



Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 4, Annex 4.1: Offshore Ornithology Baseline Characterisation Report

Date: April 2022

Revision: B

Application Reference: 6.4.4.1

Pursuant to: APFP Regulation 5(2)(a)



REVISION	DATE	STATUS/ REASON FOR ISSUE	AUTHOR:	CHECKED BY:	APPROVED BY:
A	August 2021	PEIR	APEM	RWE	RWE
B	March 2022	ES	APEM	RWE	RWE

www.awelymor.cymru

RWE Renewables UK
Swindon Limited

Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire SN5 6PB
T +44 (0)8456 720 090
www.rwe.com

Registered office:
RWE Renewables UK
Swindon Limited
Windmill Hill Business Park
Whitehill Way
Swindon



Awel y Môr Offshore Wind Farm

Annex 4.1: Offshore Ornithology Baseline Characterisation Report

GoBe Consultants Limited

APEM Ref: P00004817

February 2022

Matthew Boa, James Spencer, Lyle Boyle, Dr Tim Kasoar, Sean Sweeney and Dr Emily Nelson

Client: GoBe Consultants Ltd

Address: Suites B2 & C2
Higher Mill
Buckfast Abbey
Buckfastleigh
Devon
TQ11 0EE

Project reference: P00004817

Date of issue: February 2022

Project Director: Sean Sweeney

Project Manager: Matthew Boa

Other: James Spencer, Dr Emily Nelson, Dr Tim Kasoar and Lyle Boyle

APEM Ltd
Riverview
A17 Embankment Business Park
Heaton Mersey
Stockport
SK4 3GN

Tel: 0161 442 8938

Fax: 0161 432 6083

Registered in England No. 02530851

Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
0.1	23/11/2021	All	All	APEM ES First Draft	TK
0.2	24/11/2021	All	All	Amends following APEM review	EN
1.0	30/11/2021	All	All	Amends following Gobe review	EN
1.1	06/01/2022	All	All	Update to RH abundance presentation	SS

Contents

1	Introduction	3
1.1	Project background	3
1.2	Aims and objectives	3
1.3	Study area	4
1.4	Nomenclature	4
2	Offshore ornithology	6
2.1	Key data sources	6
2.2	Existing data sources	8
2.2.1	Historic GyM baseline characterisation surveys	8
2.2.2	GyM post-consent monitoring	9
2.2.3	Rhyl Flats post-construction monitoring	13
2.2.4	WWT all Wales common scoter survey	13
2.2.5	Liverpool Bay/Bae Lerpwl area of search (Lawson et al., 2016)	14
2.2.6	European Seabirds at Sea (ESAS)	18
2.3	Contemporary aerial observer and aerial digital surveys	18
2.3.1	WWT waterbird surveys	18
2.3.2	AyM aerial digital surveys	19
2.3.3	Data analysis	21
3	Results	26
3.1	Spatial distribution	26
3.2	Flight height/ direction	26
3.3	Species recorded	26
4	Species accounts	28
4.1	Common scoter	28
4.1.1	AyM Survey Data (aerial digital survey data 2019-2021)	28
4.1.2	Biological Season Mean Peak Estimates	28
4.1.3	Spatial Density Distribution and Flight Direction	29

4.2	Kittiwake	31
4.2.1	AyM Survey Data (aerial survey data 2019-2021).....	31
4.2.1	Biological Season Mean Peak Estimates	31
4.2.2	Spatial Density Distribution and Flight Direction.....	32
4.3	Common gull.....	34
4.3.1	AyM Survey Data (aerial survey data 2019-2021).....	34
4.3.2	Biological Season Mean Peak Estimates	34
4.3.3	Spatial Density Distribution and Flight Direction.....	35
4.4	Great black-backed gull	37
4.4.1	AyM Survey Data (aerial survey data 2019-2021).....	37
4.4.2	Biological Season Mean Peak Estimates	37
4.4.3	Spatial Density Distribution and Flight Direction.....	38
4.5	Herring gull	40
4.5.1	AyM Survey Data (aerial survey data 2019-2021).....	40
4.5.2	Biological Season Mean Peak Estimates	40
4.5.3	Spatial Density Distribution and Flight Direction.....	41
4.6	'Commic' tern.....	43
4.6.1	AyM Survey Data (aerial survey data 2019-2021).....	43
4.6.2	Biological Season Mean Peak Estimates	43
4.6.3	Spatial Density Distribution and Flight Direction.....	44
4.7	Guillemot	46
4.7.1	AyM Survey Data (aerial survey data 2019-2021).....	46
4.7.2	Biological Season Mean Peak Estimates	48
4.7.3	Spatial Density Distribution and Flight Direction.....	49
4.8	Razorbill.....	51
4.8.1	AyM Survey Data (aerial survey data 2019-2021).....	51
4.8.2	Biological Season Mean Peak Estimates	53

