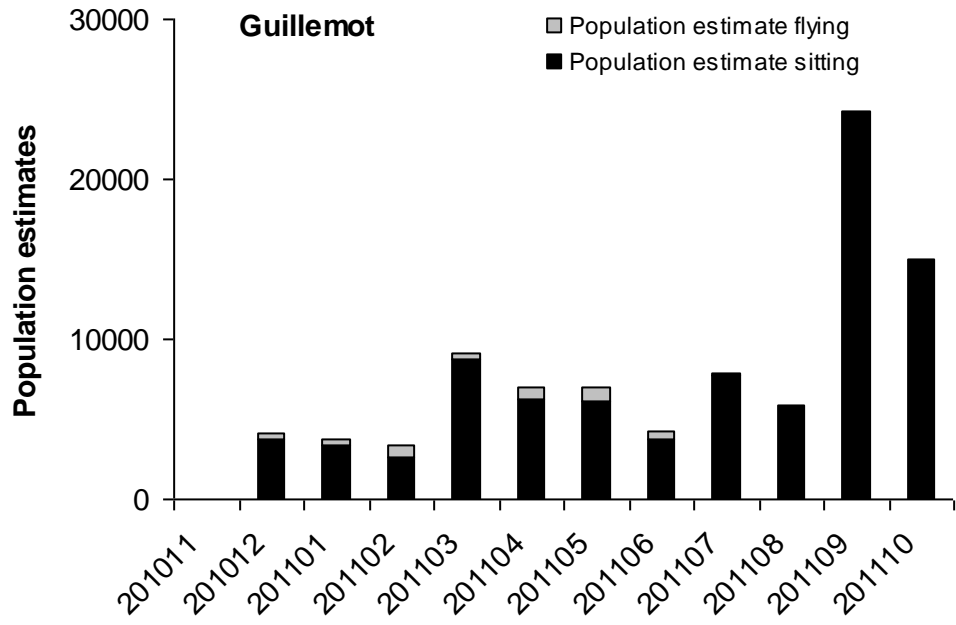
A total of 8,013 individual Guillemots were recorded divided over 2,777 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Guillemots were present throughout most of the year with the highest numbers in autumn. Lowest numbers were encountered in winter.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.59	371	5.98	3775	2606	5470
201101	0.55	347	5.38	3402	2194	5274
201102	1.17	742	4.16	2627	1425	4843
201103	0.62	394	13.84	8741	5614	13609
201104	1.16	735	9.99	6310	3978	10007
201105	1.45	914	9.61	6071	3883	9492
201106	0.81	515	5.99	3787	2313	6199
201107	0.33	209	12.19	7701	5307	11175
201108	0.04	27	9.33	5895	3992	8705
201109	0.00	0	38.30	24199	16141	36279
201110	0.09	54	23.65	14938	10571	21110

*Monthly population estimates of sitting and flying birds:*





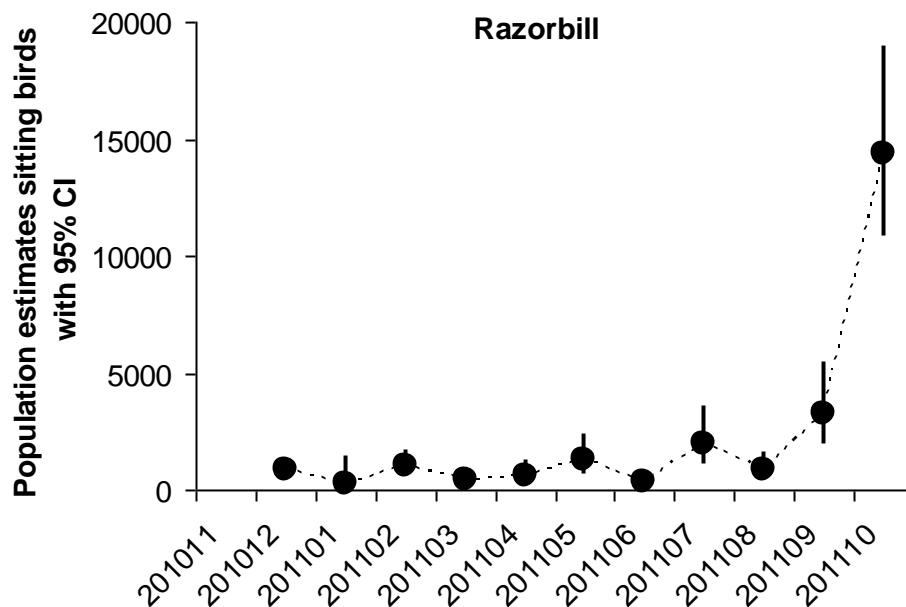
#### 4.13 Razorbill *Alca torda*

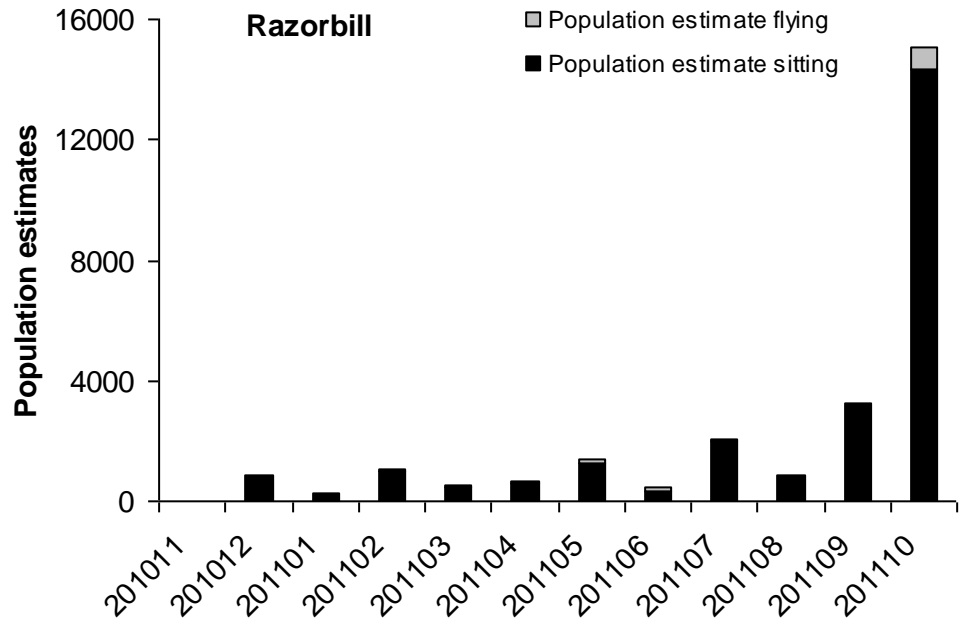
A total of 1,973 individual Razorbills were recorded divided over 660 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Razorbills were most abundant in autumn (especially in October).

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.01	7	1.32	833	516	1343
201101	0.02	14	0.44	279	53	1468
201102	0.08	48	1.58	1000	571	1752
201103	0.15	92	0.72	454	223	926
201104	0.15	95	0.90	571	255	1278
201105	0.22	141	1.98	1253	646	2430
201106	0.18	115	0.57	361	154	847
201107	0.14	88	3.13	1975	1075	3630
201108	0.00	0	1.35	851	443	1633
201109	0.00	0	5.19	3276	1971	5445
201110	1.13	711	22.68	14331	10825	18971

*Monthly population estimates of sitting and flying birds:*





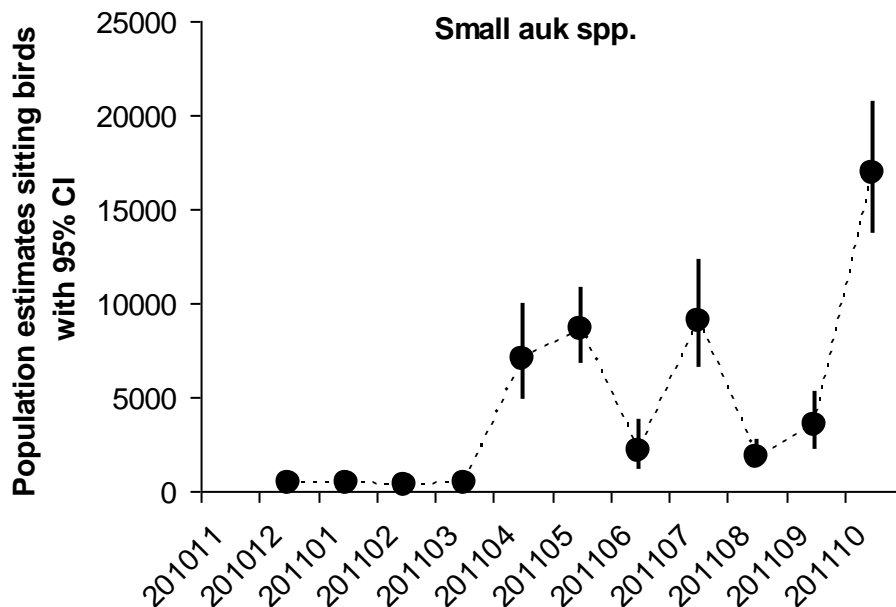
#### 4.14 Small auk species

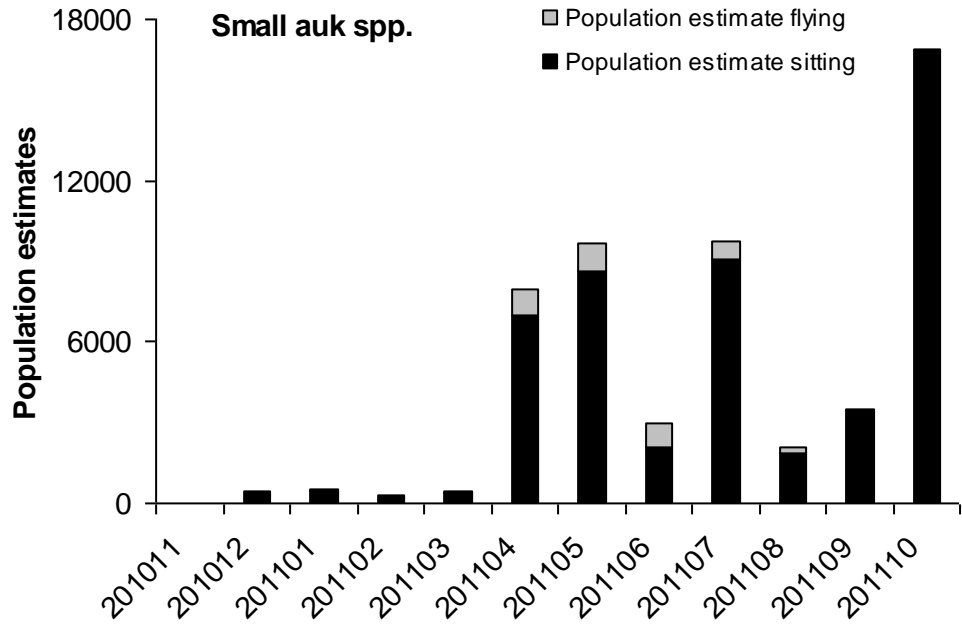
Small auks as a species group consists of unidentified small auks, Little Auk and Puffin. A total of 3,539 individual small auks were recorded divided over 1,928 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Small auks were mainly seen in spring and summer.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.09	56	0.67	423	252	711
201101	0.04	27	0.75	471	297	747
201102	0.02	14	0.48	306	234	400
201103	0.04	26	0.61	387	194	773
201104	1.59	1007	11.06	6988	4878	10010
201105	1.66	1048	13.63	8609	6828	10855
201106	1.41	894	3.31	2091	1156	3782
201107	1.14	722	14.33	9055	6638	12352
201108	0.34	212	2.91	1839	1231	2747
201109	0.07	47	5.48	3464	2239	5358
201110	0.01	7	26.70	16869	13724	20734

*Monthly population estimates of sitting and flying birds:*





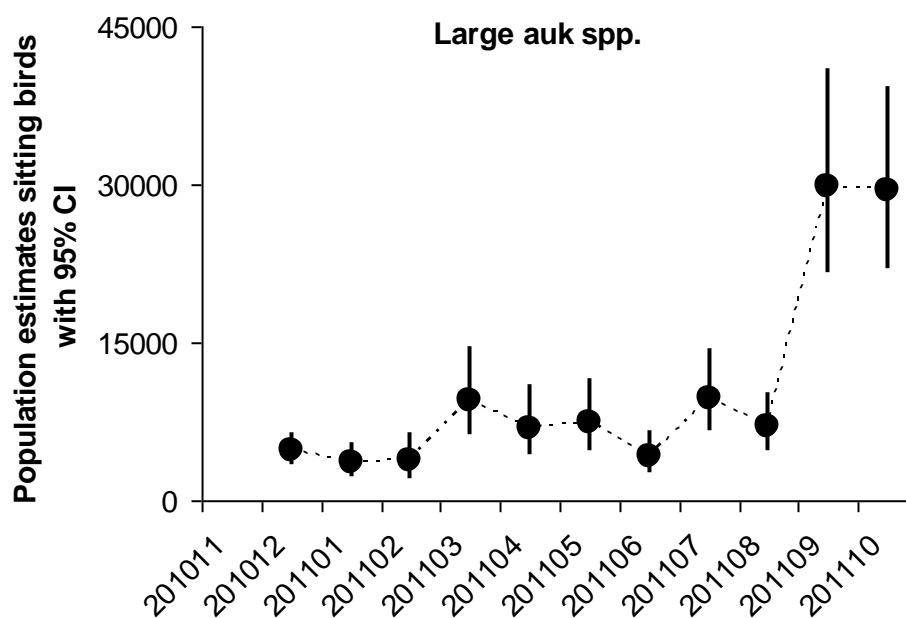
#### 4.15 Large auk species

The species group Large auks consist of birds recorded as guillemot/razorbill, Guillemots and Razorbills. A total of 11,161 individual Large auks were recorded divided over 3,561 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Large auks were present year-round and high numbers were recorded in autumn

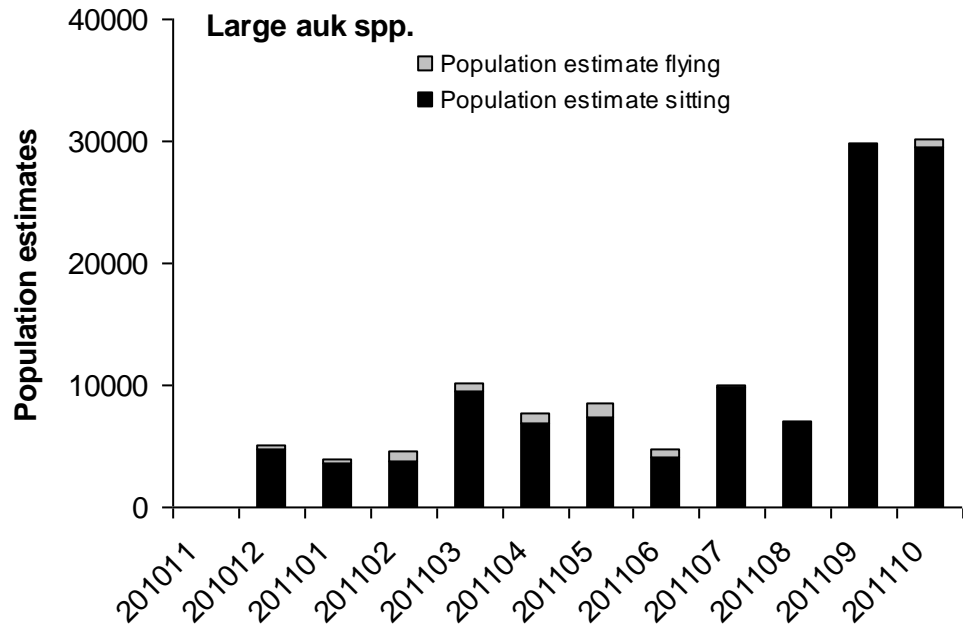
*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyyymm)	Density flying birds per km2	Population estimate flying	Density sitting birds per km2	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.65	413	7.51	4744	3450	6524
201101	0.57	360	5.66	3573	2344	5447
201102	1.48	932	5.86	3705	2152	6379
201103	0.86	545	15.12	9552	6213	14687
201104	1.31	830	10.89	6880	4289	11035
201105	1.75	1109	11.70	7392	4688	11655
201106	1.01	636	6.59	4161	2593	6677
201107	0.47	297	15.47	9771	6618	14427
201108	0.04	27	11.09	7006	4805	10214
201109	0.00	0	47.14	29784	21642	40991
201110	1.21	765	46.60	29443	22100	39227

*Monthly population estimates of sitting and flying birds:*







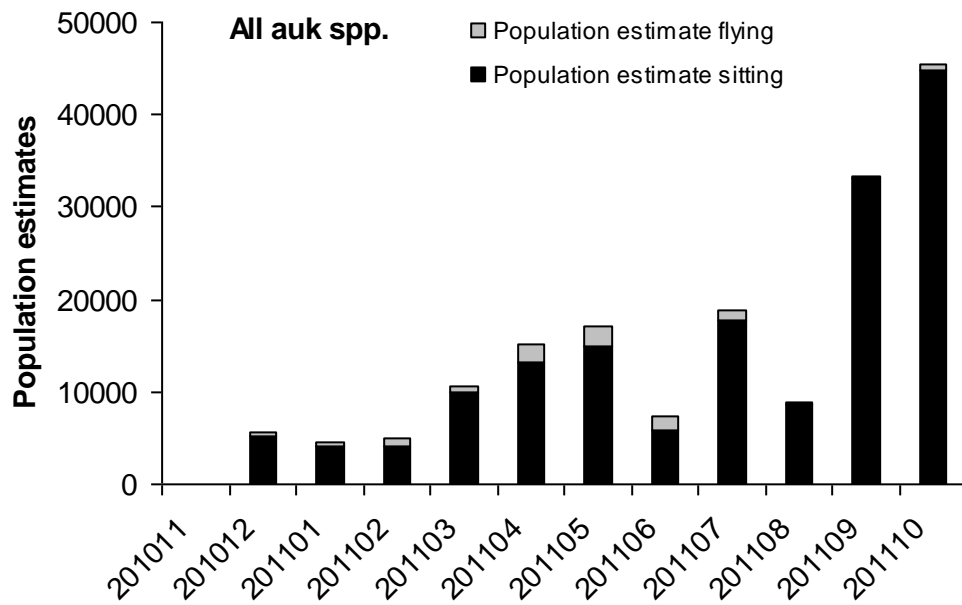
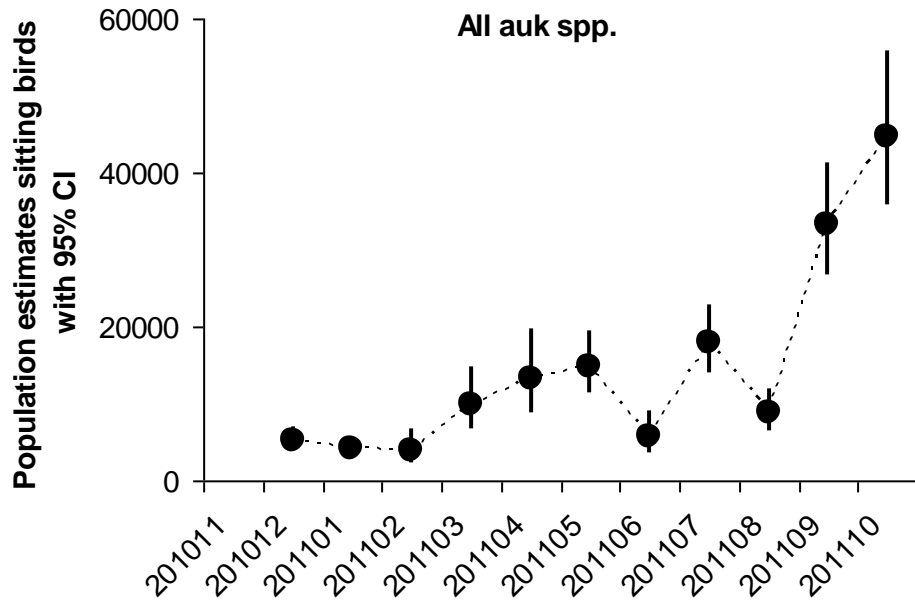
#### 4.16 All auk species

The species group All auk species consist of all categories of species in the groups Small auk species and Large auk species as well as the category 'unidentified auks' (of which observers did not give an indication that the birds either belonged to the group of small or large auks). A total of 14,700 individual auks were recorded divided over 5,489 sightings during the ship-based surveys in the second study year at Neart na Gaoithe. Auks were common throughout the year with a peak in autumn.

*Density and population estimates of flying and sitting birds (including confidence intervals for the sitting birds):*

Survey (yyymm)	Density flying birds per km <sup>2</sup>	Population estimate flying	Density sitting birds per km <sup>2</sup>	Population estimate sitting	Lower 95% Confidence interval	Higher 95% Confidence interval
201011						
201012	0.74	470	8.23	5201	3858	7012
201101	0.61	388	6.48	4092	2878	5817
201102	1.50	946	6.37	4025	2428	6672
201103	0.90	572	15.72	9934	6671	14794
201104	2.91	1838	20.97	13247	8934	19643
201105	3.41	2157	23.50	14845	11331	19450
201106	2.42	1530	9.11	5758	3676	9020
201107	1.61	1019	28.26	17854	13956	22842
201108	0.38	239	13.82	8731	6411	11891
201109	0.09	54	52.55	33198	26721	41246
201110	1.22	772	70.88	44784	35900	55867

*Monthly population estimates of sitting and flying birds:*



## **5 Populations estimates in predefined sub-zones at Neart na Gaoithe**

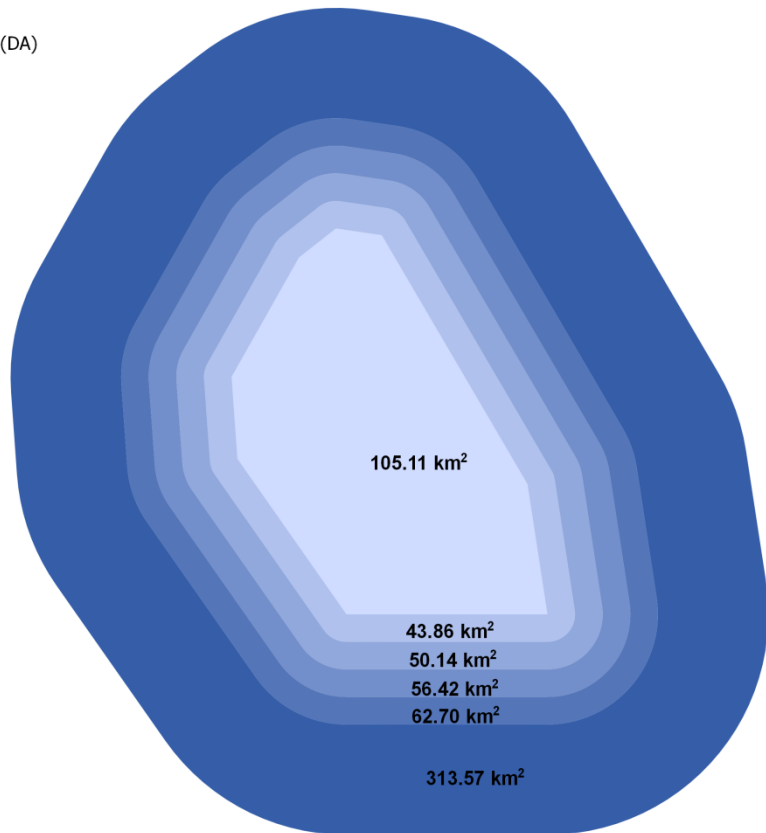
### **5.1 Introduction and methods**

In this chapter population estimates have been derived for different sub-zones at Neart na Gaoithe on a monthly basis for both study years (23 surveys in the period November 2009 - October 2011). These figures, presented in the following paragraphs (5.1 - 5.16), are birds sitting on the water and are based on calculations with the Distance Analysis software (CREEM).