4.8.3	Spatial Density Distribution and Flight Direction.....	54
4.9	Red-throated diver	56
4.9.1	AyM Survey Data (aerial survey data 2019-2021).....	56
4.9.2	Biological Season Mean Peak Estimates	57
4.9.3	Spatial Density Distribution and Flight Direction.....	59
4.10	Fulmar	61
4.10.1	AyM Survey Data (aerial survey data 2019-2021).....	61
4.10.2	Biological Season Mean Peak Estimates	61
4.10.3	Spatial Density Distribution and Flight Direction.....	62
4.11	Manx shearwater	64
4.11.1	AyM Survey Data (aerial survey data 2019-2021).....	64
4.11.2	Biological Season Mean Peak Estimates	65
4.11.3	Spatial Density Distribution and Flight Direction.....	66
4.12	Gannet.....	68
4.12.1	AyM Survey Data (aerial survey data 2019-2021).....	68
4.12.2	Biological Season Mean Peak Estimates	69
4.12.3	Spatial Density Distribution and Flight Direction.....	71
4.13	Other Species Recorded.....	73
4.13.1	AyM Survey Data (aerial survey data 2019-2021).....	73
5	References	76
Appendix 1	Scientific Names and Taxonomy	810
Appendix 2	WWT Waterbird Survey Results	821
Appendix 3	Abundance and behaviour information for all birds (excluding Apportionment and Correction for Availability Bias).....	82
Appendix 4	Flight Direction Rose Diagrams	164

List of Figures

Figure 1	AyM Study Area	5
Figure 2	Survey areas for GyM post-consent monitoring.....	10
Figure 3	Estimated mean density surface of red-throated diver recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).....	15
Figure 4	Estimated mean density surface of common scoter recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).....	16
Figure 5	Estimated mean density surface of little gull recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).....	17
Figure 6	Heatmaps of common scoter distribution in each bio-season.	30
Figure 7	Heatmaps of kittiwake distribution in each bio-season.....	33
Figure 8	Heatmaps of common gull distribution in each bio-season.	36
Figure 9	Heatmaps of great black-backed gull distribution in each bio-season.	39
Figure 10	Heatmaps of herring gull distribution in each bio-season.	42
Figure 12	Heatmaps of ‘commic’ tern distribution in each bio-season.....	45
Figure 13	Heatmaps of guillemot distribution in each bio-season.....	50
Figure 14	Heatmaps of razorbill distribution in each bio-season.	55
Figure 15	Heatmaps of red-throated diver distribution in each bio-season.....	60
Figure 16	Heatmaps of fulmar distribution in each bio-season.....	63
Figure 17	Heatmaps of Manx shearwater distribution in each bio-season.....	67
Figure 18	Heatmaps of gannet distribution in each bio-season.....	72
Figure 18	Other species recorded in the AyM aerial surveys 2019 - 2021	75

List of Tables

Table 1	Key sources of offshore ornithology data for AyM.....	6
Table 2	Total number of birds of each species recorded by ESAS surveys in the wider AyM study area 4 km	18
Table 3	Dates, times and coverage of the first 24 aerial digital surveys of the AyM study area.	20
Table 4	Grouping levels for birds with no species level identification.....	22
Table 5	Bio-seasons used as the basis for the species accounts presented in Section 4. Based on Furness (2015) unless specified otherwise.....	25
Table 6	Bird species recorded in site-specific aerial digital surveys of AyM study area.	27
Table 7	Common scoter raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM 4 km buffer only.	28
Table 8	Common scoter bio-season mean peak abundance and density (individuals per km ²) in AyM 4 km buffer only.....	29
Table 9	Kittiwake raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.	31
Table 10	Kittiwake bio-season mean peak abundance and density (individuals per km ²) in AyM array area.	32
Table 11	Common gull raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.	34
Table 12	Common gull bio-season mean peak abundance and density (individuals per km ²) in AyM array area.....	34
Table 13	Great black-backed gull raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.....	37
Table 14	Great black-backed gull bio-season mean peak abundance and density (individuals per km ²) in AyM array area.	37
Table 15	Herring gull raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.	40
Table 16	Herring gull bio-season mean peak abundance and density (individuals per km ²) in AyM array area.....	40
Table 19	'Commic' tern raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.	43
Table 20	'Commic' tern bio-season mean peak abundance and density (individuals per km ²) in AyM array area.....	43
Table 21	Guillemot raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area and corresponding buffers.	46

Table 23	Guillemot bio-season mean peak abundance and density (individuals per km ²) in AyM array area and corresponding buffers.	48
Table 25	Razorbill raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area and corresponding buffers.	51
Table 27	Razorbill bio-season mean peak abundance and density (individuals per km ²) in AyM array area and corresponding buffers.	53
Table 29	Red-throated diver raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area and corresponding buffers.	56
Table 31	Red-throated diver bio-season mean peak abundance and density (individuals per km ²) in AyM array area and corresponding buffers.....	58
Table 33	Fulmar raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area.	61
Table 34	Fulmar bio-season mean peak abundance and density (individuals per km ²) in AyM array area.	61
Table 35	Manx shearwater raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area and corresponding buffers.	64
Table 36	Manx shearwater bio-season mean peak abundance and density (individuals per km ²) in AyM array area and corresponding buffers.	65
Table 37	Gannet raw counts, total estimated abundance and total estimated density (individuals per km ²) in AyM array area and corresponding buffers.	68
Table 38	Gannet bio-season mean peak abundance and density (individuals per km ²) in AyM array area and corresponding buffers.	70

1 Introduction

This section outlines the background to the Awel y Môr Offshore Windfarm (AyM OWF) and the need to characterise the baseline environment, with specific reference to offshore ornithology aspects.

1.1 Project background

Awel y Môr Offshore Wind Farm Limited ('the Applicant') is proposing to develop the Awel y Môr (AyM) Offshore Wind Farm (OWF) as a proposed extension to the operational Gwynt y Môr (GyM) OWF. AyM is located approximately 10.5 km offshore from the north-east coast of Wales at its closest point, with the array covering an area of approximately 78 km². AyM will comprise both offshore and onshore infrastructure, including an offshore generating station (wind farm), export cables to landfall and an onshore substation for connection to the electricity transmission network (please see **Volume 2, Chapter 1: Offshore Project Description (Application ref 6.2.1)** and **Volume 3, Chapter 1: Onshore Project Description (Application ref 6.3.1)** for full details on the Project Design). The location of AyM is illustrated in **Figure 1**.

1.2 Aims and objectives

The aim of this report is to present and describe the ornithological interests within the AyM array area, a buffer surrounding it and the wider region. These findings are used to determine those ornithology receptors that characterise the baseline environment and are of relevance to the assessment of potential impacts from AyM within **Volume 2, Chapter 4: Offshore Ornithology (Application ref 6.2.4)**. Those ornithology receptors are primarily the bird species that are collectively called seabirds. The data sources used to define the baseline characterisation are from site-specific aerial digital surveys for offshore ornithology as well as a desk-based review of existing data sources.

The main content of this report surrounds information on offshore ornithology derived from 24 consecutive months of high-resolution aerial digital stills surveys, undertaken between March 2019 and February 2021 (inclusive). These survey data were used to determine the following;

- Bird abundance and density estimates (monthly and for bio-seasons);
- Behaviour of birds (numbers flying and sitting on the water);
- Age classification of key seabirds; and
- Spatial distribution maps of key seabirds (for bio-seasons).