Distance analysis yielded population estimates for the whole study area Neart na Gaoithe. Within this study area a development area (DA) was defined (Figure 5.1). Around this DA four buffers were created, each at a distance of 1 km from the last. All individual sightings of birds within the different sub-zones (DA, DA+1, DA+1+2, DA+1+2+3, DA+1+2+3+4 and Neart na Gaoithe) were identified in the database. Population sizes for each sub-zone were calculated as a proportion of the population of the entire area based on the ratios of observed numbers of the different sub-zones. The population sizes for each sub-zone are presented along with lower and upper ranges, which are based on the confidence intervals determined in chapters 3 and 4. These have also been calculated proportionally to the relative sighted numbers of each sub-zone. Accordingly these intervals have lost their strict statistical meaning, so that these should be regarded as ranges and treated as indicative only.

**Legend**

- Development Area (DA)
- DA+1
- DA+1+2
- DA+1+2+3
- DA+1+2+3+4
- NNG



*Figure 5.1 Neart na Gaoithe (NNG) and Development Area (DA) with consecutive 1 km buffers.*



## 5.2 Northern Fulmar *Fulmarus glacialis*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyy-mm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	49	16	153	11	3	33	11	3	33	0	0	0	0	0	0	0	0	0
200912	43	7	249	43	7	249	43	7	249	43	7	249	43	7	249	43	7	249
201001	32	7	139	32	7	139	21	5	93	21	5	93	0	0	0	0	0	0
201002	44	4	448	44	4	448	44	4	448	44	4	448	28	3	280	28	3	280
201003	149	59	374	58	23	146	45	18	114	45	18	114	45	18	114	32	13	81
201004	108	45	261	27	11	65	27	11	65	27	11	65	0	0	0	0	0	0
201005	11	2	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	11	2	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	32	8	125	21	5	83	21	5	83	11	3	42	11	3	42	0	0	0
201009	277	114	678	151	62	370	126	52	308	101	41	247	101	41	247	50	21	123
201010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201011																		
201012	388	52	2904	362	49	2710	233	31	1742	233	31	1742	0	0	0	0	0	0
201101	292	123	697	94	40	225	85	36	202	47	20	112	47	20	112	9	4	22
201102	11	2	62	11	2	62	11	2	62	11	2	62	11	2	62	11	2	62
201103	94	17	530	47	9	265	31	6	177	0	0	0	0	0	0	0	0	0
201104	96	39	237	64	26	158	64	26	158	53	22	132	43	17	105	43	17	105
201105	70	22	225	12	4	38	12	4	38	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	165	20	1321	124	15	991	124	15	991	124	15	991	124	15	991	21	3	165
201108	420	267	659	79	50	124	40	25	62	24	15	37	8	5	12	0	0	0
201109	648	362	1160	251	140	449	209	117	374	157	88	281	84	47	150	42	23	75
201110	53	18	156	11	4	31	11	4	31	0	0	0	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	49	75	124	11	34	44	11	20	31	0	20	20	0	14	14	0	14	14
200912	43	212	255	43	116	159	43	109	152	43	82	125	43	62	105	43	27	70
201001	32	136	168	32	61	93	21	61	82	21	54	76	0	54	54	0	48	48
201002	44	101	145	44	40	84	44	20	64	44	20	64	28	7	34	28	7	34
201003	149	114	263	58	40	98	45	33	79	45	20	65	45	20	65	32	13	46
201004	108	41	149	27	27	54	27	20	47	27	20	47	0	14	14	0	14	14
201005	11	41	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	11	7	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	27	27	0	14	14	0	0	0	0	0	0	0	0	0	0	0	0
201008	32	41	73	21	27	49	21	27	49	11	27	38	11	14	24	0	14	14
201009	277	75	352	151	41	192	126	34	160	101	20	121	101	7	108	50	7	57
201010	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7
201011																		
201012	388	105	493	362	91	453	233	91	324	233	77	310	0	77	77	0	77	77
201101	292	224	516	94	116	210	85	95	180	47	95	142	47	75	122	9	68	77
201102	11	82	93	11	54	65	11	34	45	11	27	38	11	20	31	11	20	31
201103	94	66	160	47	39	86	31	20	51	0	13	13	0	13	13	0	13	13
201104	96	68	164	64	41	105	64	27	91	53	14	67	43	7	49	43	7	49
201105	70	54	124	12	47	59	12	34	45	0	27	27	0	27	27	0	13	13
201106	0	102	102	0	61	61	0	47	47	0	47	47	0	34	34	0	34	34
201107	165	81	246	124	54	178	124	34	157	124	13	137	124	13	137	21	13	34
201108	420	355	775	79	137	216	40	75	115	24	55	78	8	27	35	0	14	14
201109	648	311	959	251	155	406	209	122	331	157	95	251	84	41	124	42	27	69
201110	53	27	80	11	14	24	11	14	24	0	7	7	0	7	7	0	7	7



### 5.3 Sooty Shearwater *Puffinus griseus*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	13	2	73	13	2	73	13	2	73	13	2	73	0	0	0	0	0	0
201009	153	75	311	51	25	104	51	25	104	20	10	41	10	5	21	0	0	0
201010	746	435	1280	562	328	965	346	202	594	303	177	519	216	126	371	162	95	278
201011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	214	65	708	146	44	484	113	34	373	113	34	373	23	7	75	0	0	0
201110	818	179	3733	17	4	78	17	4	78	17	4	78	17	4	78	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7
200912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	13	0	13	13	0	13	13	0	13	13	0	13	0	0	0	0	0	0
201009	153	14	167	51	14	65	51	14	65	20	14	34	10	14	24	0	7	7
201010	746	34	780	562	34	596	346	27	373	303	14	316	216	0	216	162	0	162
201011																		
201012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	14	14	0	14	14	0	0	0	0	0	0	0	0	0	0	0	0
201109	214	20	234	146	20	167	113	14	126	113	14	126	23	7	29	0	7	7
201110	818	81	899	17	81	98	17	27	44	17	14	31	17	14	31	0	7	7

## 5.4 Northern Gannet *Morus bassanus*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyy-mm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	116	23	594	6	1	33	3	1	17	3	1	17	0	0	0	0	0	0
200912	8	1	50	8	1	50	8	1	50	8	1	50	8	1	50	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	17	4	65	9	2	33	9	2	33	9	2	33	0	0	0	0	0	0
201003	83	38	179	50	23	107	33	15	72	25	11	54	17	8	36	17	8	36
201004	401	197	818	82	40	168	72	35	147	10	5	21	10	5	21	10	5	21
201005	307	136	697	10	4	22	10	4	22	10	4	22	10	4	22	10	4	22
201006	685	336	1397	261	128	533	240	118	490	169	83	346	120	59	245	113	55	230
201007	216	88	527	25	10	60	6	3	15	6	3	15	6	3	15	0	0	0
201008	193	102	366	126	67	239	126	67	239	76	40	143	67	35	127	67	35	127
201009	1668	1174	2370	1093	769	1553	896	630	1273	756	532	1074	583	411	829	386	272	549
201010	466	273	795	210	123	358	202	118	345	85	50	146	39	23	66	8	5	13
201011				0			0			0			0			0		
201012	17	3	100	17	3	100	17	3	100	0	0	0	0	0	0	0	0	0
201101	488	77	3078	18	3	112	18	3	112	18	3	112	18	3	112	0	0	0
201102	76	32	179	51	21	119	51	21	119	42	18	99	42	18	99	34	14	80
201103	285	134	607	24	11	51	16	7	34	16	7	34	16	7	34	16	7	34
201104	2819	1593	4989	2175	1229	3848	2007	1134	3552	1865	1054	3301	1823	1030	3227	1457	823	2578
201105	1209	451	3240	367	137	984	329	123	882	38	14	103	31	11	82	15	6	41
201106	892	539	1476	284	172	470	193	117	320	91	55	150	57	34	94	34	21	56
201107	1027	716	1474	682	476	979	506	353	726	452	315	649	368	256	528	276	192	396
201108	733	400	1342	181	99	332	181	99	332	60	33	111	45	25	83	45	25	83
201109	2785	1914	4053	1263	868	1838	1115	767	1623	894	614	1301	680	467	989	295	203	430
201110	1010	634	1606	280	176	445	183	115	290	134	84	213	97	61	155	85	53	135

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	116	183	299	6	34	40	3	27	30	3	20	24	0	20	20	0	20	20
200912	8	21	29	8	0	8	8	0	8	8	0	8	8	0	8	0	0	0
201001	0	20	20	0	14	14	0	7	7	0	7	7	0	7	7	0	7	7
201002	17	377	394	9	128	136	9	115	123	9	40	49	0	20	20	0	20	20
201003	83	1485	1568	50	763	812	33	635	669	25	515	540	17	488	505	17	462	478
201004	401	681	1082	82	361	443	72	225	297	10	170	181	10	129	140	10	129	140
201005	307	1287	1594	10	879	888	10	586	595	10	477	486	10	320	330	10	150	159
201006	685	996	1681	261	616	878	240	474	714	169	352	522	120	278	398	113	237	350
201007	216	955	1171	25	481	506	6	433	439	6	268	274	6	151	157	0	89	89
201008	193	2930	3123	126	1302	1427	126	1124	1250	76	620	696	67	382	449	67	177	244
201009	1668	2437	4105	1093	1467	2559	896	1046	1941	756	903	1659	583	584	1167	386	353	739
201010	466	787	1253	210	407	617	202	366	568	85	278	363	39	210	249	8	163	171
201011																		
201012	17	63	80	17	28	45	17	7	24	0	7	7	0	7	7	0	7	7
201101	488	177	665	18	88	106	18	75	93	18	61	79	18	61	79	0	14	14
201102	76	878	954	51	694	745	51	653	704	42	653	695	42	483	525	34	374	408
201103	285	1031	1316	24	466	490	16	355	371	16	309	325	16	250	265	16	79	95
201104	2819	2314	5133	2175	878	3052	2007	558	2565	1865	388	2253	1823	191	2014	1457	177	1634
201105	1209	3004	4213	367	1781	2148	329	1552	1881	38	1371	1409	31	974	1005	15	800	815
201106	892	4740	5632	284	1957	2241	193	1537	1730	91	1226	1316	57	928	984	34	603	637
201107	1027	3320	4347	682	2031	2713	506	1842	2348	452	1613	2065	368	1376	1744	276	1248	1524
201108	733	5299	6032	181	2397	2578	181	1762	1943	60	1318	1378	45	990	1036	45	731	776
201109	2785	3728	6513	1263	2499	3762	1115	2364	3479	894	2195	3089	680	1067	1747	295	628	924
201110	1010	2675	3685	280	941	1221	183	596	778	134	460	594	97	393	490	85	305	390

## 5.5 Herring Gull *Larus argentatus*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyy-mm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	2909	85	100120	6	0	221	6	0	221	6	0	221	0	0	0	0	0	0
200912	366	77	1752	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	8768	1166	65937	5310	706	39934	1764	235	13267	1764	235	13267	1764	235	13267	0	0	0
201002	113	29	436	81	21	311	81	21	311	81	21	311	16	4	62	16	4	62
201003	24	7	86	12	4	43	12	4	43	12	4	43	12	4	43	12	4	43
201004	450	45	4475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	247	82	743	30	10	90	15	5	45	15	5	45	7	2	23	7	2	23
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	37	6	214	37	6	214	37	6	214	0	0	0	0	0	0	0	0	0
201009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201010	12	2	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201011				0			0			0			0			0		
201012	66	19	234	65	19	232	63	18	223	1	0	4	1	0	4	1	0	4
201101	109	25	485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	57	9	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	60	9	391	2	0	12	2	0	12	2	0	12	2	0	12	2	0	12
201104	1933	505	7403	1058	276	4053	1036	271	3969	87	23	335	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	48	8	281	48	8	281	48	8	281	48	8	281	48	8	281	48	8	281
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	2909	563	3472	6	197	203	6	68	74	6	54	61	0	20	20	0	20	20
200912	366	582	948	0	68	68	0	48	48	0	41	41	0	41	41	0	27	27
201001	8768	313	9081	5310	82	5392	1764	82	1846	1764	75	1839	1764	27	1791	0	20	20
201002	113	40	153	81	27	108	81	27	108	81	27	108	16	27	43	16	7	23
201003	24	74	98	12	60	72	12	40	52	12	33	45	12	33	45	12	27	39
201004	450	41	491	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7
201005	0	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	247	27	274	30	20	50	15	14	29	15	7	22	7	7	14	7	7	14
201007	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	37	0	37	37	0	37	37	0	37	0	0	0	0	0	0	0	0	0
201009	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	0	0
201010	12	7	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201011																		
201012	66	210	276	65	98	164	63	35	98	1	14	15	1	7	8	1	7	8
201101	109	469	578	0	252	252	0	224	224	0	116	116	0	88	88	0	41	41
201102	57	75	132	0	61	61	0	54	54	0	41	41	0	20	20	0	14	14
201103	60	66	126	2	33	35	2	33	35	2	33	35	2	26	28	2	13	15
201104	1933	82	2015	1058	0	1058	1036	0	1036	87	0	87	0	0	0	0	0	0
201105	0	13	13	0	7	7	0	7	7	0	0	0	0	0	0	0	0	0
201106	0	135	135	0	41	41	0	20	20	0	20	20	0	20	20	0	20	20
201107	48	175	223	48	20	68	48	0	48	48	0	48	48	0	48	48	0	48
201108	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	0	27	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## 5.6 Great Black-backed Gull *Larus marinus*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyy-mm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate	Lower range estimate	Higher range estimate	Pop. estimate	Lower range estimate	Higher range estimate	Pop. estimate	Lower range estimate	Higher range estimate	Pop. estimate	Lower range estimate	Higher range estimate	Pop. estimate	Lower range estimate	Higher range estimate
200911	263	84	824	33	11	105	25	8	78	17	5	52	4	1	13	0	0	0
200912	53	9	322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	631	167	2388	449	119	1700	311	82	1178	309	82	1168	303	80	1147	0	0	0
201002	10	2	62	10	2	62	10	2	62	10	2	62	0	0	0	0	0	0
201003	21	5	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	21	5	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201009	21	5	81	11	3	41	11	3	41	11	3	41	11	3	41	0	0	0
201010	192	65	573	96	33	287	84	28	251	0	0	0	0	0	0	0	0	0
201011				0			0			0			0			0		
201012	74	16	339	70	15	321	66	14	302	0	0	0	0	0	0	0	0	0
201101	97	40	237	36	15	89	36	15	89	24	10	59	12	5	30	0	0	0
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	10	2	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	103	34	317	68	22	209	65	21	200	8	3	25	8	3	25	3	1	8
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	198	74	529	70	26	187	70	26	187	58	22	156	35	13	93	0	0	0
201110	10	2	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	263	14	277	33	7	40	25	7	32	17	7	23	4	7	11	0	7	7
200912	53	34	87	0	27	27	0	27	27	0	27	27	0	21	21	0	21	21
201001	631	41	672	449	27	476	311	14	325	309	14	322	303	14	317	0	14	14
201002	10	7	17	10	0	10	10	0	10	10	0	10	0	0	0	0	0	0
201003	21	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	21	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201009	21	48	69	11	14	24	11	14	24	11	14	24	11	7	17	0	7	7
201010	192	47	239	96	27	123	84	27	111	0	27	27	0	0	0	0	0	0
201011																		
201012	74	105	179	70	28	98	66	21	87	0	14	14	0	14	14	0	7	7
201101	97	129	226	36	54	91	36	41	77	24	27	51	12	14	26	0	7	7
201102	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	10	26	36	0	7	7	0	7	7	0	7	7	0	7	7	0	0	0
201104	103	102	205	68	20	88	65	14	79	8	7	15	8	0	8	3	0	3
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	198	351	549	70	290	360	70	284	354	58	284	342	35	14	48	0	7	7
201110	10	41	51	0	14	14	0	14	14	0	14	14	0	14	14	0	0	0



## 5.7 Little Gull *Larus minutus*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	61	13	279	20	4	93	20	4	93	20	4	93	0	0	0	0	0	0
200912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	52	18	149	52	18	149	21	7	60	21	7	60	10	4	30	10	4	30
201009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201010	1672	811	3444	819	397	1687	682	331	1406	444	215	914	409	199	843	307	149	633
201011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	102	17	615	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201110	2767	970	7893	2067	725	5897	1590	557	4536	0	0	0	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	61	0	61	20	0	20	20	0	20	20	0	20	0	0	0	0	0	0
200912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	52	20	72	52	0	52	21	0	21	21	0	21	10	0	10	10	0	10
201009	0	149	149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201010	1672	109	1781	819	34	853	682	20	703	444	20	464	409	7	416	307	7	314
201011																		
201012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	102	581	683	0	41	41	0	41	41	0	41	41	0	41	41	0	41	41
201110	2767	156	2923	2067	54	2121	1590	54	1644	0	0	0	0	0	0	0	0	0

## 5.8 Kittiwake *Rissa tridactyla*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	219	43	1124	6	1	32	6	1	32	6	1	32	6	1	32	6	1	32
200912	240	69	836	51	15	176	51	15	176	51	15	176	25	7	88	25	7	88
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	11	2	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	2239	750	6687	85	29	255	21	7	64	0	0	0	0	0	0	0	0	0
201005	11	2	69	11	2	69	0	0	0	0	0	0	0	0	0	0	0	0
201006	337	152	747	120	54	267	108	49	240	108	49	240	36	16	80	36	16	80
201007	23	6	87	12	3	44	0	0	0	0	0	0	0	0	0	0	0	0
201008	1399	354	5527	1382	350	5460	1214	307	4795	1214	307	4795	792	200	3130	152	38	599
201009	4935	2085	11679	4612	1948	10913	3575	1510	8460	3135	1325	7420	2297	971	5437	2032	859	4809
201010	7431	4073	13557	5867	3216	10703	4748	2602	8662	4611	2528	8413	2356	1291	4298	1883	1032	3435
201011				0			0			0			0			0		
201012	308	138	687	226	101	505	127	57	283	118	53	263	100	45	222	72	32	162
201101	112	12	1022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	183	52	650	131	37	464	131	37	464	131	37	464	131	37	464	0	0	0
201103	492	158	1528	7	2	22	0	0	0	0	0	0	0	0	0	0	0	0
201104	728	387	1371	498	265	938	402	214	758	326	173	613	287	153	541	239	127	451
201105	110	43	284	83	32	213	79	31	203	79	31	203	71	28	183	47	18	122
201106	1464	251	8552	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	3952	1556	10037	2932	1154	7447	1442	568	3661	1432	564	3636	1432	564	3636	1393	548	3537
201108	396	158	990	167	67	418	158	63	396	97	39	242	26	11	66	18	7	44
201109	715	198	2585	616	171	2226	616	171	2226	417	116	1508	0	0	0	0	0	0
201110	5543	224	137060	145	6	3583	145	6	3583	72	3	1792	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	219	122	341	6	54	61	6	34	40	6	27	33	6	27	33	6	20	27
200912	240	178	418	51	34	85	51	27	78	51	27	78	25	21	46	25	14	39
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	11	108	119	0	7	7	0	7	7	0	0	0	0	0	0	0	0	0
201003	0	40	40	0	20	20	0	7	7	0	7	7	0	0	0	0	0	0
201004	2239	245	2484	85	109	194	21	61	83	0	20	20	0	20	20	0	7	7
201005	11	157	168	11	68	79	0	68	68	0	68	68	0	61	61	0	41	41
201006	337	183	520	120	54	175	108	54	163	108	47	156	36	20	56	36	20	56
201007	23	172	195	12	89	101	0	69	69	0	48	48	0	41	41	0	41	41
201008	1399	34	1433	1382	7	1389	1214	7	1220	1214	7	1220	792	7	799	152	7	159
201009	4935	1032	5967	4612	312	4924	3575	299	3874	3135	244	3380	2297	197	2494	2032	163	2195
201010	7431	658	8089	5867	373	6240	4748	346	5094	4611	305	4917	2356	190	2546	1883	136	2018
201011																		
201012	308	883	1191	226	827	1053	127	785	912	118	771	889	100	743	842	72	736	808
201101	112	986	1098	0	41	41	0	20	20	0	20	20	0	14	14	0	7	7
201102	183	54	237	131	14	144	131	14	144	131	14	144	131	14	144	0	14	14
201103	492	177	669	7	112	119	0	66	66	0	59	59	0	33	33	0	7	7
201104	728	299	1027	498	184	682	402	150	552	326	95	421	287	61	349	239	48	287
201105	110	383	493	83	228	311	79	175	253	79	141	220	71	121	192	47	81	128
201106	1464	366	1830	0	142	142	0	115	115	0	68	68	0	47	47	0	27	27
201107	3952	1242	5194	2932	864	3796	1442	843	2285	1432	445	1877	1432	378	1810	1393	223	1615
201108	396	130	526	167	82	249	158	48	206	97	48	145	26	34	61	18	27	45
201109	715	88	803	616	41	656	616	41	656	417	20	437	0	20	20	0	20	20
201110	5543	2925	8468	145	2356	2501	145	2201	2346	72	149	221	0	115	115	0	88	88

## 5.9 All gull species

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	967	365	2565	20	7	52	16	6	43	13	5	35	5	2	13	3	1	9
200912	600	220	1639	33	12	90	33	12	90	33	12	90	16	6	45	16	6	45
201001	3412	982	11856	2181	628	7577	1001	288	3478	996	287	3462	987	284	3429	0	0	0
201002	111	32	378	74	21	252	74	21	252	74	21	252	12	4	42	12	4	42
201003	54	21	139	11	4	28	11	4	28	11	4	28	11	4	28	11	4	28
201004	2430	967	6107	94	37	236	21	8	52	0	0	0	0	0	0	0	0	0
201005	11	2	67	11	2	67	0	0	0	0	0	0	0	0	0	0	0	0
201006	595	283	1249	139	66	293	112	53	234	112	53	234	46	22	98	37	18	78
201007	34	12	97	23	8	65	0	0	0	0	0	0	0	0	0	0	0	0
201008	1282	418	3932	1268	413	3889	1085	354	3327	1043	340	3197	676	220	2074	141	46	432
201009	6158	2538	14945	5745	2368	13944	4456	1837	10814	3909	1611	9488	2868	1182	6959	2527	1042	6133
201010	6712	4099	10992	5066	3094	8296	4027	2459	6595	3773	2304	6179	2007	1225	3286	1590	971	2603
201011				0			0			0			0			0		
201012	608	328	1126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201101	346	133	902	16	6	42	16	6	42	11	4	28	5	2	14	0	0	0
201102	146	45	470	61	19	196	61	19	196	61	19	196	61	19	196	0	0	0
201103	791	287	2174	15	6	42	8	3	21	8	3	21	8	3	21	8	3	21
201104	3613	1663	7849	1975	909	4291	1877	864	4078	362	167	786	202	93	440	159	73	346
201105	132	50	346	99	38	260	94	36	247	94	36	247	85	32	222	57	21	148
201106	1434	245	8374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	3961	1476	10635	2964	1104	7957	1506	561	4043	1496	558	4017	1487	554	3991	1448	540	3888
201108	360	145	894	152	61	377	144	58	358	88	35	219	24	10	60	16	6	40
201109	893	439	1816	515	253	1047	515	253	1047	356	175	723	23	11	46	0	0	0
201110	2616	936	7311	749	268	2093	586	210	1638	22	8	61	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	967	780	1747	20	258	277	16	109	125	13	88	101	5	54	59	3	47	51
200912	600	848	1448	33	164	197	33	137	170	33	96	129	16	82	99	16	62	78
201001	3412	367	3779	2181	116	2296	1001	102	1103	996	95	1091	987	48	1035	0	34	34
201002	111	155	266	74	34	108	74	34	108	74	27	101	12	27	39	12	7	19
201003	54	114	168	11	80	91	11	47	58	11	40	51	11	33	44	11	27	38
201004	2430	320	2750	94	123	216	21	75	96	0	34	34	0	34	34	0	20	20
201005	11	184	195	11	82	93	0	82	82	0	82	82	0	68	68	0	48	48
201006	595	251	846	139	81	221	112	74	186	112	61	173	46	27	74	37	27	64
201007	34	186	220	23	96	119	0	76	76	0	55	55	0	48	48	0	48	48
201008	1282	75	1357	1268	14	1282	1085	14	1098	1043	7	1049	676	7	683	141	7	148
201009	6158	1236	7394	5745	333	6078	4456	319	4775	3909	265	4174	2868	210	3078	2527	170	2697
201010	6712	875	7587	5066	488	5554	4027	441	4468	3773	387	4159	2007	217	2224	1590	163	1752
201011																		
201012	608	1275	1883	0	995	995	0	883	883	0	841	841	0	806	806	0	792	792
201101	346	1598	1944	16	347	363	16	286	302	11	163	174	5	116	121	0	54	54
201102	146	136	282	61	75	136	61	68	129	61	54	115	61	34	95	0	27	27
201103	791	269	1060	15	151	166	8	105	113	8	99	106	8	66	73	8	20	27
201104	3613	497	4110	1975	211	2186	1877	170	2047	362	102	464	202	61	264	159	48	207
201105	132	396	528	99	235	334	94	181	276	94	141	235	85	121	206	57	81	137
201106	1434	528	1962	0	190	190	0	142	142	0	95	95	0	74	74	0	54	54
201107	3961	1505	5466	2964	897	3861	1506	843	2349	1496	445	1941	1487	378	1864	1448	223	1671
201108	360	150	510	152	89	241	144	55	199	88	55	143	24	41	65	16	27	43
201109	893	1553	2446	515	716	1231	515	709	1224	356	682	1038	23	74	97	0	68	68
201110	2616	3121	5737	749	2424	3173	586	2268	2854	22	163	184	0	129	129	0	88	88

## 5.10 Little Auk *Alle alle*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	1711	1060	2762	1189	737	1919	1131	701	1826	986	611	1592	725	449	1170	522	323	843
200912	145	33	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	1350	713	2555	529	280	1002	450	238	852	318	168	601	291	154	551	159	84	301
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201011				0			0			0			0			0		
201012	568	281	1150	331	164	671	308	152	623	260	129	527	213	105	431	95	47	192
201101	492	232	1041	187	88	397	94	44	198	70	33	149	47	22	99	47	22	99
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	1711	47	1758	1189	47	1236	1131	34	1165	986	20	1006	725	20	745	522	14	536
200912	145	0	145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	1350	0	1350	529	0	529	450	0	450	318	0	318	291	0	291	159	0	159
201003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201011																		
201012	568	56	624	331	56	387	308	28	336	260	21	281	213	7	220	95	0	95
201101	492	27	519	187	27	215	94	14	107	70	7	77	47	7	54	47	0	47
201102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



## 5.11 Puffin *Fratercula arctica*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	78	24	255	39	12	128	39	12	128	39	12	128	39	12	128	0	0	0
200912	296	60	1469	46	9	226	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	1323	942	1858	705	502	990	546	389	767	503	358	707	345	246	485	288	205	404
201004	5746	3602	9166	3692	2314	5889	3037	1904	4844	2650	1661	4227	2158	1353	3443	1771	1110	2826
201005	3149	1696	5846	1198	645	2224	691	372	1283	599	323	1112	353	190	656	200	108	371
201006	2071	1257	3412	690	419	1137	568	345	935	491	298	809	307	186	505	215	130	354
201007	1739	1100	2749	674	426	1065	501	317	793	423	268	669	376	238	594	204	129	322
201008	25739	15664	42296	14240	8666	23400	13776	8384	22638	10264	6247	16867	4559	2774	7492	2345	1427	3853
201009	1476	1001	2176	1052	714	1551	906	614	1336	775	525	1142	701	476	1034	453	307	668
201010	14067	10530	18790	7993	5983	10677	5940	4447	7935	4750	3555	6344	3353	2510	4478	2174	1628	2904
201011				0			0			0			0			0		
201012	64	20	203	48	15	152	32	10	102	32	10	102	32	10	102	32	10	102
201101	128	49	334	80	31	209	64	25	167	16	6	42	0	0	0	0	0	0
201102	279	214	365	155	119	203	109	83	142	78	59	101	47	36	61	47	36	61
201103	354	177	706	169	85	338	108	54	215	62	31	123	31	15	61	31	15	61
201104	6568	4585	9408	4727	3300	6771	3829	2673	5484	3255	2272	4662	2769	1933	3966	1826	1275	2616
201105	7734	6134	9752	3619	2870	4563	2889	2292	3643	2408	1910	3036	2043	1620	2576	1547	1227	1950
201106	1866	1032	3375	617	341	1116	416	230	753	308	171	558	278	154	502	231	128	418
201107	8475	6213	11561	6739	4940	9193	3279	2404	4473	3038	2227	4144	2628	1927	3585	2278	1670	3108
201108	1705	1142	2547	867	581	1296	763	511	1139	673	451	1005	628	421	938	494	331	737
201109	3358	2171	5193	1405	909	2173	1206	780	1866	833	539	1289	510	330	789	323	209	500
201110	16661	13555	20479	7701	6265	9466	6216	5058	7641	4864	3958	5979	2863	2329	3519	1776	1445	2183

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	78	0	78	39	0	39	39	0	39	39	0	39	39	0	39	0	0	0
200912	296	0	296	46	0	46	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201003	1323	27	1350	705	7	711	546	0	546	503	0	503	345	0	345	288	0	288
201004	5746	844	6590	3692	517	4209	3037	463	3500	2650	422	3072	2158	395	2553	1771	245	2017
201005	3149	463	3612	1198	102	1300	691	89	780	599	61	660	353	41	394	200	20	220
201006	2071	393	2464	690	135	826	568	102	669	491	68	559	307	47	354	215	41	255
201007	1739	495	2234	674	186	859	501	172	673	423	117	540	376	96	472	204	41	245
201008	25739	450	26189	14240	191	14431	13776	177	13953	10264	170	10435	4559	123	4682	2345	116	2460
201009	1476	0	1476	1052	0	1052	906	0	906	775	0	775	701	0	701	453	0	453
201010	14067	0	14067	7993	0	7993	5940	0	5940	4750	0	4750	3353	0	3353	2174	0	2174
201011																		
201012	64	0	64	48	0	48	32	0	32	32	0	32	32	0	32	32	0	32
201101	128	0	128	80	0	80	64	0	64	16	0	16	0	0	0	0	0	0
201102	279	14	293	155	14	169	109	14	122	78	14	91	47	14	60	47	7	53
201103	354	26	380	169	13	182	108	13	121	62	0	62	31	0	31	31	0	31
201104	6568	1007	7575	4727	619	5347	3829	483	4312	3255	374	3629	2769	136	2905	1826	48	1874
201105	7734	1048	8782	3619	511	4130	2889	417	3306	2408	302	2710	2043	188	2231	1547	108	1654
201106	1866	894	2760	617	515	1131	416	460	877	308	311	620	278	217	494	231	129	360
201107	8475	722	9197	6739	405	7144	3279	324	3603	3038	250	3288	2628	202	2831	2278	202	2481
201108	1705	212	1917	867	150	1018	763	96	858	673	82	755	628	61	690	494	55	548
201109	3358	47	3405	1405	14	1419	1206	7	1213	833	7	840	510	7	517	323	0	323
201110	16661	7	16668	7701	7	7708	6216	7	6223	4864	7	4871	2863	0	2863	1776	0	1776

## 5.12 Guillemot *Uria aalge*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	4374	3253	5883	2666	1983	3586	2036	1514	2738	1497	1114	2014	1248	928	1678	1025	762	1378
200912	1652	1026	2660	503	313	810	400	248	644	310	192	499	297	184	478	258	160	416
201001	1016	509	2026	195	98	390	130	65	260	91	46	182	52	26	104	26	13	52
201002	1331	803	2206	504	304	835	258	156	428	129	78	214	90	55	150	65	39	107
201003	4051	2399	6842	906	536	1530	818	484	1381	591	350	999	465	276	786	340	201	574
201004	3770	2068	6872	1716	941	3128	1122	615	2044	824	452	1502	500	274	911	162	89	296
201005	3062	1498	6259	774	379	1582	150	73	307	23	11	47	12	6	24	12	6	24
201006	4456	3094	6418	904	627	1301	743	516	1070	594	413	856	408	284	588	347	241	499
201007	866	607	1235	289	202	412	260	182	371	217	152	309	173	121	247	130	91	185
201008	1579	828	3014	457	240	872	277	145	529	180	94	344	42	22	79	28	15	53
201009	13093	9299	18437	6098	4331	8587	4742	3368	6677	3550	2522	5000	2277	1617	3206	1604	1139	2259
201010	28342	23951	33538	18058	15261	21369	15726	13290	18609	13182	11139	15598	11203	9467	13256	8281	6998	9799
201011				0			0			0			0			0		
201012	3775	2606	5470	2252	1555	3264	1749	1207	2534	1397	964	2024	1044	721	1513	705	486	1021
201101	3402	2194	5274	474	306	735	324	209	502	271	175	420	181	116	280	128	83	198
201102	2627	1425	4843	1205	654	2222	1048	569	1933	844	458	1555	651	353	1200	482	261	889
201103	8741	5614	13609	3096	1988	4820	2100	1349	3270	1651	1060	2571	1056	678	1644	692	444	1077
201104	6310	3978	10007	4532	2857	7187	3695	2329	5859	3410	2150	5407	3237	2041	5134	3013	1899	4778
201105	6071	3883	9492	1585	1014	2479	1204	770	1883	492	314	769	391	250	612	241	154	377
201106	3787	2313	6199	672	410	1099	286	175	469	110	67	180	77	47	126	33	20	54
201107	7701	5307	11175	4310	2970	6254	2459	1695	3568	1851	1275	2686	1475	1017	2141	1152	794	1672
201108	5895	3992	8705	1763	1194	2603	1374	930	2028	939	636	1386	538	364	794	332	225	490
201109	24199	16141	36279	14217	9483	21314	10829	7223	16235	7838	5228	11751	4215	2812	6319	2439	1627	3657
201110	14938	10571	21110	4645	3287	6564	3654	2586	5164	2329	1648	3291	1595	1129	2255	1209	856	1709

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	4374	81	4455	2666	54	2721	2036	47	2083	1497	20	1518	1248	20	1268	1025	14	1038
200912	1652	48	1700	503	14	517	400	14	414	310	14	323	297	7	304	258	7	265
201001	1016	82	1098	195	61	257	130	34	164	91	20	112	52	20	72	26	0	26
201002	1331	243	1574	504	81	585	258	81	339	129	40	170	90	34	124	65	34	98
201003	4051	87	4138	906	67	973	818	33	851	591	20	611	465	13	479	340	13	353
201004	3770	409	4179	1716	279	1995	1122	279	1401	824	266	1090	500	143	643	162	143	305
201005	3062	443	3505	774	238	1013	150	211	361	23	157	180	12	143	155	12	109	121
201006	4456	372	4828	904	142	1046	743	68	810	594	47	642	408	14	422	347	7	353
201007	866	21	887	289	7	296	260	0	260	217	0	217	173	0	173	130	0	130
201008	1579	0	1579	457	0	457	277	0	277	180	0	180	42	0	42	28	0	28
201009	13093	0	13093	6098	0	6098	4742	0	4742	3550	0	3550	2277	0	2277	1604	0	1604
201010	28342	109	28451	18058	68	18126	15726	61	15787	13182	54	13236	11203	41	11243	8281	34	8315
201011																		
201012	3775	371	4146	2252	98	2351	1749	98	1847	1397	28	1425	1044	21	1065	705	21	726
201101	3402	347	3749	474	122	597	324	122	446	271	95	366	181	48	228	128	48	176
201102	2627	742	3369	1205	320	1525	1048	265	1314	844	143	986	651	34	685	482	20	502
201103	8741	394	9135	3096	125	3221	2100	99	2199	1651	59	1710	1056	33	1089	692	33	725
201104	6310	735	7045	4532	626	5158	3695	544	4239	3410	327	3736	3237	306	3543	3013	259	3271
201105	6071	914	6985	1585	544	2130	1204	423	1627	492	275	767	391	235	627	241	94	335
201106	3787	515	4302	672	217	888	286	190	476	110	122	232	77	88	165	33	74	108
201107	7701	209	7910	4310	128	4438	2459	94	2554	1851	67	1918	1475	34	1509	1152	34	1186
201108	5895	27	5922	1763	20	1783	1374	20	1394	939	20	959	538	20	558	332	20	352
201109	24199	0	24199	14217	0	14217	10829	0	10829	7838	0	7838	4215	0	4215	2439	0	2439
201110	14938	54	14992	4645	20	4665	3654	20	3674	2329	20	2349	1595	7	1602	1209	7	1216

### 5.13 Razorbill *Alca torda*

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	873	541	1408	514	318	828	411	255	663	347	215	559	308	191	497	257	159	414
200912	695	358	1352	371	191	721	263	135	511	263	135	511	201	103	391	170	88	330
201001	15	3	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	241	108	534	113	51	251	43	19	94	43	19	94	43	19	94	14	6	31
201003	835	502	1387	245	147	407	158	95	263	130	78	215	115	69	191	43	26	72
201004	376	220	643	105	62	180	0	0	0	0	0	0	0	0	0	0	0	0
201005	257	110	597	14	6	31	14	6	31	0	0	0	0	0	0	0	0	0
201006	273	131	570	96	46	201	96	46	201	64	31	134	48	23	101	48	23	101
201007	152	64	358	38	16	90	0	0	0	0	0	0	0	0	0	0	0	0
201008	5839	4397	7755	4240	3193	5631	3806	2866	5055	2864	2156	3803	2343	1764	3112	1500	1130	1992
201009	3511	2572	4793	1762	1291	2406	1482	1086	2023	1295	949	1768	1081	792	1476	748	548	1021
201010	22661	16562	31007	8557	6254	11708	7337	5363	10040	5358	3916	7331	3814	2788	5219	3054	2232	4178
201011				0			0			0			0			0		
201012	833	516	1343	664	411	1070	579	359	933	579	359	933	579	359	933	296	184	478
201101	279	53	1468	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	1000	571	1752	254	145	445	220	126	386	186	106	327	153	87	267	51	29	89
201103	454	223	926	227	112	463	101	50	206	50	25	103	50	25	103	50	25	103
201104	571	255	1278	367	164	822	231	103	517	190	85	426	163	73	365	109	49	243
201105	1253	646	2430	583	300	1130	510	263	989	408	210	791	350	180	678	306	158	593
201106	361	154	847	204	87	479	157	67	368	31	13	74	16	7	37	16	7	37
201107	1975	1075	3630	846	461	1556	685	373	1259	578	314	1062	430	234	790	376	205	691
201108	851	443	1633	272	141	521	199	104	382	199	104	382	145	75	278	109	57	208
201109	3276	1971	5445	1970	1185	3274	1295	779	2152	856	515	1422	270	163	449	191	115	318
201110	14331	10825	18971	5463	4126	7232	4544	3433	6016	2805	2119	3713	1690	1277	2238	796	601	1054

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	873	61	934	514	27	541	411	14	424	347	7	353	308	7	315	257	7	264
200912	695	14	709	371	7	378	263	7	269	263	7	269	201	0	201	170	0	170
201001	15	14	29	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7
201002	241	101	342	113	0	113	43	0	43	43	0	43	43	0	43	14	0	14
201003	835	201	1036	245	174	419	158	154	312	130	67	196	115	60	175	43	7	50
201004	376	109	485	105	82	187	0	82	82	0	61	61	0	20	20	0	20	20
201005	257	48	305	14	48	61	14	48	61	0	41	41	0	41	41	0	27	27
201006	273	34	307	96	7	103	96	7	103	64	7	71	48	0	48	48	0	48
201007	152	55	207	38	7	45	0	7	7	0	7	7	0	7	7	0	7	7
201008	5839	20	5859	4240	0	4240	3806	0	3806	2864	0	2864	2343	0	2343	1500	0	1500
201009	3511	14	3525	1762	0	1762	1482	0	1482	1295	0	1295	1081	0	1081	748	0	748
201010	22661	285	22946	8557	34	8591	7337	34	7371	5358	7	5364	3814	0	3814	3054	0	3054
201011																		
201012	833	7	840	664	7	671	579	7	586	579	7	586	579	7	586	296	7	303
201101	279	14	293	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201102	1000	48	1048	254	20	275	220	20	241	186	20	207	153	14	166	51	0	51
201103	454	92	546	227	0	227	101	0	101	50	0	50	50	0	50	50	0	50
201104	571	95	666	367	75	442	231	48	279	190	27	218	163	27	190	109	14	122
201105	1253	141	1394	583	60	643	510	47	557	408	40	448	350	40	390	306	40	346
201106	361	115	476	204	61	265	157	54	211	31	34	65	16	27	43	16	20	36
201107	1975	88	2063	846	34	880	685	34	719	578	27	605	430	0	430	376	0	376
201108	851	0	851	272	0	272	199	0	199	199	0	199	145	0	145	109	0	109
201109	3276	0	3276	1970	0	1970	1295	0	1295	856	0	856	270	0	270	191	0	191
201110	14331	711	15042	5463	311	5774	4544	244	4788	2805	230	3035	1690	149	1839	796	81	877

## 5.14 Small auk species

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	1195	802	1780	820	551	1222	785	527	1169	660	443	983	499	335	744	321	215	478
200912	402	129	1250	40	13	125	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	873	483	1577	336	186	607	285	158	516	201	111	364	185	102	334	101	56	182
201003	1386	987	1946	738	526	1036	572	408	804	527	375	740	362	257	508	301	215	423
201004	6221	3900	9925	3997	2506	6377	3288	2061	5245	2869	1798	4577	2337	1465	3728	1918	1202	3060
201005	3451	1859	6408	1313	707	2438	758	408	1407	657	354	1219	387	209	719	219	118	406
201006	2235	1356	3683	745	452	1228	613	372	1009	530	321	873	331	201	546	232	141	382
201007	1900	1202	3004	736	466	1164	548	347	866	462	292	731	411	260	650	223	141	352
201008	25000	15206	41102	13831	8413	22739	13381	8139	21999	9970	6064	16391	4428	2693	7280	2277	1385	3744
201009	1580	1072	2329	1126	764	1660	970	658	1430	829	563	1222	751	509	1107	485	329	715
201010	13953	10445	18639	7928	5935	10591	5892	4411	7871	4711	3527	6293	3326	2489	4442	2157	1615	2881
201011				0			0			0			0			0		
201012	423	252	711	257	153	432	227	135	381	196	117	330	166	99	279	91	54	152
201101	471	297	747	211	133	335	130	82	206	65	41	103	32	20	52	32	20	52
201102	306	234	400	170	130	222	119	91	156	85	65	111	51	39	67	51	39	67
201103	387	194	773	185	93	370	118	59	235	67	34	134	34	17	67	34	17	67
201104	6988	4878	10010	5029	3511	7205	4074	2844	5835	3463	2417	4960	2946	2056	4219	1943	1356	2783
201105	8609	6828	10855	4028	3195	5079	3216	2551	4055	2680	2126	3379	2274	1804	2867	1722	1366	2171
201106	2091	1156	3782	691	382	1250	467	258	844	346	191	625	311	172	563	259	143	469
201107	9055	6638	12352	7200	5278	9822	3503	2568	4779	3246	2379	4428	2808	2058	3830	2434	1785	3321
201108	1839	1231	2747	936	626	1398	823	551	1229	726	486	1084	678	454	1012	532	356	795
201109	3464	2239	5358	1450	937	2242	1244	804	1925	860	556	1330	526	340	814	334	216	516
201110	16869	13724	20734	7797	6343	9583	6294	5121	7736	4925	4007	6054	2899	2358	3563	1798	1463	2210

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	1195	47	1242	820	34	854	785	20	805	660	20	680	499	20	520	321	14	335
200912	402	0	402	40	0	40	0	0	0	0	0	0	0	0	0	0	0	0
201001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201002	873	0	873	336	0	336	285	0	285	201	0	201	185	0	185	101	0	101
201003	1386	27	1413	738	7	745	572	0	572	527	0	527	362	0	362	301	0	301
201004	6221	844	7065	3997	517	4514	3288	463	3751	2869	422	3291	2337	395	2732	1918	245	2163
201005	3451	463	3914	1313	102	1415	758	89	846	657	61	718	387	41	428	219	20	239
201006	2235	393	2628	745	135	880	613	102	714	530	68	598	331	47	379	232	41	272
201007	1900	495	2395	736	186	922	548	172	720	462	117	579	411	96	507	223	41	264
201008	25000	450	25450	13831	191	14022	13381	177	13558	9970	170	10140	4428	123	4551	2277	116	2393
201009	1580	0	1580	1126	0	1126	970	0	970	829	0	829	751	0	751	485	0	485
201010	13953	0	13953	7928	0	7928	5892	0	5892	4711	0	4711	3326	0	3326	2157	0	2157
201011																		
201012	423	56	479	257	28	285	227	21	248	196	7	203	166	7	173	91	0	91
201101	471	27	498	211	14	225	130	7	137	65	7	72	32	7	39	32	0	32
201102	306	14	320	170	14	184	119	14	133	85	14	99	51	14	65	51	7	58
201103	387	26	413	185	13	198	118	13	131	67	0	67	34	0	34	34	0	34
201104	6988	1007	7995	5029	619	5649	4074	483	4557	3463	374	3837	2946	136	3082	1943	48	1990
201105	8609	1048	9657	4028	511	4539	3216	417	3633	2680	302	2983	2274	188	2462	1722	108	1829
201106	2091	894	2985	691	515	1206	467	460	927	346	311	657	311	217	528	259	129	388
201107	9055	722	9777	7200	405	7605	3503	324	3827	3246	250	3496	2808	202	3010	2434	202	2637
201108	1839	212	2051	936	150	1086	823	96	918	726	82	808	678	61	739	532	55	587
201109	3464	47	3511	1450	14	1463	1244	7	1251	860	7	866	526	7	533	334	0	334
201110	16869	7	16876	7797	7	7804	6294	7	6301	4925	7	4932	2899	0	2899	1798	0	1798



## 5.15 Large auk species

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	5420	4024	7299	3213	2386	4327	2491	1849	3354	1820	1351	2450	1536	1140	2068	1265	939	1703
200912	2405	1559	3711	881	571	1359	670	434	1034	552	358	852	473	307	730	407	264	629
201001	1037	527	2040	197	100	387	131	67	258	92	47	181	53	27	103	26	13	52
201002	1706	1056	2757	669	414	1082	315	195	509	171	106	276	131	81	212	79	49	127
201003	4980	3001	8264	1111	669	1843	949	572	1574	699	421	1160	562	338	932	374	226	621
201004	4165	2367	7329	1844	1048	3244	1133	644	1994	833	473	1466	505	287	889	164	93	288
201005	3368	1686	6728	774	387	1546	159	80	318	23	11	45	11	6	23	11	6	23
201006	4883	3411	6991	1110	776	1590	833	582	1192	656	458	939	454	317	650	391	273	560
201007	1019	725	1433	330	235	464	270	192	379	225	160	316	180	128	253	135	96	190
201008	7384	5930	9194	4769	3830	5938	4171	3350	5194	3038	2440	3783	2391	1920	2977	1532	1230	1907
201009	17815	13020	24375	7322	5351	10018	5844	4271	7996	4595	3358	6287	3194	2334	4370	2303	1683	3151
201010	58381	47163	72268	30793	24876	38117	26244	21201	32486	21934	17720	27152	14457	11679	17896	10709	8652	13257
201011				0			0			0			0			0		
201012	4744	3450	6524	3032	2205	4169	2435	1771	3349	2068	1504	2843	1636	1190	2250	1040	756	1430
201101	3573	2344	5447	489	321	745	336	220	512	275	180	419	183	120	279	130	85	198
201102	3705	2152	6379	1518	882	2614	1312	762	2259	1068	620	1838	836	486	1440	579	336	997
201103	9552	6213	14687	3484	2266	5356	2302	1497	3539	1773	1153	2725	1169	761	1798	775	504	1192
201104	6880	4289	11035	4963	3094	7960	4034	2515	6471	3722	2320	5970	3531	2201	5664	3271	2039	5246
201105	7392	4688	11655	2118	1343	3340	1658	1052	2614	824	522	1299	674	427	1063	481	305	759
201106	4161	2593	6677	832	519	1335	405	252	650	135	84	217	90	56	144	45	28	72
201107	9771	6618	14427	5238	3548	7734	3213	2177	4745	2430	1646	3587	1907	1292	2816	1528	1035	2257
201108	7006	4805	10214	1944	1333	2834	1507	1034	2197	1070	734	1560	633	434	922	403	276	587
201109	29784	21642	40991	17349	12606	23877	12840	9330	17672	8776	6377	12078	4847	3522	6670	3099	2252	4265
201110	29443	22100	39227	9955	7472	13263	8121	6096	10820	5080	3813	6768	3294	2473	4389	1931	1449	2572

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	5420	183	5603	3213	88	3301	2491	61	2552	1820	27	1847	1536	27	1563	1265	20	1285
200912	2405	103	2508	881	55	935	670	55	725	552	55	607	473	41	514	407	27	435
201001	1037	122	1159	197	88	285	131	61	192	92	41	133	53	41	93	26	20	47
201002	1706	377	2083	669	94	764	315	94	409	171	40	211	131	34	165	79	34	112
201003	4980	368	5348	1111	321	1432	949	268	1216	699	167	866	562	154	716	374	20	395
201004	4165	572	4737	1844	409	2252	1133	409	1542	833	327	1160	505	163	669	164	163	327
201005	3368	490	3858	774	286	1060	159	259	418	23	197	220	11	184	195	11	136	148
201006	4883	406	5289	1110	149	1259	833	74	907	656	54	710	454	14	468	391	7	398
201007	1019	76	1095	330	14	343	270	7	277	225	7	232	180	7	187	135	7	142
201008	7384	34	7418	4769	0	4769	4171	0	4171	3038	0	3038	2391	0	2391	1532	0	1532
201009	17815	14	17829	7322	0	7322	5844	0	5844	4595	0	4595	3194	0	3194	2303	0	2303
201010	58381	468	58849	30793	136	30928	26244	102	26346	21934	61	21995	14457	41	14498	10709	34	10743
201011																		
201012	4744	413	5157	3032	112	3144	2435	112	2548	2068	42	2110	1636	28	1664	1040	28	1068
201101	3573	360	3933	489	122	611	336	122	458	275	95	370	183	48	231	130	48	177
201102	3705	932	4637	1518	429	1947	1312	374	1686	1068	252	1319	836	136	972	579	102	681
201103	9552	545	10097	3484	131	3615	2302	105	2407	1773	66	1838	1169	39	1209	775	33	808
201104	6880	830	7710	4963	701	5664	4034	592	4626	3722	354	4076	3531	333	3865	3271	272	3543
201105	7392	1109	8501	2118	605	2723	1658	470	2128	824	316	1140	674	275	949	481	134	616
201106	4161	636	4797	832	284	1117	405	251	655	135	163	297	90	122	212	45	95	140
201107	9771	297	10068	5238	162	5400	3213	128	3342	2430	94	2524	1907	34	1941	1528	34	1562
201108	7006	27	7033	1944	20	1965	1507	20	1528	1070	20	1090	633	20	653	403	20	423
201109	29784	0	29784	17349	0	17349	12840	0	12840	8776	0	8776	4847	0	4847	3099	0	3099
201110	29443	765	30208	9955	332	10287	8121	264	8385	5080	251	5331	3294	156	3450	1931	88	2019

## 5.16 All auk species

Population estimates of sitting birds (including lower and higher range estimates) for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers, DA +1+2 km buffers, DA +1 km buffers, and Development Area.