Additional information is presented within this report and its appendices for offshore ornithology receptors from the wider desk-based studies, including summary findings from the following sources:

- Post-consent monitoring data from GyM and Rhyl Flats OWF;
- WWT common scoter and waterbird surveys (WWT 2004; 2009);
- Waterbird distribution within Liverpool Bay SPA (Lawson et al., 2016); and
- European Seabirds at Sea (ESAS) data (Camphuysen *et al.*, 2004).

1.3 Study area

The study area for the offshore ornithological receptors includes all of the sea within the AyM array, an asymmetric 4 to 8 km buffer surrounding the array area (excluding GyM), and the offshore Export Cable Corridor (ECC; up to Mean Low Water Springs (MLWS) at the landfall site). The high level of bird mobility has been taken into account, noting for instance, that birds breeding outside the study area might fly into or across the study area to feed during the breeding season, might fly into the study area outside of the breeding season to overwinter, or might fly across the study area during migration.

The data collected across the study area for the AyM array and buffer have been refined for this assessment from a wider survey dataset, which was collected through a survey programme across a wider survey area. The study area for offshore ornithology and its relation to the wider survey area is shown in **Figure 1**.

1.4 Nomenclature

Throughout this report, species names that are used are those that are in common use among British ornithologists and this corresponds to the “British (English) vernacular name 2017” column of the list of vernacular and scientific names prepared by the British Ornithologists’ Union (BOU, 2019). The corresponding scientific names from that publication are listed in the glossary on scientific bird names in **Appendix 1**.

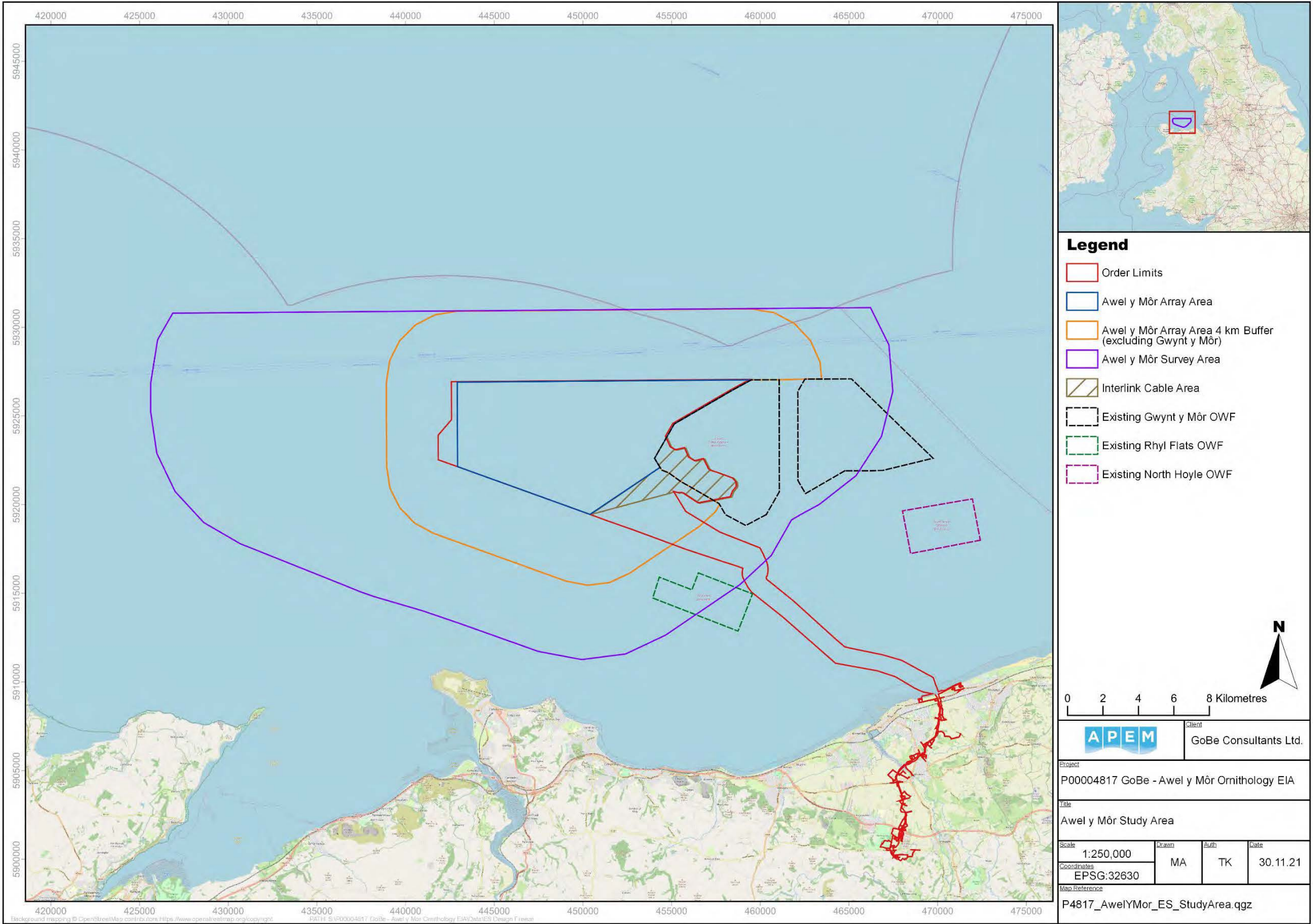


Figure 1 AyM Study Area



2 Offshore ornithology

This section describes the approach to baseline characterisation of offshore ornithological receptors.

2.1 Key data sources

An initial desk-based review of appropriate literature and data sources was undertaken for the Scoping Report (Innogy, 2020). The data sources listed in **Table 1**, which were identified in the Scoping Report (Innogy, 2020), provide coverage of the study area. These data sources and reports were confirmed through the Scoping Opinion as the most appropriate sources to use to determine the baseline for offshore ornithology receptors (PINS, 2020).

Table 1 Key sources of offshore ornithology data for AyM.

Source	Date	Summary	Coverage of study area
AyM – aerial digital survey data	2019 – 2021	Aerial digital surveys conducted by APEM Ltd. on a monthly basis between March 2019 and February 2021.	AyM array area plus a 4 km buffer to the north and an 8 km buffer to the south.
GyM OWF baseline characterisation data and post-consent monitoring	2003-2005	Boat-based and aerial visual surveys across the GyM zone and buffers. Data collection initialled in February 2003 for two years (end date May 2005).	AyM array area and approximately 95% of the buffer area.
	2010, 2012-13 & 2016-19	Aerial digital surveys across the GyM zone and buffers pre-construction (2010), during construction (2012-13) and post construction (2016-19).	AyM array area and approximately 95% of the buffer area.
Wildfowl and Wetlands Trust (WWT) – All Wales Common Scoter Survey	2001 – 2004	Aerial visual surveys of common scoter. Surveys undertaken by WWT on behalf of the Countryside Council for Wales (CCW).	AyM array and buffer area.
National Environmental Research Institute (NERI) & WWT	2004 - 2005	Aerial visual surveys for the Department of Trade and Industry (DTI) as part of the survey programme for the Round 2 offshore wind farm strategic areas.	AyM array area and approximately 90% of the buffer area.
Existing offshore wind farm grey literature	Various dates	Information obtained from various offshore wind farm Environmental Statements (i.e. Rhyl Flats, North Hoyle, Burbo Bank and Burbo Bank Extension).	No coverage of AyM study area but provides information on birds in the context of the north Wales coast.