Survey (yyyy-mm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+2 km buffers			DA + 1 km buffers			Development Area		
	Pop. estimate sitting	Lower 95% Conf. interval	Higher 95% Conf. interval	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate	Pop. estimate sitting	Lower range estimate	Higher range estimate
200911	6652	5030	8797	3944	2982	5215	3057	2311	4042	2233	1689	2953	1885	1425	2492	1552	1174	2053
200912	2773	1789	4297	1015	655	1573	773	499	1198	636	411	986	546	352	845	470	303	728
201001	1055	536	2074	200	102	394	134	68	263	93	47	184	53	27	105	27	14	53
201002	2498	1822	3425	980	715	1344	461	336	632	250	182	343	192	140	263	115	84	158
201003	6201	4125	9322	1383	920	2079	1181	786	1776	870	579	1308	699	465	1051	466	310	701
201004	9834	6002	16113	4353	2657	7132	2676	1633	4385	1967	1200	3223	1193	728	1955	387	236	634
201005	6371	3648	11127	1464	838	2556	301	173	526	43	25	75	22	12	38	22	12	38
201006	7070	4928	10143	1608	1121	2306	1206	840	1730	950	662	1363	658	458	944	566	395	812
201007	2666	1852	3837	863	599	1241	706	490	1016	588	409	846	470	327	677	353	245	508
201008	29565	22119	39519	19095	14286	25524	16702	12496	22325	12165	9101	16261	9572	7162	12795	6132	4588	8197
201009	20155	14799	27449	8283	6082	11281	6612	4855	9005	5199	3817	7080	3613	2653	4921	2605	1913	3548
201010	71784	59644	86394	37862	31459	45568	32269	26812	38836	26970	22409	32459	17776	14770	21394	13168	10941	15848
201011				0			0			0			0			0		
201012	5201	3858	7012	3324	2465	4481	2670	1981	3600	2267	1681	3056	1794	1331	2419	1140	846	1537
201101	4092	2878	5817	560	394	795	385	271	547	315	221	447	210	148	298	149	105	211
201102	4025	2428	6672	1649	995	2734	1426	860	2363	1160	700	1923	908	548	1506	629	379	1043
201103	9934	6671	14794	3623	2433	5395	2394	1608	3565	1843	1238	2745	1216	817	1811	806	542	1201
201104	13247	8934	19643	9555	6444	14169	7768	5239	11518	7166	4833	10627	6799	4585	10082	6298	4247	9338
201105	14845	11331	19450	4254	3247	5573	3330	2542	4363	1654	1263	2167	1353	1033	1773	967	738	1267
201106	5758	3676	9020	1152	735	1804	560	358	878	187	119	293	124	79	195	62	40	98
201107	17854	13956	22842	9571	7482	12246	5872	4590	7512	4440	3470	5680	3485	2724	4458	2793	2183	3573
201108	8731	6411	11891	2423	1779	3300	1878	1379	2558	1333	979	1816	789	579	1074	502	368	683
201109	33198	26721	41246	19338	15565	24026	14312	11520	17782	9782	7873	12153	5402	4348	6712	3454	2780	4292
201110	44784	35900	55867	15142	12138	18889	12352	9902	15409	7727	6194	9639	5011	4017	6251	2937	2354	3663

Population estimates of sitting and flying birds for the Neart na Gaoithe, DA +1+2+3+4 km buffers, DA +1+2+3 km buffers , DA +1+2 km buffers , DA +1 km buffers , and Development Area.

Survey (yyymm)	Neart na Gaoithe			DA + 1+2+3+4 km buffers			DA + 1+2+3 km buffers			DA + 1+ 2 km buffers			DA + 1km			DA		
	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total	Pop. estimate sitting	Pop. estimate flying	Pop. estimate total
200911	6652	231	6883	3944	111	4055	3057	77	3134	2233	34	2267	1885	34	1919	1552	26	1578
200912	2773	103	2876	1015	55	1070	773	55	828	636	55	691	546	41	587	470	27	497
201001	1055	122	1177	200	88	289	134	61	195	93	41	134	53	41	94	27	20	47
201002	2498	377	2875	980	94	1074	461	94	555	250	40	290	192	34	226	115	34	149
201003	6201	395	6596	1383	344	1728	1181	287	1468	870	179	1050	699	165	864	466	22	488
201004	9834	1416	11250	4353	1012	5364	2676	1012	3688	1967	809	2776	1193	405	1598	387	405	792
201005	6371	953	7324	1464	556	2020	301	503	805	43	384	427	22	358	379	22	265	286
201006	7070	799	7869	1608	293	1901	1206	147	1352	950	107	1057	658	27	684	566	13	580
201007	2666	570	3236	863	104	966	706	52	758	588	52	640	470	52	522	353	52	405
201008	29565	484	30049	19095	0	19095	16702	0	16702	12165	0	12165	9572	0	9572	6132	0	6132
201009	20155	14	20169	8283	0	8283	6612	0	6612	5199	0	5199	3613	0	3613	2605	0	2605
201010	71784	468	72252	37862	136	37998	32269	102	32371	26970	61	27031	17776	41	17817	13168	34	13202
201011																		
201012	5201	470	5671	3324	127	3451	2670	127	2797	2267	48	2314	1794	32	1826	1140	32	1172
201101	4092	388	4480	560	132	691	385	132	516	315	102	417	210	51	261	149	51	200
201102	4025	946	4971	1649	435	2084	1426	380	1805	1160	255	1415	908	138	1046	629	104	732
201103	9934	572	10506	3623	138	3761	2394	110	2504	1843	69	1912	1216	41	1257	806	34	841
201104	13247	1838	15085	9555	1551	11107	7768	1310	9078	7166	783	7950	6799	738	7537	6298	602	6900
201105	14845	2157	17002	4254	1176	5430	3330	915	4245	1654	614	2269	1353	536	1889	967	261	1228
201106	5758	1530	7288	1152	684	1835	560	602	1163	187	391	577	124	293	418	62	228	290
201107	17854	1019	18873	9571	556	10127	5872	440	6312	4440	324	4764	3485	116	3601	2793	116	2908
201108	8731	239	8970	2423	179	2602	1878	179	2057	1333	179	1513	789	179	968	502	179	681
201109	33198	54	33252	19338	0	19338	14312	0	14312	9782	0	9782	5402	0	5402	3454	0	3454
201110	44784	772	45556	15142	335	15477	12352	266	12619	7727	253	7980	5011	157	5168	2937	89	3025

## 6 Collision rate modelling

### 6.1 Introduction

Below the results of the collision rate modelling are presented for year 1 (November 2009 to October 2010), year 2 (November 2010 to October 2011) and on the basis of both years of data. A total of four wind farm variants were modelled. The parameters of each variant that were used in the collision rate modelling are given in table 6.1.1. For each of the wind farm variants a monthly operating time was provided by Mainstream (table 6.1.2).

**Table 6.1.1** *Parameters used in collision rate modelling, for four wind farm variants at Neart na Gaoithe.*

Variant	Number of blades	Rotation speed (rpm)	Rotor radius (m)	Minimum rotor height	Maximum blade width (m)	Pitch (°)	Number of turbines	Latitude (DD)
128 x 3.6MW	3	13	60	24	4.2	15 <sup>2</sup>	128	56.25
109 x 4.135MW	3	18	56.25	24	4.2 <sup>1</sup>	15 <sup>2</sup>	109	56.25
75 x 6MW	3	13	60.5	24	4.2 <sup>1</sup>	15 <sup>2</sup>	75	56.25
64 x 7MW	3	12.1	82	24	5.4	15 <sup>2</sup>	64	56.25

<sup>1</sup> Data estimated based on other turbine models. <sup>2</sup> Data based on nominal value.

**Table 6.1.2** *Monthly operating times as used in collision rate modelling, for four wind farm variants at Neart na Gaoithe. Figures were provided by Mainstream.*

Variant	Proportion of time in operation											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
128 x 3.6MW	0.88	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.88	0.89	0.89	0.89
109 x 4.135MW	0.88	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.88	0.89	0.89	0.89
75 x 6MW	0.88	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.88	0.89	0.89	0.89
64 x 7MW	0.85	0.85	0.84	0.82	0.80	0.80	0.78	0.79	0.82	0.84	0.85	0.85

For each of the four wind farm variants, collision rate modelling was carried out for a total of 34 species or species-groups. For 12 species this was based on recorded densities and for the 22 additional species on a predefined flux of 1,000 bird passages occurring twice a year. The parameters of each species that were used in the collision rate modelling are given in table 6.1.3.

**Table 6.1.3** *Parameters used in collision rate modelling for twelve bird species.*

Species	Length <sup>1</sup> (m)	Wingspan <sup>1</sup> (m)	Flight speed (m/s)	Flapping (0) or gliding (1)	Nocturnal activity factor <sup>5</sup> (1-5)	Proportion at rotor height <sup>6</sup>
Gannet	0.935	1.725	14.9 <sup>3</sup>	0	2	0.065
Kittiwake	0.39	1.075	13.1 <sup>2</sup>	0	3	0.060
Guillemot	0.395	0.67	19.1 <sup>4</sup>	0	2	0.000
Razorbill	0.38	0.655	16 <sup>4</sup>	0	1	0.000
Puffin	0.275	0.55	17.6 <sup>3</sup>	0	1	0.000
Herring Gull	0.61	1.44	12.8 <sup>2</sup>	0	3	0.310
Pink-footed Goose	0.76	1.61	17.3 <sup>2</sup>	0	5	0.426
Great Skua	0.58	1.40	15.6 <sup>2</sup>	0	1	0.028
Little Gull	0.28	0.69	11.5 <sup>2</sup>	0	2	0.306
Lesser Black-backed Gull	0.56	1.34	13.1 <sup>2</sup>	0	3	0.155
Great Black-backed Gull	0.74	1.66	13.7 <sup>2</sup>	0	3	0.197
Large gulls combined	0.64 <sup>7</sup>	1.48 <sup>7</sup>	13.2 <sup>7</sup>	0	3	0.274
<i>additional species</i>						
Red-throated Diver	0.74	1.1	18.6	0	1	0.02 <sup>9</sup>
Black-throated Diver	0.85	1.22	19.3	0	1	0.01 <sup>9</sup>
Bean Goose	0.88	1.74	17.3	0	5	0.75 <sup>9</sup>
Pink-footed goose	0.76	1.61	17.3 <sup>2</sup>	0	5	0.75 <sup>9</sup>
Barnacle Goose	0.7	1.42	17	0	5	0.75 <sup>9</sup>
Bar-tailed Godwit	0.41	0.72	18.3	0	5	0.75 <sup>9</sup>
Black-tailed Godwit	0.42	0.74	18.3	0	5	0.75 <sup>9</sup>
Knot	0.26	0.53	20.1	0	5	0.75 <sup>9</sup>
Curlew	0.57	1.06	16.3	0	5	0.75 <sup>9</sup>
Dunlin	0.21	0.36	15.3	0	5	0.75 <sup>9</sup>
Sanderling	0.21	0.45	15.3	0	5	0.75 <sup>9</sup>
Grey Plover	0.29	0.63	17.9	0	5	0.75 <sup>9</sup>
Lapwing	0.31	0.72	12.8	0	5	0.75 <sup>9</sup>
Ringed Plover	0.2	0.41	19.5	0	5	0.75 <sup>9</sup>
Redshank	0.27	0.53	9.6	0	5	0.75 <sup>9</sup>
Turnstone	0.24	0.49	14.9	0	5	0.75 <sup>9</sup>
Oystercatcher	0.44	0.83	13	0	1	0.75 <sup>9</sup>
Arctic Skua	0.405	1.13	13.3 <sup>3</sup>	0	1	0.038 <sup>9</sup>
Great Skua	0.58	1.40	15.6 <sup>2</sup>	0	1	0.043 <sup>9</sup>
Common Tern	0.355	0.75	10.55	0	1	0.127 <sup>9</sup>
Arctic Tern	0.36	0.715	10.9	0	1	0.028 <sup>9</sup>
Sandwich Tern	0.43	0.97	11.8 <sup>8</sup>	0	1	0.036 <sup>9</sup>

<sup>1</sup> Taken from Cramp & Perrins (1974-1994) or Snow & Perrins (1997)

<sup>2</sup> Taken from Alerstam et al. (2007).

<sup>3</sup> Taken from Pennycuik (1997).

<sup>4</sup> Taken from Pennycuik (1987).

<sup>5</sup> Taken from Garthe & Hüppop (2004).

<sup>6</sup> Based on observed flight heights from ship-based surveys carried out at Neart na Gaoithe between November 2009 and October 2011.

<sup>7</sup> Taken as the mean values of Herring Gull, Lesser Black-backed Gull and Great Black-backed Gull.

<sup>8</sup> Taken from Wakeling & Hodgson (1992).

<sup>9</sup> Taken from Cook et al. (in prep).

Results of the collision rate modelling are given in sections 6.2 to 6.5. Firstly, data based on the densities of birds recorded during the first study year are presented, followed by those based on densities during the second study year and then the mean densities from both years. Finally the results for the additional species are presented, which are based on densities calculated from fluxes of 1,000 in the month of April and 1,000 in September (see 2.3). Note that results for Pink-footed Goose and Great Skua in 6.2 to 6.4 are based on recorded densities and use the recorded proportions at rotor height.

## 6.2 Results Year 1

Table 6.2.1 Densities of flying birds at Neart na Gaoithe development area between November 2009 and October 2010. Data gathered during ship-based surveys, see section 2.1.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.064	0.188	4.079	1.216	1.451	2.208	0.838	1.667	1.506	1.506	0.192	0.000
Kittiwake	0.000	0.000	0.000	0.064	0.396	0.189	0.387	0.064	1.255	1.255	0.192	0.127
Guillemot	0.064	0.313	0.118	1.345	1.055	0.063	0.000	0.000	0.000	0.314	0.128	0.064
Razorbill	0.064	0.000	0.059	0.192	0.264	0.000	0.064	0.000	0.000	0.000	0.064	0.000
Puffin	0.000	0.000	0.000	2.305	0.198	0.379	0.387	1.090	0.000	0.000	0.000	0.000
Herring Gull	0.192	0.063	0.236	0.064	0.000	0.063	0.000	0.000	0.000	0.000	0.192	0.255
Pink-footed Goose	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Great Skua	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Little Gull	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063	0.000	0.000
Lesser Black-backed Gull	0.000	0.000	0.000	0.064	0.066	0.000	0.064	0.000	0.000	0.000	0.000	0.000
Great Black-backed Gull	0.128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.000	0.064	0.191
Large gulls combined	0.320	0.063	0.236	0.128	0.066	0.063	0.064	0.000	0.066	0.000	0.256	0.445



**Table 6.2.2 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of transits through the rotor-swept area.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.075	973	2888	78550	25397	34349	53155	20409	37522	66986	27059	2949	0	350235
Kittiwake	0.060	0	0	0	1253	8453	4032	8404	1329	29753	22905	3181	2091	81400
Guillemot	0.053	0	38	18	220	196	12	0	0	0	44	15	7	550
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	0	0	259	26	53	54	135	0	0	0	0	528
Herring Gull	0.068	16207	5055	22598	6315	0	6776	0	0	0	0	16039	21084	94074
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.065	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.055	0	0	0	0	0	0	0	0	0	4121	0	0	4121
Lesser Black-backed Gull	0.066	0	0	0	3242	3646	0	3625	0	0	0	0	0	10514
Great Black-backed Gull	0.072	7343	0	0	0	0	0	0	0	4248	0	3634	10747	25971
Large gulls combined	0.068	24676	4618	20644	11538	6488	6190	6451	0	5709	0	19537	33706	139558

**Neart na Gaoithe 109 x 4.135MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.084	776	2305	62709	20275	27423	42435	16293	29955	53477	21603	2354	0	279607
Kittiwake	0.066	0	0	0	1000	6748	3219	6710	1061	23753	18286	2540	1669	64985
Guillemot	0.056	0	30	14	176	156	9	0	0	0	35	12	6	439
Razorbill	0.059	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.055	0	0	0	207	21	42	43	108	0	0	0	0	421
Herring Gull	0.076	12939	4036	18041	5041	0	5409	0	0	0	0	12805	16832	75103
Pink-footed Goose	0.075	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.071	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.061	0	0	0	0	0	0	0	0	0	3290	0	0	3290
Lesser Black-backed Gull	0.073	0	0	0	2588	2911	0	2894	0	0	0	0	0	8393
Great Black-backed Gull	0.080	5862	0	0	0	0	0	0	0	3391	0	2901	8579	20734
Large gulls combined	0.076	19700	3687	16481	9211	5180	4942	5150	0	4558	0	15597	26909	111414

**Neart na Gaoithe 75 x 6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.074	575	1706	46409	15005	20294	31405	12058	22169	39576	15987	1742	0	206926
Kittiwake	0.059	0	0	0	740	4994	2382	4966	785	17578	13533	1880	1235	48953
Guillemot	0.053	0	22	11	130	116	7	0	0	0	26	9	4	325
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	0	0	153	16	31	32	80	0	0	0	0	312
Herring Gull	0.067	9576	2987	13351	3731	0	4003	0	0	0	0	9476	12457	55811
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.064	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.055	0	0	0	0	0	0	0	0	0	2435	0	0	2435
Lesser Black-backed Gull	0.065	0	0	0	1915	2154	0	2142	0	0	0	0	0	6212
Great Black-backed Gull	0.071	4338	0	0	0	0	0	0	0	2510	0	2147	6349	15344
Large gulls combined	0.068	14579	2728	12197	6817	3833	3657	3811	0	3373	0	11543	19914	82453

**Neart na Gaoithe 64 x 7MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.068	665	1973	53676	17354	23472	36322	13946	25640	45774	18491	2015	0	239327
Kittiwake	0.055	0	0	0	856	5776	2755	5743	908	20331	15652	2174	1429	55624
Guillemot	0.049	0	26	12	150	134	8	0	0	0	30	11	5	376
Razorbill	0.050	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.047	0	0	0	177	18	36	37	92	0	0	0	0	361
Herring Gull	0.063	11075	3454	15442	4315	0	4630	0	0	0	0	10960	14407	64284
Pink-footed Goose	0.061	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.058	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.053	0	0	0	0	0	0	0	0	0	2816	0	0	2816
Lesser Black-backed Gull	0.060	0	0	0	2215	2492	0	2477	0	0	0	0	0	7184
Great Black-backed Gull	0.065	5018	0	0	0	0	0	0	0	2902	0	2483	7344	17747
Large gulls combined	0.063	16862	3156	14107	7884	4434	4230	4408	0	3901	0	13350	23033	95364

**Table 6.2.3 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of collisions assuming an avoidance rate of 95%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	rate 0.95	0.95	
Gannet	3	10	260	83	111	171	65	120	220	90	10	0	0	0	1143
Kittiwake	0	0	0	3	22	10	21	3	78	61	8	6	0	0	213
Guillemot	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	49	15	68	19	0	20	0	0	0	0	48	64	0	0	282
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	10	0	0	0	0	10
Lesser Black-backed Gull	0	0	0	9	10	0	10	0	0	0	0	0	0	0	30
Great Black-backed Gull	23	0	0	0	0	0	0	0	13	0	12	34	0	0	82
Large gulls combined	74	14	63	35	19	18	19	0	17	0	59	102	0	0	421

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	rate 0.95	0.95	
Gannet	3	9	233	74	100	154	59	106	197	80	9	0	0	0	1025
Kittiwake	0	0	0	3	19	9	19	3	68	53	7	5	0	0	187
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	43	14	61	17	0	18	0	0	0	0	43	57	0	0	252
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
Lesser Black-backed Gull	0	0	0	8	9	0	9	0	0	0	0	0	0	0	27
Great Black-backed Gull	21	0	0	0	0	0	0	0	12	0	10	30	0	0	73
Large gulls combined	66	13	56	31	17	16	17	0	15	0	53	91	0	0	375

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	rate 0.95	0.95	
Gannet	2	8	153	49	65	101	38	71	129	53	6	0	0	0	671
Kittiwake	0	0	0	2	13	6	13	2	46	36	5	3	0	0	125
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	28	9	40	11	0	12	0	0	0	0	28	37	0	0	166
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
Lesser Black-backed Gull	0	0	0	5	6	0	6	0	0	0	0	0	0	0	18
Great Black-backed Gull	14	0	0	0	0	0	0	0	8	0	7	20	0	0	48
Large gulls combined	44	8	37	20	11	11	11	0	10	0	35	60	0	0	247

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	rate 0.95	0.95	
Gannet	2	8	155	46	64	99	37	69	128	53	6	0	0	0	667
Kittiwake	0	0	0	2	13	6	12	2	46	36	5	3	0	0	126
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	30	9	41	11	0	12	0	0	0	0	29	38	0	0	170
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
Lesser Black-backed Gull	0	0	0	5	6	0	6	0	0	0	0	0	0	0	17
Great Black-backed Gull	14	0	0	0	0	0	0	0	8	0	7	20	0	0	49
Large gulls combined	45	8	37	20	11	11	11	0	10	0	36	61	0	0	251

**Table 6.2.4 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of collisions assuming an avoidance rate of 98%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
	per month with avoidance rate 0.98 Jan	per month with avoidance rate 0.98 Feb	per month with avoidance rate 0.98 Mar	per month with avoidance rate 0.98 Apr	per month with avoidance rate 0.98 May	per month with avoidance rate 0.98 Jun	per month with avoidance rate 0.98 Jul	per month with avoidance rate 0.98 Aug	per month with avoidance rate 0.98 Sep	per month with avoidance rate 0.98 Oct	per month with avoidance rate 0.98 Nov	per month with avoidance rate 0.98 Dec	per month with avoidance rate 0.98		
Gannet	1	4	104	33	44	69	26	48	88	36	4	0	457		
Kittiwake	0	0	0	1	9	4	9	1	31	24	3	2	85		
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1		
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0		
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0		
Herring Gull	19	6	27	8	0	8	0	0	0	0	19	25	113		
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0		
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0		
Little Gull	0	0	0	0	0	0	0	0	0	4	0	0	4		
Lesser Black-backed Gull	0	0	0	4	4	0	4	0	0	0	0	0	12		
Great Black-backed Gull	9	0	0	0	0	0	0	0	5	0	5	14	33		
Large gulls combined	30	6	25	14	8	7	8	0	7	0	24	41	168		

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
	per month with avoidance rate 0.98 Jan	per month with avoidance rate 0.98 Feb	per month with avoidance rate 0.98 Mar	per month with avoidance rate 0.98 Apr	per month with avoidance rate 0.98 May	per month with avoidance rate 0.98 Jun	per month with avoidance rate 0.98 Jul	per month with avoidance rate 0.98 Aug	per month with avoidance rate 0.98 Sep	per month with avoidance rate 0.98 Oct	per month with avoidance rate 0.98 Nov	per month with avoidance rate 0.98 Dec	per month with avoidance rate 0.98	
Gannet	1	3	93	30	40	61	23	43	79	32	4	0	410	
Kittiwake	0	0	0	1	8	4	8	1	27	21	3	2	75	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	17	5	24	7	0	7	0	0	0	0	17	23	101	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	0	4	0	0	4	
Lesser Black-backed Gull	0	0	0	3	4	0	4	0	0	0	0	0	11	
Great Black-backed Gull	8	0	0	0	0	0	0	0	5	0	4	12	29	
Large gulls combined	27	5	22	12	7	7	7	0	6	0	21	37	150	

**Neart na Gaoithe 75 x 6MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
	per month with avoidance rate 0.98 Jan	per month with avoidance rate 0.98 Feb	per month with avoidance rate 0.98 Mar	per month with avoidance rate 0.98 Apr	per month with avoidance rate 0.98 May	per month with avoidance rate 0.98 Jun	per month with avoidance rate 0.98 Jul	per month with avoidance rate 0.98 Aug	per month with avoidance rate 0.98 Sep	per month with avoidance rate 0.98 Oct	per month with avoidance rate 0.98 Nov	per month with avoidance rate 0.98 Dec	per month with avoidance rate 0.98	
Gannet	1	2	61	19	26	40	15	28	52	21	2	0	269	
Kittiwake	0	0	0	1	5	2	5	1	18	14	2	1	50	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	11	4	16	4	0	5	0	0	0	0	11	15	66	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	0	2	0	0	2	
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	7	
Great Black-backed Gull	5	0	0	0	0	0	0	0	3	0	3	8	19	
Large gulls combined	17	3	15	8	5	4	4	0	4	0	14	24	99	

**Neart na Gaoithe 64 x 7MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
	per month with avoidance rate 0.98 Jan	per month with avoidance rate 0.98 Feb	per month with avoidance rate 0.98 Mar	per month with avoidance rate 0.98 Apr	per month with avoidance rate 0.98 May	per month with avoidance rate 0.98 Jun	per month with avoidance rate 0.98 Jul	per month with avoidance rate 0.98 Aug	per month with avoidance rate 0.98 Sep	per month with avoidance rate 0.98 Oct	per month with avoidance rate 0.98 Nov	per month with avoidance rate 0.98 Dec	per month with avoidance rate 0.98	
Gannet	1	2	62	19	26	39	15	28	51	21	2	0	267	
Kittiwake	0	0	0	1	5	2	5	1	18	15	2	1	50	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	12	4	16	4	0	5	0	0	0	0	12	15	68	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	0	2	0	0	2	
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	7	
Great Black-backed Gull	6	0	0	0	0	0	0	0	3	0	3	8	20	
Large gulls combined	18	3	15	8	4	4	4	0	4	0	14	25	101	

**Table 6.2.5 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of collisions assuming an avoidance rate of 99%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec	rate 0.99	
Gannet	1	2	52	17	22	34	13	24	44	18	2	0	0	229
Kittiwake	0	0	0	1	4	2	4	1	16	12	2	1	0	43
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	10	3	14	4	0	4	0	0	0	0	10	0	13	56
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	0	6
Great Black-backed Gull	5	0	0	0	0	0	0	0	3	0	2	7	16	
Large gulls combined	15	3	13	7	4	4	4	0	3	0	12	20	84	

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec	rate 0.99	
Gannet	1	2	47	15	20	31	12	22	39	16	2	0	0	205
Kittiwake	0	0	0	1	4	2	4	1	14	11	1	1	1	37
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	9	3	12	3	0	4	0	0	0	0	9	11	11	50
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	0	5
Great Black-backed Gull	4	0	0	0	0	0	0	0	2	0	2	6	15	
Large gulls combined	13	3	11	6	3	3	3	0	3	0	11	18	75	

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec	rate 0.99	
Gannet	0	1	31	10	13	20	8	14	26	11	1	0	0	134
Kittiwake	0	0	0	0	3	1	3	0	9	7	1	1	1	25
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	6	2	8	2	0	2	0	0	0	0	6	7	33	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	0	4
Great Black-backed Gull	3	0	0	0	0	0	0	0	2	0	1	4	10	
Large gulls combined	9	2	7	4	2	2	2	0	2	0	7	12	49	

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec	rate 0.99	
Gannet	0	1	31	10	13	20	7	14	26	11	1	0	0	133
Kittiwake	0	0	0	0	3	1	2	0	9	7	1	1	1	25
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	6	2	8	2	0	2	0	0	0	0	6	8	34	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	0	3
Great Black-backed Gull	3	0	0	0	0	0	0	0	2	0	1	4	10	
Large gulls combined	9	2	7	4	2	2	2	0	2	0	7	12	50	

**Table 6.2.6 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of collisions assuming an avoidance rate of 99.5%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.995 Jan	Collisions per month with avoidance rate 0.995 Feb	Collisions per month with avoidance rate 0.995 Mar	Collisions per month with avoidance rate 0.995 Apr	Collisions per month with avoidance rate 0.995 May	Collisions per month with avoidance rate 0.995 Jun	Collisions per month with avoidance rate 0.995 Jul	Collisions per month with avoidance rate 0.995 Aug	Collisions per month with avoidance rate 0.995 Sep	Collisions per month with avoidance rate 0.995 Oct	Collisions per month with avoidance rate 0.995 Nov	Collisions per month with avoidance rate 0.995 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
Gannet	0	1	26	8	11	17	7	12	22	9	1	0	114
Kittiwake	0	0	0	0	2	1	2	0	8	6	1	1	21
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	5	2	7	2	0	2	0	0	0	0	5	6	28
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	3
Great Black-backed Gull	2	0	0	0	0	0	0	0	1	0	1	3	8
Large gulls combined	7	1	6	3	2	2	2	0	2	0	6	10	42

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.995 Jan	Collisions per month with avoidance rate 0.995 Feb	Collisions per month with avoidance rate 0.995 Mar	Collisions per month with avoidance rate 0.995 Apr	Collisions per month with avoidance rate 0.995 May	Collisions per month with avoidance rate 0.995 Jun	Collisions per month with avoidance rate 0.995 Jul	Collisions per month with avoidance rate 0.995 Aug	Collisions per month with avoidance rate 0.995 Sep	Collisions per month with avoidance rate 0.995 Oct	Collisions per month with avoidance rate 0.995 Nov	Collisions per month with avoidance rate 0.995 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
Gannet	0	1	23	7	10	15	6	11	20	8	1	0	103
Kittiwake	0	0	0	0	2	1	2	0	7	5	1	0	19
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	4	1	6	2	0	2	0	0	0	0	4	6	25
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	3
Great Black-backed Gull	2	0	0	0	0	0	0	0	1	0	1	3	7
Large gulls combined	7	1	6	3	2	2	2	0	2	0	5	9	38

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.995 Jan	Collisions per month with avoidance rate 0.995 Feb	Collisions per month with avoidance rate 0.995 Mar	Collisions per month with avoidance rate 0.995 Apr	Collisions per month with avoidance rate 0.995 May	Collisions per month with avoidance rate 0.995 Jun	Collisions per month with avoidance rate 0.995 Jul	Collisions per month with avoidance rate 0.995 Aug	Collisions per month with avoidance rate 0.995 Sep	Collisions per month with avoidance rate 0.995 Oct	Collisions per month with avoidance rate 0.995 Nov	Collisions per month with avoidance rate 0.995 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
Gannet	0	1	15	5	7	10	4	7	13	5	1	0	67
Kittiwake	0	0	0	0	1	1	1	0	5	4	0	0	12
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	3	1	4	1	0	1	0	0	0	0	3	4	17
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	2
Great Black-backed Gull	1	0	0	0	0	0	0	0	1	0	1	2	5
Large gulls combined	4	1	4	2	1	1	1	0	1	0	3	6	25

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.995 Jan	Collisions per month with avoidance rate 0.995 Feb	Collisions per month with avoidance rate 0.995 Mar	Collisions per month with avoidance rate 0.995 Apr	Collisions per month with avoidance rate 0.995 May	Collisions per month with avoidance rate 0.995 Jun	Collisions per month with avoidance rate 0.995 Jul	Collisions per month with avoidance rate 0.995 Aug	Collisions per month with avoidance rate 0.995 Sep	Collisions per month with avoidance rate 0.995 Oct	Collisions per month with avoidance rate 0.995 Nov	Collisions per month with avoidance rate 0.995 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
Gannet	0	1	15	5	6	10	4	7	13	5	1	0	67
Kittiwake	0	0	0	0	1	1	1	0	5	4	1	0	13
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	3	1	4	1	0	1	0	0	0	0	3	4	17
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	2
Great Black-backed Gull	1	0	0	0	0	0	0	0	1	0	1	2	5
Large gulls combined	5	1	4	2	1	1	1	0	1	0	4	6	25

## 6.3 Results Year 2

Table 6.3.1 Densities of flying birds at Neart na Gaoithe development area between November 2010 and October 2011. Data gathered during ship-based surveys, see section 2.1.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.125	3.607	0.710	1.676	7.463	5.760	11.913	6.910	5.920	2.895	2.895	0.063
Kitiwake	0.063	0.131	0.059	0.451	0.753	0.259	2.125	0.258	0.191	0.836	0.836	6.602
Guillemot	0.439	0.197	0.296	2.450	0.878	0.712	0.322	0.194	0.000	0.064	0.064	0.189
Razorbill	0.000	0.000	0.000	0.129	0.376	0.194	0.000	0.000	0.000	0.772	0.772	0.063
Puffin	0.000	0.066	0.000	0.451	1.003	1.230	1.932	0.517	0.000	0.000	0.000	0.000
Herring Gull	0.376	0.131	0.118	0.000	0.000	0.194	0.000	0.000	0.000	0.000	0.000	0.063
Pink-footed Goose	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Great Skua	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Little Gull	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.382	0.000	0.000	0.000
Lesser Black-backed Gull	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Great Black-backed Gull	0.063	0.000	0.000	0.000	0.000	0.065	0.000	0.000	0.000	0.064	0.000	0.063
Large gulls combined	0.439	0.131	0.118	0.000	0.000	0.259	0.000	0.000	0.064	0.000	0.000	0.126

**Table 6.3.2 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of transits through the rotor-swept area.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.075	1904	55496	13679	34995	176652	138639	290140	155530	116121	52032	0	919	1130299
Kittiwake	0.060	1049	2102	1122	8829	16073	5514	46177	5354	3605	15268	0	108467	232975
Guillemot	0.053	52	24	45	401	163	134	61	34	0	9	0	22	1030
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	5	0	51	134	171	270	64	0	0	0	0	758
Herring Gull	0.068	31734	10598	11314	0	0	20850	0	0	0	0	0	5208	86951
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.065	0	0	0	0	0	0	0	0	0	0	0	515	562
Little Gull	0.055	0	0	0	0	0	0	0	27383	0	0	0	0	29872
Lesser Black-backed Gull	0.066	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	0.072	3595	0	0	0	0	4723	0	0	4117	0	0	3539	17427
Large gulls combined	0.068	33822	9682	10336	0	0	25397	0	0	5534	0	0	9515	102857

**Neart na Gaoithe 109 x 4.135MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.084	1520	44305	10921	27938	141028	110681	231631	124166	92704	41539	0	734	902363
Kittiwake	0.066	838	1678	896	7048	12832	4402	36865	4274	2878	12189	0	86593	185993
Guillemot	0.059	42	19	36	320	130	107	49	27	0	7	0	17	823
Razorbill	0.059	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.055	0	4	0	41	107	137	215	51	0	0	0	0	605
Herring Gull	0.076	25335	8461	9032	0	0	16646	0	0	0	0	0	4158	69416
Pink-footed Goose	0.075	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.071	0	0	0	0	0	0	0	0	0	0	0	411	449
Little Gull	0.061	0	0	0	0	0	0	0	21861	0	0	0	0	23848
Lesser Black-backed Gull	0.073	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	0.080	2870	0	0	0	0	3771	0	0	3287	0	0	2826	13912
Large gulls combined	0.076	27002	7730	8251	0	0	20275	0	0	4418	0	0	7596	82115

**Neart na Gaoithe 75 x 6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.074	1125	32788	8082	20676	104370	81910	171421	91890	68607	30742	0	543	667804
Kittiwake	0.059	620	1242	863	5216	9496	3258	27282	3163	2130	9021	0	64084	137646
Guillemot	0.053	31	14	26	237	96	79	36	20	0	5	0	13	609
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	3	0	30	79	101	159	38	0	0	0	0	448
Herring Gull	0.067	18749	6262	6885	0	0	12319	0	0	0	0	0	3077	51372
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.064	0	0	0	0	0	0	0	0	0	0	0	304	332
Little Gull	0.055	0	0	0	0	0	0	0	0	16178	0	0	0	17649
Lesser Black-backed Gull	0.065	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	0.071	2124	0	0	0	0	2791	0	0	2432	0	0	2091	10296
Large gulls combined	0.068	19983	5720	6107	0	0	15005	0	0	3270	0	0	5622	60770

**Neart na Gaoithe 64 x 7MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.068	1301	37922	9347	23913	120712	94736	198263	106279	79350	35555	0	628	772371
Kittiwake	0.055	717	1437	767	6033	10983	3768	31554	3658	2463	10433	0	74119	158200
Guillemot	0.049	36	16	31	274	111	92	42	23	0	6	0	15	704
Razorbill	0.050	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.047	0	3	0	35	92	117	184	44	0	0	0	0	518
Herring Gull	0.063	21685	7242	7731	0	0	14248	0	0	0	0	0	3559	59416
Pink-footed Goose	0.061	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.058	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.053	0	0	0	0	0	0	0	0	18712	0	0	0	20413
Lesser Black-backed Gull	0.060	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	0.065	2456	0	0	0	0	3228	0	0	2813	0	0	2419	11908
Large gulls combined	0.063	23112	6616	7063	0	0	17354	0	0	3782	0	0	6502	70286

**Table 6.3.3 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of collisions assuming an avoidance rate of 95%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	6	184	45	114	572	447	928	499	381	172	0	3	3657
Kittiwake	3	6	3	23	42	14	118	14	9	40	0	287	610
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	2
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	1	0	0	0	0	0	2
Herring Gull	95	32	34	0	0	61	0	0	0	0	0	16	259
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	1	2
Little Gull	0	0	0	0	0	0	0	0	66	0	0	0	72
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	11	0	0	0	0	15	0	0	13	0	0	11	55
Large gulls combined	102	29	31	0	0	75	0	0	17	0	0	29	309

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	6	165	41	103	513	401	832	448	341	155	0	3	3280
Kittiwake	2	5	3	20	37	12	104	12	8	36	0	253	536
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	2
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	1	0	0	0	0	0	1
Herring Gull	85	29	30	0	0	55	0	0	0	0	0	14	232
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	1	1
Little Gull	0	0	0	0	0	0	0	0	59	0	0	0	64
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	10	0	0	0	0	13	0	0	12	0	0	10	49
Large gulls combined	91	26	28	0	0	67	0	0	15	0	0	26	276

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	4	108	27	67	336	262	545	293	223	101	0	2	2148
Kittiwake	2	3	2	14	24	8	69	8	6	24	0	169	358
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	56	19	20	0	0	36	0	0	0	0	0	9	152
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	1	1
Little Gull	0	0	0	0	0	0	0	0	39	0	0	0	42
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	7	0	0	0	0	9	0	0	8	0	0	7	32
Large gulls combined	60	17	18	0	0	44	0	0	10	0	0	17	181

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	4	110	27	67	330	257	530	286	222	102	0	2	2113
Kittiwake	2	3	2	14	24	8	68	8	6	24	0	173	362
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	58	19	20	0	0	36	0	0	0	0	0	9	156
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	40	0	0	0	44
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	7	0	0	0	0	8	0	0	8	0	0	7	32
Large gulls combined	62	18	19	0	0	43	0	0	10	0	0	17	184



**Table 6.3.4 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of collisions assuming an avoidance rate of 98%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 2
Gannet	3	74	16	46	229	179	371	200	152	69	0	1	1463
Kittiwake	1	2	1	9	17	6	47	5	4	16	0	115	244
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	38	13	14	0	0	24	0	0	0	0	0	6	104
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	1	1
Little Gull	0	0	0	0	0	0	0	0	26	0	0	0	29
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	5	0	0	0	0	6	0	0	5	0	0	4	22
Large gulls combined	41	12	13	0	0	30	0	0	7	0	0	12	124

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 2
Gannet	2	66	16	41	205	160	333	179	136	62	0	1	1312
Kittiwake	1	2	1	8	15	5	42	5	3	14	0	101	215
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	34	11	12	0	0	22	0	0	0	0	0	6	93
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	1	1
Little Gull	0	0	0	0	0	0	0	0	24	0	0	0	26
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	4	0	0	0	0	5	0	0	5	0	0	4	20
Large gulls combined	36	10	11	0	0	27	0	0	6	0	0	10	110

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 2
Gannet	1	43	11	27	134	105	218	117	89	41	0	1	859
Kittiwake	1	1	1	5	10	3	27	3	2	9	0	67	143
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	22	8	8	0	0	14	0	0	0	0	0	4	61
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	15	0	0	0	17
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	3	0	0	0	0	3	0	0	3	0	0	3	13
Large gulls combined	24	7	7	0	0	18	0	0	4	0	0	7	73

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 2
Gannet	2	44	11	27	132	103	212	114	89	41	0	1	845
Kittiwake	1	1	1	5	10	3	27	3	2	10	0	69	145
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	23	8	8	0	0	14	0	0	0	0	0	4	62
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	16	0	0	0	16
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	3	0	0	0	0	3	0	0	3	0	0	3	13
Large gulls combined	25	7	8	0	0	17	0	0	4	0	0	7	74

**Table 6.3.5 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of collisions assuming an avoidance rate of 99%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec		
Gannet	1	37	9	23	114	89	186	100	76	34	0	1	731	
Kittiwake	1	1	1	5	8	3	24	3	2	8	0	57	122	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	19	6	7	0	0	12	0	0	0	0	0	3	52	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	13	0	0	0	14	
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Black-backed Gull	2	0	0	0	0	3	0	0	3	0	0	2	11	
Large gulls combined	20	6	6	0	0	15	0	0	3	0	0	6	62	

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec		
Gannet	1	33	8	21	103	80	166	90	68	31	0	1	656	
Kittiwake	0	1	1	4	7	2	21	2	2	7	0	51	107	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	17	6	6	0	0	11	0	0	0	0	0	3	46	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	12	0	0	0	13	
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Black-backed Gull	2	0	0	0	0	3	0	0	2	0	0	2	10	
Large gulls combined	18	5	6	0	0	13	0	0	3	0	0	5	55	

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec		
Gannet	1	22	5	13	67	52	109	59	45	20	0	0	430	
Kittiwake	0	1	0	3	5	2	14	2	1	5	0	34	72	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	11	4	4	0	0	7	0	0	0	0	0	2	30	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	8	0	0	0	8	
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Black-backed Gull	1	0	0	0	0	2	0	0	2	0	0	1	6	
Large gulls combined	12	3	4	0	0	9	0	0	2	0	0	3	36	

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
	rate 0.99 Jan	rate 0.99 Feb	rate 0.99 Mar	rate 0.99 Apr	rate 0.99 May	rate 0.99 Jun	rate 0.99 Jul	rate 0.99 Aug	rate 0.99 Sep	rate 0.99 Oct	rate 0.99 Nov	rate 0.99 Dec		
Gannet	1	22	5	13	66	51	106	57	44	20	0	0	423	
Kittiwake	0	1	0	3	5	2	14	2	1	5	0	35	72	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	12	4	4	0	0	7	0	0	0	0	0	2	31	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	8	0	0	0	9	
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Black-backed Gull	1	0	0	0	0	2	0	0	2	0	0	1	6	
Large gulls combined	12	4	4	0	0	9	0	0	2	0	0	3	37	

**Table 6.3.6 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of collisions assuming an avoidance rate of 99.5%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0	0
Gannet	1	18	5	11	57	45	93	50	38	17	0	0	0	366
Kittiwake	0	1	0	2	4	1	12	1	1	4	0	0	29	61
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	10	3	3	0	0	6	0	0	0	0	0	0	2	26
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	7	0	0	0	0	7
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	1	0	0	0	0	1	0	0	1	0	0	0	1	5
Large gulls combined	10	3	3	0	0	7	0	0	2	0	0	0	3	31

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0	0
Gannet	1	17	4	10	51	40	83	45	34	15	0	0	0	328
Kittiwake	0	0	0	2	4	1	10	1	1	4	0	0	25	54
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	8	3	3	0	0	5	0	0	0	0	0	0	1	23
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	6	0	0	0	0	6
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	1	0	0	0	0	1	0	0	1	0	0	0	1	5
Large gulls combined	9	3	3	0	0	7	0	0	1	0	0	0	3	28

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0	0
Gannet	0	11	3	7	34	26	54	29	22	10	0	0	0	215
Kittiwake	0	0	0	1	2	1	7	1	1	2	0	0	17	36
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	6	2	2	0	0	4	0	0	0	0	0	0	1	15
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	4	0	0	0	0	4
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	1	0	0	0	0	1	0	0	1	0	0	0	1	3
Large gulls combined	6	2	2	0	0	4	0	0	1	0	0	0	2	18

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0	0
Gannet	0	11	3	7	33	26	53	29	22	10	0	0	0	211
Kittiwake	0	0	0	1	2	1	7	1	1	2	0	0	17	36
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	6	2	2	0	0	4	0	0	0	0	0	0	1	16
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	4	0	0	0	0	4
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	1	0	0	0	0	1	0	0	1	0	0	0	1	3
Large gulls combined	6	2	2	0	0	4	0	0	1	0	0	0	2	18

## 6.4 Results Years 1 and 2

Table 6.4.1 Densities of flying birds at Neart na Gaoithe development area between November 2009 and October 2011. Data gathered during ship-based surveys, see section 2.1.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.095	1.897	2.395	1.446	4.457	3.984	5.984	6.376	4.289	4.667	2.200	0.031
Kittiwake	0.031	0.066	0.030	0.258	0.574	0.224	1.256	1.256	0.161	0.884	1.045	0.192
Gullinot	0.219	0.255	0.207	1.897	0.967	0.388	0.161	0.097	0.097	0.000	0.189	0.128
Razorbill	0.032	0.000	0.030	0.161	0.320	0.097	0.032	0.000	0.000	0.000	0.386	0.064
Puffin	0.000	0.033	0.000	1.378	0.601	0.804	1.159	0.803	0.000	0.000	0.000	0.000
Herring Gull	0.284	0.097	0.177	0.032	0.000	0.129	0.000	0.000	0.000	0.000	0.000	0.192
Pink-footed Goose	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Great Skua	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Little Gull	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.191	0.031	0.000
Lesser Black-backed Gull	0.000	0.000	0.000	0.032	0.033	0.000	0.000	0.032	0.000	0.000	0.000	0.000
Great Black-backed Gull	0.095	0.000	0.000	0.000	0.000	0.032	0.032	0.000	0.000	0.065	0.000	0.127
Large gulls combined	0.379	0.097	0.177	0.064	0.033	0.161	0.161	0.032	0.000	0.065	0.000	0.256