Source	Date	Summary	Coverage of study area
Designated sites	Various dates	Information of Special Protection Areas (SPAs) and other designations relevant to ornithological receptors with potential connectivity to AyM. Key source of information will be Natural Resources Wales (NRW) designated sites portal. Available from: https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en	Country wide information on designated sites.
Lawson et al., 2016	2001 - 2011	Results from eight seasons of aerial observer surveys of the Liverpool Bay region, used to inform the extension to the Liverpool Bay SPA.	Area of search covers the entire AyM ECC and partially overlaps the AyM array area.
North Wales Wildlife Trust	Various dates	Information on breeding records, ringing recoveries etc. available from the North Wales Wildlife Trust and any other relevant nature organisations.	Regional data that can be drawn upon at an AyM specific scale, or a wider regional scale.
Large scale survey data sets	2014	Large scale seabird sensitivity mapping as part of the SeaMaST project (Bradbury <i>et al.</i> , 2014); Marine Ecosystems Research Programme (MERP) distribution maps of seabird populations in the north-east Atlantic (Waggitt 2019).	UK wide coverage with information that can be drawn upon at an AyM specific scale, or a wider regional scale.
Potential impacts of offshore wind farms on birds	Various dates	Published, peer reviewed scientific literature on bird behaviour and potential impacts from OWF e.g. Garthe and Hüppop (2004); Drewitt and Langston (2006); Stienen <i>et al.</i> , (2007); Speakman <i>et al.</i> , (2009); Langston (2010); Band (2012); Cook <i>et al.</i> , (2012); Furness and Wade (2012); Wright <i>et al.</i> , (2012); Furness <i>et al.</i> , (2013); Johnston <i>et al.</i> , (2014a,b); Cook <i>et al.</i> , (2014); Dierschke <i>et al.</i> , (2017); SNCB (2017); Jarrett <i>et al.</i> , (2018); Leopold & Verdaat (2018); Mendel <i>et al.</i> , (2019).	Generic information applicable to AyM ornithological receptors.
Bird population estimates and demographic rates	Various dates	Data on seabird populations and demographic rates for use in assessments e.g. Mitchell <i>et al.</i> , (2004); BirdLife International (2004); Eaton <i>et al.</i> , (2020); Frost <i>et al.</i> ,	These sources contain information which can be drawn upon at an AyM specific scale, or a wider regional scale.

Source	Date	Summary	Coverage of study area
		(2020); Musgrove <i>et al.</i> , (2013); Furness, (2015); Horswill <i>et al.</i> , (2017), JNCC (2020); Brenchley <i>et al.</i> , (2013)	
Bird breeding ecology	Various dates	Information on the breeding ecology of various bird species e.g. Cramp and Simmons (1977-94); Del Hoyo <i>et al.</i> , (1992-2011); Robinson (2005); Brenchley <i>et al.</i> , (2013).	Generic information applicable to AyM ornithological receptors.
Bird distribution	Various dates	Publicly available reports of bird distribution in UK waters e.g. Stone <i>et al.</i> , (1995); Brown and Grice (2005); Kober <i>et al.</i> , (2010); Balmer <i>et al.</i> (2013); WWT (2013); Brenchley <i>et al.</i> , (2013).	UK wide coverage with information that can be drawn upon at an AyM specific scale, or a wider regional scale.
Bird migration and foraging movements	Various dates	Bird movements during breeding season foraging trips and migratory movements e.g. Wernham <i>et al.</i> , (2002); Thaxter <i>et al.</i> , (2012); Woodward <i>et al.</i> , (2019).	These sources contain information which can be drawn upon at an AyM specific scale, or a wider regional scale.

2.2 Existing data sources

Offshore ornithological data have been collected for multiple purposes within Liverpool Bay and wider UK waters that provide regional and national generic and species-specific information on the distribution, abundance, biological seasons, behaviour and characteristics of birds in the offshore environment. These data sources and additional sources identified through the Evidence Plan Process, in consultation with the Offshore Ornithology Expert Topic Group (ETG) (see **Section 4.2 in Volume 2, Chapter 4 (application ref: 6.2.4)**), were considered to characterise the wider region and for the purpose of impact assessments.

2.2.1 Historic GyM baseline characterisation surveys

Site-specific boat-based and aerial visual surveys were undertaken in the pre-application phase for GyM to provide the ornithological baseline for Environmental Impact Assessment (EIA). Boat-based surveys were carried out at approximately monthly intervals from February 2003 to March 2005 with aerial visual surveys undertaken between July 2004 and May 2005. Both survey methods used observation teams and were based on transect distance sampling protocols. These surveys covered the current AyM array area and approximately 95% of the AyM buffer. Aerial digital surveys were also carried out for GyM pre-construction (2010), during construction (2012-13) and post-construction (2016-19). The key species noted during these surveys included:

- SPA species: common scoter, lesser black-backed gull, Sandwich tern, common tern, Arctic tern, red-throated diver, fulmar, Manx shearwater, gannet and cormorant (note that little gull were not recorded);

- EU Birds Directive Annex 1 species: little gull and shag; and
- Additional species present in regionally important numbers and/ or listed as being of Principal Importance under Section 7 of the Environmental (Wales) Act 2016: common gull, herring gull, great black-backed gull, kittiwake, guillemot and razorbill.

Review of the occurrence and distribution of these species from the GyM baseline data suggested that four species (kittiwake, guillemot, razorbill and cormorant) have the potential to be present within AyM in numbers considered to be of importance throughout the year, whilst a further five species (Sandwich, common and Arctic tern, Manx shearwater and gannet) were recorded on a regular basis in numbers considered of importance during the breeding and migratory seasons. A further four bird species (common scoter, red-throated diver, fulmar and shag) were recorded on a regular basis during the migratory and non-breeding seasons.

2.2.2 GyM post-consent monitoring

The marine licence for GyM included ornithological monitoring requirements, with five objectives:

- Objective 1: Determine whether use of the wind farm and adjacent areas by common scoter or red-throated divers, designated interest features of Liverpool Bay SPA, changes during construction and operation of the OWF;
- Objective 2: Determine whether there is a barrier effect of common scoter moving to and from sites within and beyond the wind farm, which are thought to be used for nocturnal roosting;
- Objective 3: Determine the overall distribution of birds in the GyM and NW5 areas during construction and operation of the OWF;
- Objective 4: If the above monitoring indicates that there is a particular risk of collision for common scoter or red-throated diver within the OWF, to undertake additional monitoring to quantify that risk; and
- Objective 5: If data from other survey or monitoring sources (e.g. beached bird survey) indicate the possibility of significant rates of collision of other species, undertake additional monitoring to investigate the scale of such perceived collisions.

In order to fulfil these requirements, a number of aerial digital surveys were carried out, including pre-construction surveys (2010 to 2011), during-construction surveys (2012 to 2013) and post-construction surveys (2016 to 2019). These surveys and subsequent data analysis considered the GyM array area, GyM array area plus 2 km buffer, and a wider survey area known as NW5 (**Figure 2**). Note the NW5 surveys covered an extensive area (1,213 km², compared to 98 km² for the GyM array area and 193 km² for the GyM array area plus 2 km buffer), including both coastal waters to the south of the GyM and AyM array areas and a significant portion of the Liverpool Bay SPA to the east of the GyM array area. Results from the NW5 survey area may therefore provide relevant information at the regional scale, but are unlikely to accurately reflect use of the offshore environment in and around the AyM array area.