**Table 6.4.2 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of transits through the rotor-swept area.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.075	1438	29192	46114	30196	105501	95897	155275	96526	91553	39546	2949	460	694646
Kittiwake	0.060	525	1051	561	5041	12263	4773	27291	3341	16679	19086	3181	55279	149071
Guillemot	0.053	26	31	31	310	179	73	31	17	0	27	15	14	755
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	2	0	155	80	112	162	100	0	0	0	0	611
Herring Gull	0.068	23971	7827	16956	3157	0	13813	0	0	0	0	16039	13146	94909
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.065	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.055	0	0	0	0	0	0	0	0	13691	2061	0	0	15752
Lesser Black-backed Gull	0.066	0	0	0	1621	1823	0	1813	0	0	0	0	0	5257
Great Black-backed Gull	0.072	5469	0	0	0	0	2362	0	0	4182	0	3634	7143	22789
Large gulls combined	0.068	29249	7150	15490	5769	3244	15793	3226	0	5622	0	19537	21611	126690

**Neart na Gaoithe 109 x 4.135MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.084	1148	23305	36815	24106	84225	76558	123962	77060	73091	31571	2354	367	554563
Kittiwake	0.066	419	839	448	4024	9790	3811	21787	2667	13315	15237	2540	44131	119009
Guillemot	0.059	21	25	25	248	143	58	25	14	0	21	12	12	603
Razorbill	0.059	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.055	0	2	0	124	64	89	129	80	0	0	0	0	488
Herring Gull	0.076	19137	6248	13537	2521	0	11028	0	0	0	0	12805	10495	75770
Pink-footed Goose	0.075	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.071	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.061	0	0	0	0	0	0	0	0	10930	1645	0	0	12575
Lesser Black-backed Gull	0.073	0	0	0	1294	1455	0	1447	0	0	0	0	0	4197
Great Black-backed Gull	0.080	4366	0	0	0	0	1885	0	0	3339	0	2901	5703	18194
Large gulls combined	0.076	23351	5708	12366	4605	2590	12608	2575	0	4488	0	15597	17253	101142

**Neart na Gaoithe 75 x 6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.074	850	17247	27245	17840	62332	56658	91739	57029	54092	23364	1742	272	410411
Kittiwake	0.059	310	621	331	2978	7245	2820	16124	1974	9854	11277	1880	32660	88074
Guillemot	0.053	15	18	18	183	106	43	18	10	0	16	9	9	446
Razorbill	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.051	0	1	0	92	48	66	96	59	0	0	0	0	361
Herring Gull	0.067	14162	4624	10018	1865	0	8161	0	0	0	0	9476	7767	56074
Pink-footed Goose	0.068	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.064	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.055	0	0	0	0	0	0	0	0	8089	1217	0	0	9307
Lesser Black-backed Gull	0.065	0	0	0	958	1077	0	1071	0	0	0	0	0	3106
Great Black-backed Gull	0.071	3231	0	0	0	0	1395	0	0	2471	0	2147	4220	13464
Large gulls combined	0.068	17281	4224	9152	3408	1917	9331	1906	0	3321	0	11543	12768	74851

**Neart na Gaoithe 64 x 7MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Gannet	0.068	983	19948	31512	20634	72092	65529	106104	65959	62562	27023	2015	314	474675
Kittiwake	0.055	358	718	383	3445	8380	3262	18649	2283	11387	13042	2174	37774	101865
Guillemot	0.049	18	21	21	212	122	50	21	12	0	18	11	10	516
Razorbill	0.050	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0.047	0	2	0	106	55	77	111	68	0	0	0	0	418
Herring Gull	0.063	16380	5348	11587	2158	0	9439	0	0	0	0	10960	8983	64854
Pink-footed Goose	0.061	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0.058	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0.053	0	0	0	0	0	0	0	0	9356	1408	0	0	10764
Lesser Black-backed Gull	0.060	0	0	0	1108	1246	0	1239	0	0	0	0	0	3592
Great Black-backed Gull	0.065	3737	0	0	0	0	1614	0	0	2858	0	2483	4881	15573
Large gulls combined	0.063	19987	4886	10585	3942	2217	10792	2204	0	3842	0	13350	14767	86572

**Table 6.4.3 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of collisions assuming an avoidance rate of 95%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	5	97	153	99	342	309	497	310	300	131	10	2	2253
Kittiwake	1	3	1	13	32	12	70	9	44	51	8	146	390
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	2
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	72	24	51	9	0	40	0	0	0	0	48	40	284
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	33	5	0	0	38
Lesser Black-backed Gull	0	0	0	5	5	0	5	0	0	0	0	0	15
Great Black-backed Gull	17	0	0	0	0	7	0	0	13	0	12	23	72
Large gulls combined	88	22	47	17	10	47	9	0	17	0	59	66	382

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	4	87	137	89	306	277	445	278	269	118	9	1	2020
Kittiwake	1	2	1	12	28	11	61	8	38	44	7	129	343
Gulliemot	0	0	0	1	0	0	0	0	0	0	0	0	2
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	64	21	46	8	0	36	0	0	0	0	43	35	254
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	29	4	0	0	34
Lesser Black-backed Gull	0	0	0	4	5	0	5	0	0	0	0	0	13
Great Black-backed Gull	15	0	0	0	0	7	0	0	12	0	10	20	64
Large gulls combined	79	19	42	15	9	42	8	0	15	0	53	59	341

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	3	57	90	58	201	182	292	182	176	77	6	1	1323
Kittiwake	1	2	1	8	19	7	41	5	26	30	5	86	229
Gulliemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	42	14	30	6	0	24	0	0	0	0	28	23	167
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	19	3	0	0	22
Lesser Black-backed Gull	0	0	0	3	3	0	3	0	0	0	0	0	9
Great Black-backed Gull	10	0	0	0	0	4	0	0	8	0	7	13	42
Large gulls combined	52	13	28	10	6	27	6	0	10	0	35	39	224

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 1
	rate 0.95 Jan	rate 0.95 Feb	rate 0.95 Mar	rate 0.95 Apr	rate 0.95 May	rate 0.95 Jun	rate 0.95 Jul	rate 0.95 Aug	rate 0.95 Sep	rate 0.95 Oct	rate 0.95 Nov	rate 0.95 Dec	
Gannet	3	58	91	58	197	178	283	178	175	78	6	1	1305
Kittiwake	1	2	1	8	19	7	40	5	26	30	5	88	231
Gulliemot	0	0	0	0	0	0	0	0	0	0	0	0	1
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1
Herring Gull	44	14	31	6	0	24	0	0	0	0	29	24	171
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	20	3	0	0	23
Lesser Black-backed Gull	0	0	0	3	3	0	3	0	0	0	0	0	9
Great Black-backed Gull	10	0	0	0	0	4	0	0	8	0	7	14	43
Large gulls combined	54	13	28	10	6	27	5	0	10	0	36	39	228

**Table 6.4.4 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of collisions assuming an avoidance rate of 98%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE
	rate 0.98 Jan	rate 0.98 Feb	rate 0.98 Mar	rate 0.98 Apr	rate 0.98 May	rate 0.98 Jun	rate 0.98 Jul	rate 0.98 Aug	rate 0.98 Sep	rate 0.98 Oct	rate 0.98 Nov	rate 0.98 Dec	RATE 2	
Gannet	2	39	61	39	137	124	199	124	120	52	4	1	901	
Kittiwake	1	1	1	5	13	5	28	3	17	20	3	59	156	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	1	
Herring Gull	29	9	20	4	0	16	0	0	0	0	19	16	114	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	13	2	0	0	15	
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	6	
Great Black-backed Gull	7	0	0	0	0	3	0	0	5	0	5	9	29	
Large gulls combined	35	9	19	7	4	19	4	0	7	0	24	26	153	

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE
	rate 0.98 Jan	rate 0.98 Feb	rate 0.98 Mar	rate 0.98 Apr	rate 0.98 May	rate 0.98 Jun	rate 0.98 Jul	rate 0.98 Aug	rate 0.98 Sep	rate 0.98 Oct	rate 0.98 Nov	rate 0.98 Dec	RATE 2	
Gannet	2	35	55	35	123	111	178	111	108	47	4	1	808	
Kittiwake	1	1	1	5	11	4	25	3	15	16	3	52	137	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	1	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	26	8	18	3	0	14	0	0	0	0	17	14	102	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	12	2	0	0	14	
Lesser Black-backed Gull	0	0	0	2	2	0	2	0	0	0	0	0	5	
Great Black-backed Gull	6	0	0	0	0	3	0	0	5	0	4	8	26	
Large gulls combined	31	8	17	6	3	17	3	0	6	0	21	23	136	

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE
	rate 0.98 Jan	rate 0.98 Feb	rate 0.98 Mar	rate 0.98 Apr	rate 0.98 May	rate 0.98 Jun	rate 0.98 Jul	rate 0.98 Aug	rate 0.98 Sep	rate 0.98 Oct	rate 0.98 Nov	rate 0.98 Dec	RATE 2	
Gannet	1	23	36	23	80	73	117	73	70	31	2	0	529	
Kittiwake	0	1	0	3	7	3	16	2	10	12	2	34	92	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	17	6	12	2	0	9	0	0	0	0	11	9	67	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	8	1	0	0	9	
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	4	
Great Black-backed Gull	4	0	0	0	0	2	0	0	3	0	3	5	17	
Large gulls combined	21	5	11	4	2	11	2	0	4	0	14	15	90	

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	Collisions per month with avoidance	TOTAL COLLISIONS PER YEAR AVOIDANCE
	rate 0.98 Jan	rate 0.98 Feb	rate 0.98 Mar	rate 0.98 Apr	rate 0.98 May	rate 0.98 Jun	rate 0.98 Jul	rate 0.98 Aug	rate 0.98 Sep	rate 0.98 Oct	rate 0.98 Nov	rate 0.98 Dec	RATE 2	
Gannet	1	23	36	23	79	71	113	71	70	31	2	0	522	
Kittiwake	0	1	0	3	7	3	16	2	10	12	2	35	93	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	17	6	12	2	0	9	0	0	0	0	12	10	68	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	8	1	0	0	9	
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	3	
Great Black-backed Gull	4	0	0	0	0	2	0	0	3	0	3	5	17	
Large gulls combined	21	5	11	4	2	11	2	0	4	0	14	16	91	

**Table 6.4.5 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of collisions assuming an avoidance rate of 99%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
Gannet	1	19	31	20	68	62	99	62	60	26	2	0	451
Kittiwake	0	1	0	3	6	2	14	2	9	10	2	29	78
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	14	5	10	2	0	8	0	0	0	10	8	8	57
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	7	1	0	0	8
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	3
Great Black-backed Gull	3	0	0	0	0	1	0	0	3	0	2	5	14
Large gulls combined	18	4	9	3	2	9	2	0	3	0	12	13	76

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
Gannet	1	17	27	16	61	55	89	56	54	24	2	0	404
Kittiwake	0	0	0	2	6	2	12	2	8	9	1	26	69
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	13	4	9	2	0	7	0	0	0	0	9	7	51
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	6	1	0	0	7
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	3
Great Black-backed Gull	3	0	0	0	0	1	0	0	2	0	2	4	13
Large gulls combined	16	4	8	3	2	8	2	0	3	0	11	12	68

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
Gannet	1	11	18	12	40	36	58	36	35	15	1	0	265
Kittiwake	0	0	0	2	4	1	8	1	5	6	1	17	46
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	8	3	6	1	0	5	0	0	0	0	6	5	33
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	4	1	0	0	4
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	2
Great Black-backed Gull	2	0	0	0	0	1	0	0	2	0	1	3	8
Large gulls combined	10	3	6	2	1	5	1	0	2	0	7	8	45

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR AVOIDANCE RATE 3
Gannet	1	12	18	12	39	36	57	36	35	16	1	0	261
Kittiwake	0	0	0	2	4	1	8	1	5	6	1	18	46
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	9	3	6	1	0	5	0	0	0	0	6	5	34
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	4	1	0	0	5
Lesser Black-backed Gull	0	0	0	1	1	0	1	0	0	0	0	0	2
Great Black-backed Gull	2	0	0	0	0	1	0	0	2	0	1	3	9
Large gulls combined	11	3	6	2	1	5	1	0	2	0	7	8	46



**Table 6.4.6 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of collisions assuming an avoidance rate of 99.5%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Gannet	0	10	15	10	34	31	50	31	30	13	1	0	225	
Kittiwake	0	0	0	1	3	1	7	1	4	5	1	15	39	
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	
Herring Gull	7	2	5	1	0	4	0	0	0	0	5	4	28	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	3	1	0	0	4	
Lesser Black-backed Gull	0	0	0	0	1	0	1	0	0	0	0	0	1	
Great Black-backed Gull	2	0	0	0	0	1	0	0	1	0	1	2	7	
Large gulls combined	9	2	5	2	1	5	1	0	2	0	6	7	38	

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Gannet	0	9	14	9	31	28	45	28	27	12	1	0	202
Kittiwake	0	0	0	1	3	1	6	1	4	4	1	13	34
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	6	2	5	1	0	4	0	0	0	0	4	4	25
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	3	0	0	0	3
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	1
Great Black-backed Gull	2	0	0	0	0	1	0	0	1	0	1	2	6
Large gulls combined	8	2	4	2	1	4	1	0	2	0	5	6	34

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Gannet	0	6	9	6	20	18	29	18	18	8	1	0	132
Kittiwake	0	0	0	1	2	1	4	1	3	3	0	9	23
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	4	1	3	1	0	2	0	0	0	0	3	2	17
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	2	0	0	0	2
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	1
Great Black-backed Gull	1	0	0	0	0	0	0	0	1	0	1	1	4
Large gulls combined	5	1	3	1	1	3	1	0	1	0	3	4	22

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	Collisions per month with avoidance rate 0.995	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.995
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Gannet	0	6	9	6	20	18	28	18	18	8	1	0	130
Kittiwake	0	0	0	1	2	1	4	0	3	3	1	9	23
Guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring Gull	4	1	3	1	0	2	0	0	0	0	3	2	17
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	2	0	0	0	2
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	1
Great Black-backed Gull	1	0	0	0	0	0	0	0	1	0	1	1	4
Large gulls combined	5	1	3	1	1	3	1	0	1	0	4	4	23

## 6.5 Results additional species

*Table 6.5.1 Monthly densities of additional species at Neart na Gaoithe development area as calculated from fluxes of 1,000 of each species passing during the months of April and September (see 2.3).*

Species	Density (birds/km <sup>2</sup> ) Jan	Density (birds/km <sup>2</sup> ) Feb	Density (birds/km <sup>2</sup> ) Mar	Density (birds/km <sup>2</sup> ) Apr	Density (birds/km <sup>2</sup> ) May	Density (birds/km <sup>2</sup> ) Jun	Density (birds/km <sup>2</sup> ) Jul	Density (birds/km <sup>2</sup> ) Aug	Density (birds/km <sup>2</sup> ) Sep	Density (birds/km <sup>2</sup> ) Oct	Density (birds/km <sup>2</sup> ) Nov	Density (birds/km <sup>2</sup> ) Dec
Red-throated diver	0	0	0	0,006	0	0	0	0	0,006	0	0	0
Black-throated diver	0	0	0	0,005	0	0	0	0	0,006	0	0	0
Bean Goose	0	0	0	0,006	0	0	0	0	0,007	0	0	0
Pink footed goose	0	0	0	0,006	0	0	0	0	0,007	0	0	0
Barnacle goose	0	0	0	0,006	0	0	0	0	0,007	0	0	0
Bar-tailed godwit	0	0	0	0,006	0	0	0	0	0,006	0	0	0
Black-tailed godwit	0	0	0	0,006	0	0	0	0	0,006	0	0	0
Knot	0	0	0	0,005	0	0	0	0	0,006	0	0	0
Curlew	0	0	0	0,006	0	0	0	0	0,007	0	0	0
Dunlin	0	0	0	0,007	0	0	0	0	0,007	0	0	0
Sanderling	0	0	0	0,007	0	0	0	0	0,007	0	0	0
Grey plover	0	0	0	0,006	0	0	0	0	0,006	0	0	0
Lapwing	0	0	0	0,008	0	0	0	0	0,009	0	0	0
Ringed plover	0	0	0	0,005	0	0	0	0	0,006	0	0	0
Redshank	0	0	0	0,011	0	0	0	0	0,012	0	0	0
Turnstone	0	0	0	0,007	0	0	0	0	0,008	0	0	0
Oystercatcher	0	0	0	0,008	0	0	0	0	0,009	0	0	0
Arctic skua	0	0	0	0,008	0	0	0	0	0,009	0	0	0
Great skua	0	0	0	0,007	0	0	0	0	0,008	0	0	0
Common tern	0	0	0	0,010	0	0	0	0	0,011	0	0	0
Arctic Tern	0	0	0	0,009	0	0	0	0	0,010	0	0	0
Sandwich tern	0	0	0	0,009	0	0	0	0	0,010	0	0	0

**Table 6.5.2 Results of collision rate modelling for Neart na Gaoithe development area as calculated from fluxes of 1,000 of each species passing during the months of April and September (see 2.3). Potential number of transits through the rotor-swept area.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Red-throated diver	0.063	0	0	0	38	0	0	0	0	38	0	0	0	76
Blackthroated diver	0.065	0	0	0	19	0	0	0	0	19	0	0	0	38
Bean Goose	0.071	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Pink footed goose	0.069	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Barnacle goose	0.066	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Bar-tailed godwit	0.054	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Blacktailed godwit	0.055	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Knot	0.050	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Curlew	0.061	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Dunlin	0.049	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Sanderling	0.049	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Grey plover	0.052	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Lapwing	0.055	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Ringed plover	0.048	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Redshank	0.056	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Turnstone	0.050	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Oystercatcher	0.059	0	0	0	2408	0	0	0	0	2658	0	0	0	5066
Arctic skua	0.060	0	0	0	72	0	0	0	0	72	0	0	0	144
Great skua	0.064	0	0	0	82	0	0	0	0	81	0	0	0	163
Common tern	0.059	0	0	0	241	0	0	0	0	241	0	0	0	481
Arctic Tern	0.058	0	0	0	53	0	0	0	0	53	0	0	0	106
Sandwich tern	0.061	0	0	0	68	0	0	0	0	68	0	0	0	136

**Neart na Gaoithe 109 x 4.135MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Red-throated diver	0.069	0	0	0	30	0	0	0	0	30	0	0	0	61
Blackthroated diver	0.072	0	0	0	15	0	0	0	0	15	0	0	0	30
Bean Goose	0.079	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Pink footed goose	0.076	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Barnacle goose	0.073	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Bar-tailed godwit	0.059	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Blacktailed godwit	0.060	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Knot	0.054	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Curlew	0.067	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Dunlin	0.053	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Sanderling	0.054	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Grey plover	0.056	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Lapwing	0.061	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Ringed plover	0.052	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Redshank	0.064	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Turnstone	0.055	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Oystercatcher	0.066	0	0	0	1922	0	0	0	0	2122	0	0	0	4044
Arctic skua	0.066	0	0	0	58	0	0	0	0	57	0	0	0	115
Great skua	0.070	0	0	0	65	0	0	0	0	65	0	0	0	130
Common tern	0.067	0	0	0	192	0	0	0	0	192	0	0	0	384
Arctic Tern	0.066	0	0	0	42	0	0	0	0	42	0	0	0	85
Sandwich tern	0.068	0	0	0	54	0	0	0	0	54	0	0	0	109

**Neart na Gaoithe 75 x 6MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Red-throated diver	0.062	0	0	0	22	0	0	0	0	22	0	0	0	45
Blackthroated diver	0.064	0	0	0	11	0	0	0	0	11	0	0	0	22
Bean Goose	0.071	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Pink footed goose	0.069	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Barnacle goose	0.065	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Bar-tailed godwit	0.054	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Blacktailed godwit	0.054	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Knot	0.050	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Curlew	0.060	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Dunlin	0.048	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Sanderling	0.049	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Grey plover	0.052	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Lapwing	0.054	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Ringed plover	0.048	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Redshank	0.056	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Turnstone	0.050	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Oystercatcher	0.058	0	0	0	1423	0	0	0	0	1570	0	0	0	2993
Arctic skua	0.060	0	0	0	43	0	0	0	0	43	0	0	0	85
Great skua	0.063	0	0	0	48	0	0	0	0	48	0	0	0	96
Common tern	0.059	0	0	0	142	0	0	0	0	142	0	0	0	284
Arctic Tern	0.058	0	0	0	31	0	0	0	0	31	0	0	0	63
Sandwich tern	0.060	0	0	0	40	0	0	0	0	40	0	0	0	81

**Neart na Gaoithe 64 x 7MW**

Species	Probability of collision during single rotor crossing	Potential number of transits through rotor-swept area Jan	Potential number of transits through rotor-swept area Feb	Potential number of transits through rotor-swept area Mar	Potential number of transits through rotor-swept area Apr	Potential number of transits through rotor-swept area May	Potential number of transits through rotor-swept area Jun	Potential number of transits through rotor-swept area Jul	Potential number of transits through rotor-swept area Aug	Potential number of transits through rotor-swept area Sep	Potential number of transits through rotor-swept area Oct	Potential number of transits through rotor-swept area Nov	Potential number of transits through rotor-swept area Dec	TOTAL transits through rotor-swept area per YEAR
Red-throated diver	0.057	0	0	0	26	0	0	0	0	26	0	0	0	52
Blackthroated diver	0.059	0	0	0	13	0	0	0	0	13	0	0	0	26
Bean Goose	0.064	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Pink footed goose	0.062	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Barnacle goose	0.059	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Bar-tailed godwit	0.050	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Blacktailed godwit	0.050	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Knot	0.046	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Curlew	0.056	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Dunlin	0.046	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Sanderling	0.046	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Grey plover	0.048	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Lapwing	0.052	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Ringed plover	0.045	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Redshank	0.056	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Turnstone	0.047	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Oystercatcher	0.055	0	0	0	1645	0	0	0	0	1816	0	0	0	3461
Arctic skua	0.055	0	0	0	49	0	0	0	0	49	0	0	0	98
Great skua	0.058	0	0	0	56	0	0	0	0	56	0	0	0	111
Common tern	0.057	0	0	0	165	0	0	0	0	164	0	0	0	329
Arctic Tern	0.056	0	0	0	36	0	0	0	0	36	0	0	0	73
Sandwich tern	0.058	0	0	0	47	0	0	0	0	47	0	0	0	93

**Table 6.5.3 Results of collision rate modelling for Neart na Gaoithe development area as calculated from fluxes of 1,000 of each species passing during the months of April and September (see 2.3). Potential number of collisions assuming an avoidance rate of 95%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.95 Jan	Collisions per month with avoidance rate 0.95 Feb	Collisions per month with avoidance rate 0.95 Mar	Collisions per month with avoidance rate 0.95 Apr	Collisions per month with avoidance rate 0.95 May	Collisions per month with avoidance rate 0.95 Jun	Collisions per month with avoidance rate 0.95 Jul	Collisions per month with avoidance rate 0.95 Aug	Collisions per month with avoidance rate 0.95 Sep	Collisions per month with avoidance rate 0.95 Oct	Collisions per month with avoidance rate 0.95 Nov	Collisions per month with avoidance rate 0.95 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.95
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	8	0	0	0	0	0	8	0	0	16
Pink footed goose	0	0	0	7	0	0	0	0	0	8	0	0	15
Barnacle goose	0	0	0	7	0	0	0	0	0	8	0	0	15
Bar-tailed godwit	0	0	0	6	0	0	0	0	0	6	0	0	12
Black-tailed godwit	0	0	0	6	0	0	0	0	0	6	0	0	12
Knot	0	0	0	5	0	0	0	0	0	6	0	0	11
Curlew	0	0	0	6	0	0	0	0	0	7	0	0	14
Dunlin	0	0	0	5	0	0	0	0	0	6	0	0	11
Sanderling	0	0	0	5	0	0	0	0	0	6	0	0	11
Grey plover	0	0	0	5	0	0	0	0	0	6	0	0	12
Lapwing	0	0	0	6	0	0	0	0	0	6	0	0	12
Ringed plover	0	0	0	5	0	0	0	0	0	6	0	0	11
Redshank	0	0	0	6	0	0	0	0	0	7	0	0	13
Turnstone	0	0	0	5	0	0	0	0	0	6	0	0	11
Oystercatcher	0	0	0	6	0	0	0	0	0	7	0	0	13
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	1	0	0	0	0	0	1	0	0	1
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.95 Jan	Collisions per month with avoidance rate 0.95 Feb	Collisions per month with avoidance rate 0.95 Mar	Collisions per month with avoidance rate 0.95 Apr	Collisions per month with avoidance rate 0.95 May	Collisions per month with avoidance rate 0.95 Jun	Collisions per month with avoidance rate 0.95 Jul	Collisions per month with avoidance rate 0.95 Aug	Collisions per month with avoidance rate 0.95 Sep	Collisions per month with avoidance rate 0.95 Oct	Collisions per month with avoidance rate 0.95 Nov	Collisions per month with avoidance rate 0.95 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.95
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	7	0	0	0	0	0	7	0	0	14
Pink footed goose	0	0	0	6	0	0	0	0	0	7	0	0	14
Barnacle goose	0	0	0	6	0	0	0	0	0	7	0	0	13
Bar-tailed godwit	0	0	0	5	0	0	0	0	0	6	0	0	10
Black-tailed godwit	0	0	0	5	0	0	0	0	0	6	0	0	11
Knot	0	0	0	5	0	0	0	0	0	5	0	0	10
Curlew	0	0	0	6	0	0	0	0	0	6	0	0	12
Dunlin	0	0	0	4	0	0	0	0	0	5	0	0	9
Sanderling	0	0	0	5	0	0	0	0	0	5	0	0	10
Grey plover	0	0	0	5	0	0	0	0	0	5	0	0	10
Lapwing	0	0	0	5	0	0	0	0	0	6	0	0	11
Ringed plover	0	0	0	4	0	0	0	0	0	5	0	0	9
Redshank	0	0	0	5	0	0	0	0	0	6	0	0	11
Turnstone	0	0	0	5	0	0	0	0	0	5	0	0	10
Oystercatcher	0	0	0	6	0	0	0	0	0	6	0	0	12
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	1	0	0	0	0	0	1	0	0	1
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.95 Jan	Collisions per month with avoidance rate 0.95 Feb	Collisions per month with avoidance rate 0.95 Mar	Collisions per month with avoidance rate 0.95 Apr	Collisions per month with avoidance rate 0.95 May	Collisions per month with avoidance rate 0.95 Jun	Collisions per month with avoidance rate 0.95 Jul	Collisions per month with avoidance rate 0.95 Aug	Collisions per month with avoidance rate 0.95 Sep	Collisions per month with avoidance rate 0.95 Oct	Collisions per month with avoidance rate 0.95 Nov	Collisions per month with avoidance rate 0.95 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.95
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	4	0	0	0	0	0	5	0	0	9
Pink footed goose	0	0	0	4	0	0	0	0	0	5	0	0	9
Barnacle goose	0	0	0	4	0	0	0	0	0	5	0	0	9
Bar-tailed godwit	0	0	0	3	0	0	0	0	0	4	0	0	7
Black-tailed godwit	0	0	0	3	0	0	0	0	0	4	0	0	7
Knot	0	0	0	4	0	0	0	0	0	4	0	0	8
Curlew	0	0	0	3	0	0	0	0	0	3	0	0	6
Dunlin	0	0	0	3	0	0	0	0	0	3	0	0	6
Sanderling	0	0	0	3	0	0	0	0	0	3	0	0	6
Grey plover	0	0	0	3	0	0	0	0	0	4	0	0	7
Lapwing	0	0	0	3	0	0	0	0	0	4	0	0	7
Ringed plover	0	0	0	3	0	0	0	0	0	3	0	0	6
Redshank	0	0	0	3	0	0	0	0	0	4	0	0	7
Turnstone	0	0	0	3	0	0	0	0	0	3	0	0	7
Oystercatcher	0	0	0	4	0	0	0	0	0	4	0	0	8
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.95 Jan	Collisions per month with avoidance rate 0.95 Feb	Collisions per month with avoidance rate 0.95 Mar	Collisions per month with avoidance rate 0.95 Apr	Collisions per month with avoidance rate 0.95 May	Collisions per month with avoidance rate 0.95 Jun	Collisions per month with avoidance rate 0.95 Jul	Collisions per month with avoidance rate 0.95 Aug	Collisions per month with avoidance rate 0.95 Sep	Collisions per month with avoidance rate 0.95 Oct	Collisions per month with avoidance rate 0.95 Nov	Collisions per month with avoidance rate 0.95 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.95
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	4	0	0	0	0	0	5	0	0	9
Pink footed goose	0	0	0	4	0	0	0	0	0	5	0	0	9
Barnacle goose	0	0	0	4	0	0	0	0	0	4	0	0	8
Bar-tailed godwit	0	0	0	3	0	0	0	0	0	4	0	0	7
Black-tailed godwit	0	0	0	3	0	0	0	0	0	4	0	0	7
Knot	0	0	0	3	0	0	0	0	0	3	0	0	7
Curlew	0	0	0	4	0	0	0	0	0	4	0	0	8
Dunlin	0	0	0	3	0	0	0	0	0	3	0	0	6
Sanderling	0	0	0	3	0	0	0	0	0	3	0	0	6
Grey plover	0	0	0	3	0	0	0	0	0	4	0	0	7
Lapwing	0	0	0	3	0	0	0	0	0	4	0	0	7
Ringed plover	0	0	0	3	0	0	0	0	0	3	0	0	6
Redshank	0	0	0	4	0	0	0	0	0	4	0	0	8
Turnstone	0	0	0	3	0	0	0	0	0	4	0	0	7
Oystercatcher	0	0	0	4	0	0	0	0	0	4	0	0	8
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 6.5.4 Results of collision rate modelling for Neart na Gaoithe development area as calculated from fluxes of 1,000 of each species passing during the months of April and September (see 2.3). Potential number of collisions assuming an avoidance rate of 98%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	3	0	0	0	0	0	3	0	0	6
Pink footed goose	0	0	0	3	0	0	0	0	0	3	0	0	6
Barnacle goose	0	0	0	3	0	0	0	0	0	3	0	0	6
Bar-tailed godwit	0	0	0	2	0	0	0	0	0	3	0	0	5
Black-tailed godwit	0	0	0	2	0	0	0	0	0	3	0	0	5
Knot	0	0	0	2	0	0	0	0	0	2	0	0	4
Curlew	0	0	0	3	0	0	0	0	0	3	0	0	5
Dunlin	0	0	0	2	0	0	0	0	0	2	0	0	4
Sanderling	0	0	0	2	0	0	0	0	0	2	0	0	4
Grey plover	0	0	0	2	0	0	0	0	0	2	0	0	5
Lapwing	0	0	0	2	0	0	0	0	0	3	0	0	5
Ringed plover	0	0	0	2	0	0	0	0	0	2	0	0	4
Redshank	0	0	0	2	0	0	0	0	0	3	0	0	5
Tumstone	0	0	0	2	0	0	0	0	0	2	0	0	4
Oystercatcher	0	0	0	2	0	0	0	0	0	3	0	0	5
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	3	0	0	0	0	0	3	0	0	6
Pink footed goose	0	0	0	3	0	0	0	0	0	3	0	0	5
Barnacle goose	0	0	0	2	0	0	0	0	0	3	0	0	5
Bar-tailed godwit	0	0	0	2	0	0	0	0	0	2	0	0	4
Black-tailed godwit	0	0	0	2	0	0	0	0	0	2	0	0	4
Knot	0	0	0	2	0	0	0	0	0	2	0	0	4
Curlew	0	0	0	2	0	0	0	0	0	2	0	0	5
Dunlin	0	0	0	2	0	0	0	0	0	2	0	0	4
Sanderling	0	0	0	2	0	0	0	0	0	2	0	0	4
Grey plover	0	0	0	2	0	0	0	0	0	2	0	0	4
Lapwing	0	0	0	2	0	0	0	0	0	2	0	0	4
Ringed plover	0	0	0	2	0	0	0	0	0	2	0	0	4
Redshank	0	0	0	2	0	0	0	0	0	2	0	0	5
Tumstone	0	0	0	2	0	0	0	0	0	2	0	0	4
Oystercatcher	0	0	0	2	0	0	0	0	0	2	0	0	5
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	2	0	0	0	0	0	2	0	0	4
Pink footed goose	0	0	0	2	0	0	0	0	0	2	0	0	4
Barnacle goose	0	0	0	2	0	0	0	0	0	2	0	0	3
Bar-tailed godwit	0	0	0	1	0	0	0	0	0	1	0	0	3
Black-tailed godwit	0	0	0	1	0	0	0	0	0	1	0	0	3
Knot	0	0	0	1	0	0	0	0	0	1	0	0	3
Curlew	0	0	0	2	0	0	0	0	0	2	0	0	3
Dunlin	0	0	0	1	0	0	0	0	0	1	0	0	3
Sanderling	0	0	0	1	0	0	0	0	0	1	0	0	3
Grey plover	0	0	0	1	0	0	0	0	0	1	0	0	3
Lapwing	0	0	0	1	0	0	0	0	0	2	0	0	3
Ringed plover	0	0	0	1	0	0	0	0	0	1	0	0	3
Redshank	0	0	0	1	0	0	0	0	0	2	0	0	3
Tumstone	0	0	0	1	0	0	0	0	0	1	0	0	3
Oystercatcher	0	0	0	1	0	0	0	0	0	2	0	0	3
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.98 Jan	Collisions per month with avoidance rate 0.98 Feb	Collisions per month with avoidance rate 0.98 Mar	Collisions per month with avoidance rate 0.98 Apr	Collisions per month with avoidance rate 0.98 May	Collisions per month with avoidance rate 0.98 Jun	Collisions per month with avoidance rate 0.98 Jul	Collisions per month with avoidance rate 0.98 Aug	Collisions per month with avoidance rate 0.98 Sep	Collisions per month with avoidance rate 0.98 Oct	Collisions per month with avoidance rate 0.98 Nov	Collisions per month with avoidance rate 0.98 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.98
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	2	0	0	0	0	0	2	0	0	4
Pink footed goose	0	0	0	2	0	0	0	0	0	2	0	0	4
Barnacle goose	0	0	0	2	0	0	0	0	0	2	0	0	3
Bar-tailed godwit	0	0	0	1	0	0	0	0	0	1	0	0	3
Black-tailed godwit	0	0	0	1	0	0	0	0	0	1	0	0	3
Knot	0	0	0	1	0	0	0	0	0	1	0	0	3
Curlew	0	0	0	1	0	0	0	0	0	2	0	0	3
Dunlin	0	0	0	1	0	0	0	0	0	1	0	0	3
Sanderling	0	0	0	1	0	0	0	0	0	1	0	0	3
Grey plover	0	0	0	1	0	0	0	0	0	1	0	0	3
Lapwing	0	0	0	1	0	0	0	0	0	2	0	0	3
Ringed plover	0	0	0	1	0	0	0	0	0	1	0	0	3
Redshank	0	0	0	2	0	0	0	0	0	2	0	0	3
Tumstone	0	0	0	1	0	0	0	0	0	1	0	0	3
Oystercatcher	0	0	0	1	0	0	0	0	0	2	0	0	3
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 6.5.5 Results of collision rate modelling for Neart na Gaoithe development area as calculated from fluxes of 1,000 of each species passing during the months of April and September (see 2.3). Potential number of collisions assuming an avoidance rate of 99%.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	2	0	0	0	0	2	0	0	0	3
Pink footed goose	0	0	0	1	0	0	0	0	2	0	0	0	3
Barnacle goose	0	0	0	1	0	0	0	0	2	0	0	0	3
Bar-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	2
Black-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	2
Knot	0	0	0	1	0	0	0	0	1	0	0	0	2
Curlew	0	0	0	1	0	0	0	0	1	0	0	0	3
Dunlin	0	0	0	1	0	0	0	0	1	0	0	0	3
Sanderling	0	0	0	1	0	0	0	0	1	0	0	0	2
Grey plover	0	0	0	1	0	0	0	0	1	0	0	0	2
Lapwing	0	0	0	1	0	0	0	0	1	0	0	0	2
Ringed plover	0	0	0	1	0	0	0	0	1	0	0	0	2
Redshank	0	0	0	1	0	0	0	0	1	0	0	0	3
Turnstone	0	0	0	1	0	0	0	0	1	0	0	0	2
Oystercatcher	0	0	0	1	0	0	0	0	1	0	0	0	3
Arctic skua	0	0	0	0	0	0	0	0	1	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	1	0	0	0	0	1	0	0	0	3
Pink footed goose	0	0	0	1	0	0	0	0	1	0	0	0	3
Barnacle goose	0	0	0	1	0	0	0	0	1	0	0	0	3
Bar-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	3
Black-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	2
Knot	0	0	0	1	0	0	0	0	1	0	0	0	2
Curlew	0	0	0	1	0	0	0	0	1	0	0	0	2
Dunlin	0	0	0	1	0	0	0	0	1	0	0	0	2
Sanderling	0	0	0	1	0	0	0	0	1	0	0	0	2
Grey plover	0	0	0	1	0	0	0	0	1	0	0	0	2
Lapwing	0	0	0	1	0	0	0	0	1	0	0	0	2
Ringed plover	0	0	0	1	0	0	0	0	1	0	0	0	2
Redshank	0	0	0	1	0	0	0	0	1	0	0	0	2
Turnstone	0	0	0	1	0	0	0	0	1	0	0	0	2
Oystercatcher	0	0	0	1	0	0	0	0	1	0	0	0	2
Arctic skua	0	0	0	0	0	0	0	0	1	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Pink footed goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Barnacle goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Bar-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	1
Black-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	1
Knot	0	0	0	1	0	0	0	0	1	0	0	0	1
Curlew	0	0	0	1	0	0	0	0	1	0	0	0	2
Dunlin	0	0	0	1	0	0	0	0	1	0	0	0	1
Sanderling	0	0	0	1	0	0	0	0	1	0	0	0	1
Grey plover	0	0	0	1	0	0	0	0	1	0	0	0	1
Lapwing	0	0	0	1	0	0	0	0	1	0	0	0	1
Ringed plover	0	0	0	1	0	0	0	0	1	0	0	0	1
Redshank	0	0	0	1	0	0	0	0	1	0	0	0	1
Turnstone	0	0	0	1	0	0	0	0	1	0	0	0	1
Oystercatcher	0	0	0	1	0	0	0	0	1	0	0	0	2
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month with avoidance rate 0.99 Jan	Collisions per month with avoidance rate 0.99 Feb	Collisions per month with avoidance rate 0.99 Mar	Collisions per month with avoidance rate 0.99 Apr	Collisions per month with avoidance rate 0.99 May	Collisions per month with avoidance rate 0.99 Jun	Collisions per month with avoidance rate 0.99 Jul	Collisions per month with avoidance rate 0.99 Aug	Collisions per month with avoidance rate 0.99 Sep	Collisions per month with avoidance rate 0.99 Oct	Collisions per month with avoidance rate 0.99 Nov	Collisions per month with avoidance rate 0.99 Dec	TOTAL COLLISIONS PER YEAR WITH AVOIDANCE RATE OF 0.99
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Bean Goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Pink footed goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Barnacle goose	0	0	0	1	0	0	0	0	1	0	0	0	2
Bar-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	1
Black-tailed godwit	0	0	0	1	0	0	0	0	1	0	0	0	1
Knot	0	0	0	1	0	0	0	0	1	0	0	0	1
Curlew	0	0	0	1	0	0	0	0	1	0	0	0	2
Dunlin	0	0	0	1	0	0	0	0	1	0	0	0	1
Sanderling	0	0	0	1	0	0	0	0	1	0	0	0	1
Grey plover	0	0	0	1	0	0	0	0	1	0	0	0	1
Lapwing	0	0	0	1	0	0	0	0	1	0	0	0	1
Ringed plover	0	0	0	1	0	0	0	0	1	0	0	0	1
Redshank	0	0	0	1	0	0	0	0	1	0	0	0	1
Turnstone	0	0	0	1	0	0	0	0	1	0	0	0	1
Oystercatcher	0	0	0	1	0	0	0	0	1	0	0	0	2
Arctic skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Great skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	0	0	0	0	0	0	0







## 7 Discussion

### 7.1 Distance analysis

#### **Choice of models for Distance analysis calculations**

In the species accounts the rationale is given for every species why a certain model was chosen. The main issues for improving models concerned the type of detection function, the inclusion or not of covariates (either as a variate or factor), the application of size bias regression or mean size in the cluster size analysis. This latter issue turned out to lead potentially to relatively large differences in final population estimates, the reason this aspect is discussed more elaborately below.

Generally, the data of the Neart na Gaoithe surveys were such that a variety of competing models could be fitted that produced similar results. Thus, fitting a variety of models and using AIC to objectively choose between models seemed in principle a sensible approach for most species. However, as reported in several individual species accounts, selecting the model with the lowest AIC was not always applied to all species. Most of the exclusions have been made on the basis of the knowledge of birds and survey experience. Especially in case the detection function overestimated the density on the track line, we have chosen an alternative function. Most of the time this was in situations that birds were being detected disproportionately in the second band (due to birds diving under water or birds flying up in the A band and pop up in the second band unnoticed). As a robust, conservative approach, hazard-rate detection curves can then be chosen. Alternatively pooling the two bands also can reveal a smooth distance detection curve. Only sea state has been included in some species models as a covariate in some detection functions when on the basis of AIC it would be included. Mostly sea state was included as a non-factor variable as it used fewer parameters and enforced a monotonic relationship between detectability and sea state. The Distance analysis program uses a size bias regression for each survey to obtain estimates of cluster size. For some species the numbers of sightings in a survey were small and so in these cases the size bias regression failed to come up with reliable estimates of expected cluster size. In the following paragraph this issue is further discussed as it turned out to be that applying a mean cluster size instead could reveal far too high population estimates.

#### **Size bias regression vs Mean cluster size analysis**

In some cases during the population size modelling in Distance, the created models encounter problems with the clustered distribution of certain species. Distance uses size-bias regression models to calculate population estimates based on the assumption that larger groups are more easily observed further away from the transect line than individual birds at a similar distance. With the size-bias regression, the assumption is made that all cluster sizes are observed on, or close to, the track line. So, in case more large clusters are observed close to the line than one would expect the size-bias estimate is larger than the mean estimate. The question is why the observed groups on the track line can consist of more large groups than

expected? Often this is the case when numbers per survey are low and thus the potential influence of a large group near the transect line is large. In certain species, like gulls and Northern Fulmar, this phenomena can occur due to groups of birds related to fishery activities, that are still present long after fishing activity was undertaken at that location. Also clustered presence of foraging Little Gulls along lines or fronts at sea might give problems.

This size-bias regression gives problems when the expected cluster size ( $E(s)$  as determined by Distance) is larger than the mean cluster size. This problem mainly occurs when population estimates are given per survey and thus based on a cluster size per survey as well (in Distance terms: "Cluster Size per 'stratum' instead of 'global'"). Only in one extreme case size-bias regression was less likely to be the preferred method and possible consequences are described in the example below of the Great Black-backed Gull.

#### *Great Black-backed Gull*

The greatest influence of shifting from size bias regression to mean cluster size would have occurred when analysing Great Black-backed Gull. In 3 out of the 23 surveys (implying 35% of the total number of observations)  $E(s)$  was larger than the Mean Cluster Size and a warning is given by the model. Although the problem only occurred in a limited number of surveys the implications could be great for the final outcomes of the estimates sizes of the populations (table 7.1). In these surveys population estimates are indeed slightly smaller when mean cluster size is used, however, in cases when the size bias regression properly reveals that  $E(s) < \text{Mean CS}$ , and rigorously the mean cluster size approach is applied to all surveys the population estimates can rise up to 5.43 times as high.

In this report, size-bias regression has been chosen as the preferred method for estimating populations based on several reasons. Problems with the size-biased regression do not occur frequently (only in 12% of all surveys (41 out of 345 (15 species, 23 surveys) surveys) and in most cases  $E(s)$  only slightly larger than the mean cluster size. Also the surveys with these problems are almost exclusively surveys with low numbers of the particular species so the overall influence on population estimates is small.

*Table 7.1 Comparison of Size bias regression and Mean Cluster Size population estimates during individual surveys.*

Species	Survey	Warning	Population estimate based on Size-bias Regression	Population estimate based on Mean Cluster Size	Correction factor when using Mean Cluster Size approach
Greater Black-backed Gull	200911		263	662	2.52
	200912		53	53	1.00
	201001		631	2412	3.82
	201002		10	10	1.00
	201003		21	21	1.00
	201004		21	21	1.00
	201005		0	0	
	201006		0	0	
	201007		0	0	
	201008		0	0	
	201009		21	21	1.00
	201010	x	<b>192</b>	<b>168</b>	<b>0.88</b>
	201012		74	402	5.43
	201101	x	<b>97</b>	<b>84</b>	<b>0.87</b>
	201102		0	0	
	201103		10	10	1.00
	201104		103	401	3.89
	201105		0	0	
	201106		0	0	
	201107		0	0	
201108		0	0		
201109	x	<b>198</b>	<b>178</b>	<b>0.90</b>	
201110		10	10	1.00	

## 7.2 Collision rate modelling

The results of the collision rate modelling for four wind farm variants in the Neart na Gaoithe development area are presented in chapter 6. For the 12 main species, these results are presented on the basis of densities of flying birds recorded in the area during a two-year period. In addition, a further 22 species were assessed based on a fixed number of passages per year; these results are discussed at the end of this chapter. The differences between the estimated collision rates between year 1 and year 2 are due to differences in recorded bird densities. In general, the recorded densities of flying birds in the Neart na Gaoithe development area were slightly higher in year 2. On average, monthly densities for the 12 species assessed in the collision rate modelling (excluding additional species) differed by 3.82 birds/km<sup>2</sup>. The results based on the mean density across the two years are also presented (6.4) and are discussed here in relation to the modelled estimates in order to prevent repetition.

A total of four wind farm variants were modelled. These variants differed in the type, size and operating characteristics of turbines as well as the numbers of turbines. These differences translate into differing collision risk for a single transit across the rotor-swept area and also the total number of transits through this area. In terms of the model used, in general a larger turbine relates to a lower collision risk per transit but a greater potential number of transits through the rotor-swept area for any given species. The total number of transits per wind farm is also influenced by the total number of turbines. For the variants modelled, the highest collision risk per transit was for the smallest turbine (4.135MW GE) and the lowest collision risk was for the largest turbine (7MW Vestas). The total number of transits per year was lowest for the variant

with the second-fewest turbines (75 x 6MW Siemens NG5) and highest for the variant with the most turbines (128 x 3.6MW Siemens).

For the model used, and for any given turbine, collision risk is related to the size and flight speed of the bird in question. Of the 12 species assessed, the largest, Northern Gannet, had the highest collision risk and the smallest, Puffin, the lowest. Collision risk per transit varied from 4.7% for Puffin with a 7MW (Vestas) turbine to 8.4% for Northern Gannet with a 4.135MW (GE) turbine. The combination of this collision risk and the potential number of transits resulted in the species-specific and variant-specific collision rates to which various avoidance factors were applied. This avoidance factor reduces the estimated numbers of collisions proportionately. Here avoidance rates of 95%, 98%, 99% and 99.5% were applied, which reduced the estimated numbers of collisions correspondingly.

The application of avoidance rates reduced the estimated number of collisions per year. For the highest collision rate calculated before avoidance (appendix 1), for Northern Gannet and the 128 x 3.6MW Siemens variant, an avoidance rate of 99% reduced the estimated number of collisions to 451 per year; for a rate of 99.5% this was 225 estimated collisions per year.

The estimated numbers of collisions for the 22 additional species are fairly similar between species. This is a consequence of the identical fluxes and similar proportions flying at rotor height used. The latter value was taken from literature and for many species was a generic value leading to identical values being used for all species within a group, *i.e.* geese. The differences in results are therefore mainly due to bird characteristics (size and flight speed) and are relatively small compared. The numbers of birds used in the model is directly proportional to the estimated numbers of collisions. Therefore, increasing the flux by two would double the numbers of collisions. In this respect the results for these additional species, which are based on a known number of flights, provide a useful reference for species seldom recorded during the field surveys.

The estimates of collision rates for birds at Neart na Gaoithe development area were produced using the extended Band model, which makes a number of assumptions and simplifications of birds, turbines and their interactions. Furthermore, simplification of input data adds to the variability and uncertainty of output values. The main sources of uncertainty are outlined in Band (2011) and include, amongst others, the use of fixed parameters for dynamic variables like wingspan, flight speed, flight direction, turbine speed, wind speed and bird abundance. Uncertainty also exists in the data for bird abundance, which often shows high variability, both spatially and temporally. These factors influence the uncertainty surrounding estimates to varying degrees, however, it is arguably avoidance behaviour that has most influence on this uncertainty. Currently, few published figures exist for the level of avoidance exhibited by birds in relation to wind turbines, certainly for the offshore environment. This, coupled with the strong influence of the avoidance rate on the modelled results,

means that the uncertainty arising from avoidance rates used are likely to overshadow any uncertainty resulting due to other factors. Band (2011) outlines the uncertainty surrounding the modelled results should be expressed numerically. For most factors, however, these cannot be assessed empirically and would therefore be an ambiguous appraisal of the error involved.



## 8 Literature

- Alerstam, T., M. Rosén, J. Bäckman, P.G.P. Ericson & O. Hellgren, 2007. Flight speeds among bird species: Allometric and phylogenetic effects. *PLoS Biol* 5(8): e197. doi:10.1371/journal.pbio.0050197.
- Band, W., M. 2011. Using a collision risk model to assess bird collision risks for offshore windfarms. Final version, September 2011. SOSS, The Crown Estate, 37pp. <http://www.bto.org/science/wetland-and-marine/soss/projects>.
- Band, W., M. Madders & D.P. Whitfield, 2007. Developing field and analytical methods to assess avian collision risk at wind farms. in M. de Lucas, G.F.E. Janss & M. Ferrer. *Birds and Wind Farms: Risk Assessment and Mitigation*. pp. 259-275. Quercus. Madrid.
- Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L. 1993. *DISTANCE Sampling: Estimating abundance of biological populations*. Chapman & Hall, London, reprinted 1999 by RUWPA, University of St. Andrews, Scotland.
- Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L. 2001. *Introduction to Distance Sampling*. Oxford University Press, Oxford. 432pp.
- Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L. (eds) 2004. *Advanced Distance Sampling*. Oxford University Press, Oxford. 434pp.
- Camphuysen, C.J., A.D. Fox, M.F. Leopold & I.K. Petersen, 2004. Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K. - A comparison of ship and aerial sampling methods for marine birds, and their applicability to offshore wind farm assessments. Report COWRIE - BAM -02-2002.
- Chamberlain, D.E., M.R. Rehfisch, A.D. Fox, M. Desholm & S.J. Anthony, 2006. The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. *Ibis* 148: 198-202.
- Cook, A.S.C.P., A. Johnston, L.J. Wright & N.H.K. Burton, *in rev.* A review of flight heights and avoidance rates of birds in relation to offshore wind farms. Strategic Ornithological Support Services/BTO report, UK.
- Cramp, S. & C.M. Perrins, 1977-1994. *Handbook of the birds of Europe, the Middle East and Africa. The birds of the western Palearctic*. Oxford University Press, Oxford.
- Mainstream Renewable Power (2012). Meart na Gaoithe Offshore Wind Farm Environmental Statement Appendix 12.1 Ornithological Technical Report.
- Pennycuik, C.J. 1997. Actual and 'optimum' flight speeds: Field data reassessed. *The Journal of Experimental Biology* 200: 2355-2361.
- Pennycuik, C.J. 1987. Flight of auks (Alcidae) and other northern seabirds compared with southern Procellariiformes: ornithologist observations. *Journal of Experimental Biology* 128: 335-347.
- Snow, D.W. & C. Perrins 1997. *Birds of the Western Palearctic. Concise edition. Volume 1, Non-passerines*. Oxford University Press, Oxford.
- Thaxter, C.B., S. Wanless, F. Daunt, M.P. Harris, S. Benvenuti, Y. Watanuki, D. Grénillet & K.C. Harmer, 2010. Influence of wing loading on the trade-off between pursuit-diving and flight in common guillemots and razorbills. *The Journal of Experimental Biology* 213: 1018-1025.

- Thomas, L., Buckland, S.T., Rexstad, E.A., Laake, J.L., Strindberg, S., Hedley, S.L., Bishop, J.R.B., Marques, T.A. and Burnham, K.P. (2010) Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology* 47: 5-14
- Tasker, M.L., P.H. Jones, T.J. Dixon & B.F. Blake, 1984. Counting seabirds at sea from ships: a review of methods employed and a suggestion for a standardized approach. *Auk* 101: 567-577.
- Wakeling, J.M. & J. Hodgson, 1992. Optimisation of the flight speed of the little, common and Sandwich tern. *Journal of Experimental Biology*. 169; 261-266.



# Appendix 1

Results of collision rate modelling for Neart na Gaoithe development area assuming no avoidance.

*Table A.1.1 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2010. Potential number of collisions assuming no avoidance.*

## Neart na Gaoithe 128 x 3.6MW

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL
	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	COLLISIONS
	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	NO
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVOIDANCE	NO
Gannet	64	192	5206	1660	2224	3427	1306	2410	4390	1794	195	0	22888	0
Kittiwake	0	0	0	65	437	208	430	68	1558	1213	168	111	4258	0
Guillemot	0	2	1	10	9	1	0	0	0	2	1	0	26	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	12	1	2	2	6	0	0	0	0	23	0
Herring Gull	970	305	1361	375	0	397	0	0	0	0	965	1271	5643	0
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	201	0	0	201	0
Lesser Black-backed Gull	0	0	0	186	207	0	204	0	0	0	0	0	597	0
Great Black-backed Gull	464	0	0	0	0	0	0	0	267	0	230	683	1643	0
Large gulls combined	1490	281	1253	691	385	365	378	0	343	0	1185	2048	8418	0

## Neart na Gaoithe 109 x 4.135MW

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL
	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	COLLISIONS
	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	NO
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVOIDANCE	NO
Gannet	57	172	4669	1489	1995	3073	1171	2161	3937	1608	175	0	20506	0
Kittiwake	0	0	0	58	384	183	378	60	1370	1066	148	97	3744	0
Guillemot	0	2	1	9	8	0	0	0	0	0	1	0	22	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	10	1	2	2	5	0	0	0	0	20	0
Herring Gull	867	272	1216	335	0	355	0	0	0	0	862	1135	5042	0
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	179	0	0	179	0
Lesser Black-backed Gull	0	0	0	165	184	0	181	0	0	0	0	0	531	0
Great Black-backed Gull	414	0	0	0	0	0	0	0	238	0	206	609	1466	0
Large gulls combined	1329	250	1118	616	343	326	337	0	306	0	1057	1827	7508	0

## Neart na Gaoithe 75 x 6MW

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL
	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	COLLISIONS
	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	NO
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVOIDANCE	NO
Gannet	38	113	3057	975	1306	2012	767	1415	2578	1063	115	0	13428	0
Kittiwake	0	0	0	38	257	122	252	40	914	711	99	65	2498	0
Guillemot	0	1	0	6	5	0	0	0	0	1	0	0	15	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	7	1	1	1	3	0	0	0	0	14	0
Herring Gull	570	179	799	220	0	233	0	0	0	0	566	746	3313	0
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	118	0	0	118	0
Lesser Black-backed Gull	0	0	0	109	122	0	119	0	0	0	0	0	350	0
Great Black-backed Gull	272	0	0	0	0	0	0	0	157	0	135	401	965	0
Large gulls combined	874	165	736	406	226	215	222	0	201	0	695	1202	4941	0

## Neart na Gaoithe 64 x 7MW

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL
	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	per month	COLLISIONS
	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	NO
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVOIDANCE	NO
Gannet	39	114	3091	968	1285	1970	745	1381	2567	1065	117	0	13341	0
Kittiwake	0	0	0	39	255	121	248	39	921	728	102	67	2519	0
Guillemot	0	1	1	6	5	0	0	0	0	1	0	0	15	0
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	7	1	1	1	3	0	0	0	0	14	0
Herring Gull	591	184	818	221	0	231	0	0	0	0	586	766	3396	0
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	0	125	0	0	125	0
Lesser Black-backed Gull	0	0	0	110	121	0	117	0	0	0	0	0	348	0
Great Black-backed Gull	279	0	0	0	0	0	0	0	156	0	138	407	981	0
Large gulls combined	904	169	750	406	224	212	217	0	202	0	716	1229	5028	0

**Table A.1.2 Results of collision rate modelling for Neart na Gaoithe development area between November 2010 and October 2011. Potential number of collisions assuming no avoidance.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	TOTAL COLLISIONS per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		AVOIDANCE
Gannet	126	3682	907	2288	11440	8937	18562	9989	7610	3449	0	0	61	73146
Kitiwake	55	111	59	461	832	284	2360	275	189	809	0	0	5748	12200
Guillemot	2	1	2	19	8	6	3	2	0	0	0	0	1	48
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	2	6	8	12	3	0	0	0	0	0	33
Herring Gull	1900	639	681	0	0	1221	0	0	0	0	0	0	314	5188
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	30	32
Little Gull	0	0	0	0	0	0	0	0	1320	0	0	0	0	1440
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	227	0	0	0	0	292	0	0	258	0	0	0	225	1093
Large gulls combined	2042	588	627	0	0	1500	0	0	332	0	0	0	578	6183

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	TOTAL COLLISIONS per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		AVOIDANCE
Gannet	113	3302	813	2051	10258	8015	16645	8957	6824	3093	0	0	55	65393
Kitiwake	49	98	52	405	731	250	2075	242	166	711	0	0	5054	10726
Guillemot	2	1	2	16	7	5	2	1	0	0	0	0	1	42
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	2	5	7	10	2	0	0	0	0	0	29
Herring Gull	1698	571	609	0	0	1091	0	0	0	0	0	0	280	4635
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	26	28
Little Gull	0	0	0	0	0	0	0	0	1176	0	0	0	0	1283
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	202	0	0	0	0	260	0	0	231	0	0	0	201	975
Large gulls combined	1821	525	560	0	0	1338	0	0	296	0	0	0	516	5515

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	TOTAL COLLISIONS per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		AVOIDANCE
Gannet	74	2162	532	1343	6717	5248	10900	5865	4469	2025	0	0	36	42361
Kitiwake	32	65	35	270	488	167	1384	161	111	474	0	0	3372	7156
Guillemot	1	1	1	11	4	4	2	1	0	0	0	0	1	28
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	1	3	4	7	2	0	0	0	0	0	20
Herring Gull	1116	375	400	0	0	717	0	0	0	0	0	0	184	3045
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	17	19
Little Gull	0	0	0	0	0	0	0	0	775	0	0	0	0	845
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	133	0	0	0	0	171	0	0	152	0	0	0	132	642
Large gulls combined	1199	345	368	0	0	880	0	0	195	0	0	0	339	3629

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	Collisions per month NO	TOTAL COLLISIONS per YEAR
	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE	AVOIDANCE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		AVOIDANCE
Gannet	76	2194	538	1334	6607	5139	10595	5723	4450	2048	0	0	36	42261
Kitiwake	34	67	36	272	485	165	1362	159	112	485	0	0	3458	7237
Guillemot	1	1	1	11	4	4	2	1	0	0	0	0	1	28
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	1	3	4	7	2	0	0	0	0	0	19
Herring Gull	1158	385	409	0	0	711	0	0	0	0	0	0	189	3112
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	808	0	0	0	0	882
Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Black-backed Gull	137	0	0	0	0	168	0	0	151	0	0	0	134	643
Large gulls combined	1238	353	375	0	0	869	0	0	196	0	0	0	347	3686

**Table A.1.3 Results of collision rate modelling for Neart na Gaoithe development area between November 2009 and October 2011. Potential number of collisions assuming no avoidance.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS per YEAR
	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	NO AVOIDANCE	
Gannet	95	1937	3056	1974	6832	6182	9934	6199	6000	2621	195	30	45057	
Kittiwake	28	56	30	263	634	246	1395	171	873	1011	168	2930	7805	
Guillemot	1	1	1	14	8	3	1	1	0	1	1	1	35	
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0	
Puffin	0	0	0	7	4	5	7	4	0	0	0	0	27	
Herring Gull	1435	472	1021	188	0	809	0	0	0	0	965	792	5682	
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	
Little Gull	0	0	0	0	0	0	0	0	660	100	0	0	761	
Lesser Black-backed Gull	0	0	0	93	104	0	102	0	0	0	0	0	298	
Great Black-backed Gull	345	0	0	0	0	146	0	0	263	0	230	454	1438	
Large gulls combined	1766	435	940	345	192	933	189	0	337	0	1185	1313	7635	

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS per YEAR
	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	NO AVOIDANCE
Gannet	85	1737	2741	1770	6127	5544	8908	5559	5301	2351	175	27	40404
Kittiwake	24	49	26	231	558	216	1226	151	768	889	148	2576	6862
Guillemot	1	1	1	13	7	3	1	1	0	1	1	1	31
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	6	3	4	6	4	0	0	0	0	23
Herring Gull	1282	422	912	168	0	723	0	0	0	0	862	708	5076
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	588	90	0	0	678
Lesser Black-backed Gull	0	0	0	83	92	0	90	0	0	0	0	0	265
Great Black-backed Gull	308	0	0	0	0	130	0	0	234	0	206	405	1283
Large gulls combined	1575	388	839	308	172	832	169	0	301	0	1057	1171	6810

**Neart na Gaoithe 75 x 6MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS per YEAR
	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	NO AVOIDANCE
Gannet	56	1137	1795	1159	4012	3630	5833	3640	3523	1539	115	18	26457
Kittiwake	16	33	17	154	372	144	818	101	512	593	99	1716	4578
Guillemot	1	1	1	9	5	2	1	0	0	1	0	0	21
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	4	2	3	4	3	0	0	0	0	16
Herring Gull	843	277	599	110	0	475	0	0	0	0	566	465	3335
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	387	59	0	0	446
Lesser Black-backed Gull	0	0	0	55	61	0	60	0	0	0	0	0	175
Great Black-backed Gull	203	0	0	0	0	86	0	0	154	0	135	266	844
Large gulls combined	1036	255	552	203	113	547	111	0	198	0	695	771	4482

**Neart na Gaoithe 64 x 7MW**

Species	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	Collisions	TOTAL COLLISIONS per YEAR
	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	per month NO AVOIDANCE	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	NO AVOIDANCE
Gannet	57	1154	1814	1151	3946	3555	5670	3552	3508	1557	117	18	26999
Kittiwake	17	34	18	155	370	143	805	99	516	607	102	1762	4628
Guillemot	1	1	1	9	5	2	1	0	0	1	0	0	21
Razorbill	0	0	0	0	0	0	0	0	0	0	0	0	0
Puffin	0	0	0	4	2	3	4	3	0	0	0	0	16
Herring Gull	874	285	614	111	0	471	0	0	0	0	586	477	3417
Pink-footed Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Gull	0	0	0	0	0	0	0	0	404	62	0	0	467
Lesser Black-backed Gull	0	0	0	55	60	0	59	0	0	0	0	0	174
Great Black-backed Gull	208	0	0	0	0	84	0	0	154	0	138	270	854
Large gulls combined	1071	261	563	203	112	541	109	0	199	0	716	788	4562

**Table A.1.4 Results of collision rate modelling for Neart na Gaoithe development area as calculated from a flux of 1,000 of each species passing twice during a year, once in April and once in September (see 2.3). Potential number of collisions assuming no avoidance.**

**Neart na Gaoithe 128 x 3.6MW**

Species	Collisions per month NO AVOIDANCE Jan	Collisions per month NO AVOIDANCE Feb	Collisions per month NO AVOIDANCE Mar	Collisions per month NO AVOIDANCE Apr	Collisions per month NO AVOIDANCE May	Collisions per month NO AVOIDANCE Jun	Collisions per month NO AVOIDANCE Jul	Collisions per month NO AVOIDANCE Aug	Collisions per month NO AVOIDANCE Sep	Collisions per month NO AVOIDANCE Oct	Collisions per month NO AVOIDANCE Nov	Collisions per month NO AVOIDANCE Dec	TOTAL COLLISIONS S per YEAR NO AVOIDANCE
Red-throated diver	0	0	0	0	2	0	0	0	0	2	0	0	4
Black-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	2
Bean Goose	0	0	0	0	15	0	0	0	0	167	0	0	317
Pink-footed goose	0	0	0	0	146	0	0	0	0	161	0	0	307
Barnacle goose	0	0	0	0	139	0	0	0	0	154	0	0	292
Bar-tailed godwit	0	0	0	0	114	0	0	0	0	127	0	0	241
Black-tailed godwit	0	0	0	0	115	0	0	0	0	127	0	0	243
Knot	0	0	0	0	106	0	0	0	0	117	0	0	223
Curlew	0	0	0	0	128	0	0	0	0	142	0	0	270
Dunlin	0	0	0	0	103	0	0	0	0	114	0	0	216
Sanderling	0	0	0	0	104	0	0	0	0	115	0	0	220
Grey plover	0	0	0	0	109	0	0	0	0	121	0	0	230
Lapwing	0	0	0	0	116	0	0	0	0	128	0	0	244
Ringed plover	0	0	0	0	102	0	0	0	0	113	0	0	214
Redstank	0	0	0	0	119	0	0	0	0	131	0	0	250
Turnstone	0	0	0	0	106	0	0	0	0	118	0	0	224
Oystercatcher	0	0	0	0	124	0	0	0	0	137	0	0	261
Arctic skua	0	0	0	0	4	0	0	0	0	4	0	0	8
Great skua	0	0	0	0	5	0	0	0	0	5	0	0	9
Common tern	0	0	0	0	12	0	0	0	0	12	0	0	25
Arctic Tern	0	0	0	0	3	0	0	0	0	3	0	0	5
Sandwich tern	0	0	0	0	4	0	0	0	0	4	0	0	7

**Neart na Gaoithe 109 x 4.135MW**

Species	Collisions per month NO AVOIDANCE Jan	Collisions per month NO AVOIDANCE Feb	Collisions per month NO AVOIDANCE Mar	Collisions per month NO AVOIDANCE Apr	Collisions per month NO AVOIDANCE May	Collisions per month NO AVOIDANCE Jun	Collisions per month NO AVOIDANCE Jul	Collisions per month NO AVOIDANCE Aug	Collisions per month NO AVOIDANCE Sep	Collisions per month NO AVOIDANCE Oct	Collisions per month NO AVOIDANCE Nov	Collisions per month NO AVOIDANCE Dec	TOTAL COLLISIONS S per YEAR NO AVOIDANCE
Red-throated diver	0	0	0	0	2	0	0	0	0	2	0	0	4
Black-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	2
Bean Goose	0	0	0	0	133	0	0	0	0	147	0	0	280
Pink-footed goose	0	0	0	0	129	0	0	0	0	142	0	0	271
Barnacle goose	0	0	0	0	122	0	0	0	0	135	0	0	257
Bar-tailed godwit	0	0	0	0	100	0	0	0	0	110	0	0	210
Black-tailed godwit	0	0	0	0	100	0	0	0	0	111	0	0	211
Knot	0	0	0	0	91	0	0	0	0	101	0	0	192
Curlew	0	0	0	0	113	0	0	0	0	125	0	0	238
Dunlin	0	0	0	0	89	0	0	0	0	99	0	0	188
Sanderling	0	0	0	0	90	0	0	0	0	100	0	0	190
Grey plover	0	0	0	0	94	0	0	0	0	105	0	0	199
Lapwing	0	0	0	0	102	0	0	0	0	113	0	0	215
Ringed plover	0	0	0	0	87	0	0	0	0	97	0	0	184
Redstank	0	0	0	0	108	0	0	0	0	120	0	0	228
Turnstone	0	0	0	0	92	0	0	0	0	102	0	0	195
Oystercatcher	0	0	0	0	110	0	0	0	0	122	0	0	232
Arctic skua	0	0	0	0	3	0	0	0	0	3	0	0	7
Great skua	0	0	0	0	4	0	0	0	0	4	0	0	8
Common tern	0	0	0	0	11	0	0	0	0	11	0	0	23
Arctic Tern	0	0	0	0	2	0	0	0	0	2	0	0	5
Sandwich tern	0	0	0	0	3	0	0	0	0	3	0	0	7

**Neart na Gaoithe 75 x 6MW**

Species	Collisions per month NO AVOIDANCE Jan	Collisions per month NO AVOIDANCE Feb	Collisions per month NO AVOIDANCE Mar	Collisions per month NO AVOIDANCE Apr	Collisions per month NO AVOIDANCE May	Collisions per month NO AVOIDANCE Jun	Collisions per month NO AVOIDANCE Jul	Collisions per month NO AVOIDANCE Aug	Collisions per month NO AVOIDANCE Sep	Collisions per month NO AVOIDANCE Oct	Collisions per month NO AVOIDANCE Nov	Collisions per month NO AVOIDANCE Dec	TOTAL COLLISIONS S per YEAR NO AVOIDANCE
Red-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	2
Black-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	1
Bean Goose	0	0	0	0	86	0	0	0	0	96	0	0	186
Pink-footed goose	0	0	0	0	86	0	0	0	0	95	0	0	180
Barnacle goose	0	0	0	0	81	0	0	0	0	90	0	0	172
Bar-tailed godwit	0	0	0	0	67	0	0	0	0	74	0	0	141
Black-tailed godwit	0	0	0	0	68	0	0	0	0	75	0	0	142
Knot	0	0	0	0	62	0	0	0	0	69	0	0	130
Curlew	0	0	0	0	75	0	0	0	0	83	0	0	159
Dunlin	0	0	0	0	60	0	0	0	0	67	0	0	127
Sanderling	0	0	0	0	61	0	0	0	0	68	0	0	129
Grey plover	0	0	0	0	64	0	0	0	0	71	0	0	135
Lapwing	0	0	0	0	68	0	0	0	0	75	0	0	143
Ringed plover	0	0	0	0	60	0	0	0	0	66	0	0	126
Redstank	0	0	0	0	70	0	0	0	0	77	0	0	147
Turnstone	0	0	0	0	62	0	0	0	0	69	0	0	131
Oystercatcher	0	0	0	0	73	0	0	0	0	80	0	0	153
Arctic skua	0	0	0	0	2	0	0	0	0	2	0	0	4
Great skua	0	0	0	0	3	0	0	0	0	3	0	0	5
Common tern	0	0	0	0	7	0	0	0	0	7	0	0	15
Arctic Tern	0	0	0	0	2	0	0	0	0	2	0	0	3
Sandwich tern	0	0	0	0	2	0	0	0	0	2	0	0	4

**Neart na Gaoithe 64 x 7MW**

Species	Collisions per month NO AVOIDANCE Jan	Collisions per month NO AVOIDANCE Feb	Collisions per month NO AVOIDANCE Mar	Collisions per month NO AVOIDANCE Apr	Collisions per month NO AVOIDANCE May	Collisions per month NO AVOIDANCE Jun	Collisions per month NO AVOIDANCE Jul	Collisions per month NO AVOIDANCE Aug	Collisions per month NO AVOIDANCE Sep	Collisions per month NO AVOIDANCE Oct	Collisions per month NO AVOIDANCE Nov	Collisions per month NO AVOIDANCE Dec	TOTAL COLLISIONS S per YEAR NO AVOIDANCE
Red-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	2
Black-throated diver	0	0	0	0	1	0	0	0	0	1	0	0	1
Bean Goose	0	0	0	0	86	0	0	0	0	96	0	0	182
Pink-footed goose	0	0	0	0	84	0	0	0	0	93	0	0	177
Barnacle goose	0	0	0	0	80	0	0	0	0	89	0	0	169
Bar-tailed godwit	0	0	0	0	67	0	0	0	0	75	0	0	142
Black-tailed godwit	0	0	0	0	68	0	0	0	0	75	0	0	143
Knot	0	0	0	0	62	0	0	0	0	69	0	0	131
Curlew	0	0	0	0	75	0	0	0	0	83	0	0	158
Dunlin	0	0	0	0	61	0	0	0	0	68	0	0	129
Sanderling	0	0	0	0	62	0	0	0	0	68	0	0	131
Grey plover	0	0	0	0	64	0	0	0	0	71	0	0	135
Lapwing	0	0	0	0	69	0	0	0	0	77	0	0	147
Ringed plover	0	0	0	0	60	0	0	0	0	67	0	0	126
Redstank	0	0	0	0	75	0	0	0	0	83	0	0	159
Turnstone	0	0	0	0	63	0	0	0	0	70	0	0	134
Oystercatcher	0	0	0	0	74	0	0	0	0	83	0	0	157
Arctic skua	0	0	0	0	2	0	0	0	0	2	0	0	4
Great skua	0	0	0	0	3	0	0	0	0	3	0	0	5
Common tern	0	0	0	0	8	0	0	0	0	8	0	0	15
Arctic Tern	0	0	0	0	2	0	0	0	0	2	0	0	3
Sandwich tern	0	0	0	0	2	0	0	0	0	2	0	0	4