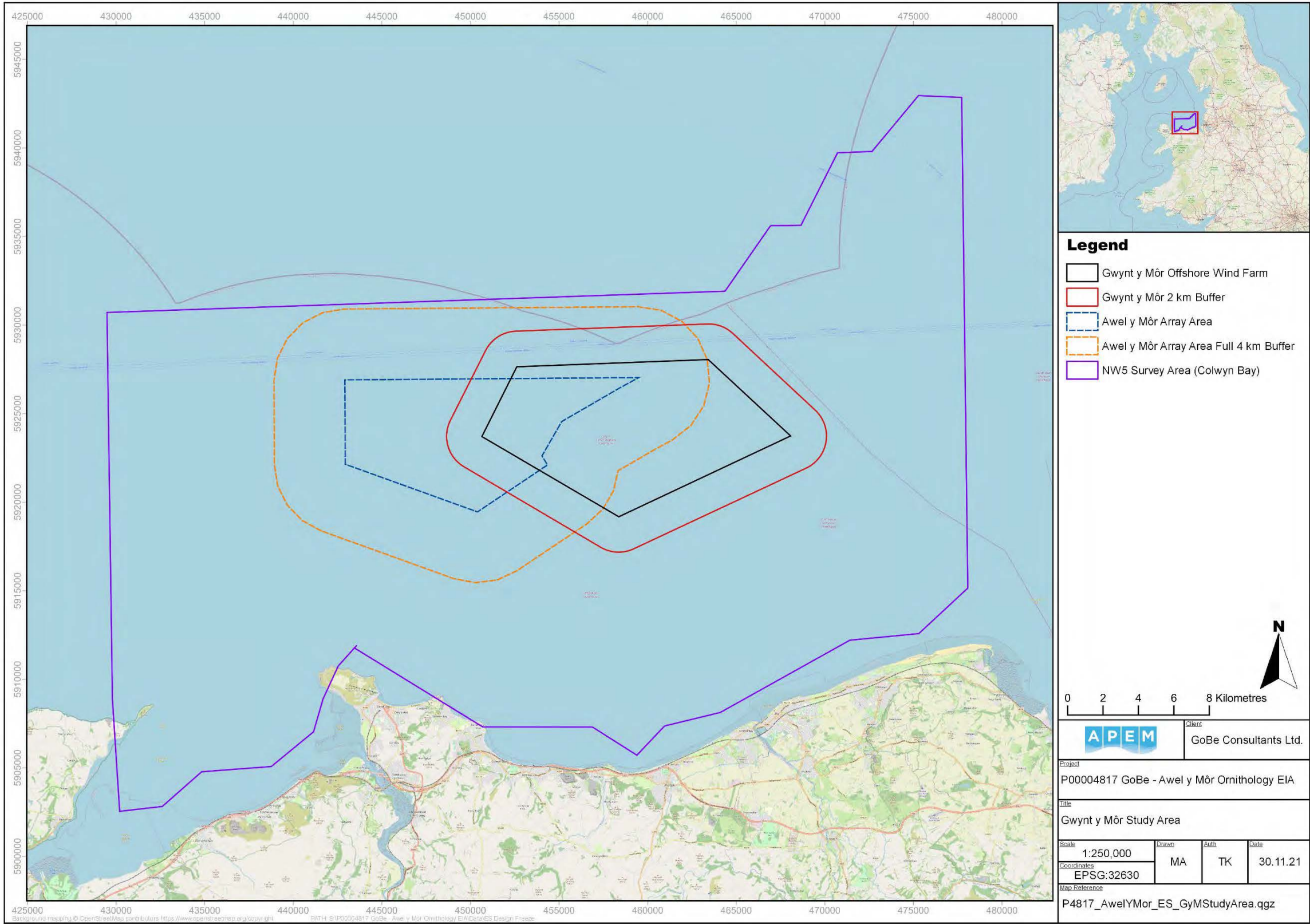


Figure 2 Survey areas for GyM post-consent monitoring.



Pre-construction aerial digital surveys determined that common scoter were present in low abundance within the GyM array area, with an estimated peak of 36 individuals across the site. Aerial digital surveys conducted during the construction and post-construction phases, observed no common scoter within the GyM array area, however low numbers were estimated to be present within GyM plus 2 km buffer in January 2018/19. These surveys indicated that common scoter displayed localised avoidance of the site during construction and operation. The low numbers of common scoter within the GyM array area can be attributed to the area offering poor foraging potential, due to its distance from shore (13 km) and the depth of water (12 to 28 m) (Snow & Perrins, 1998). A clear relationship between common scoter densities and distance from shore has been demonstrated previously across NW5 (Kaiser et al., 2006), with high to moderate densities closely associated with inshore areas with densities decreasing substantially as the distance from shore increases. Common scoter densities were greatest in the shallow feeding grounds in the inshore area between the coast and GyM plus 2 km buffer. Overall, the GyM array area was found to be a relatively unimportant area for common scoters and therefore it was concluded that there are no significant impacts on this species from GyM.

During the pre-, during- and post-construction aerial digital surveys, red-throated divers were estimated to be present in low densities across GyM plus 2 km buffer, with higher predicted densities observed in the south-east of the wider NW5 area. The peak estimated abundance of red-throated diver present within the GyM array area was 22 individuals; below the regional, national and international importance thresholds of 81, 170 and 2,600 individuals, respectively. The distribution of red-throated divers across all construction phases appeared to be relatively constant. This suggests that the presence of the wind turbine generators (WTGs) may not be having an effect on the spatial distribution of the species, with individuals having been recorded within the GyM array area during all construction and post-construction phases. However, other environmental factors may be the determining factor contributing to the relationship between diver density and distance to WTGs. Skov and Prins (2001) showed that diver abundance and distribution can be strongly linked to their habitat preference of shallow waters around sand bank regions. As a result, red-throated divers are known to congregate in depths of 0 to 20 m which are also associated with prey species such as herring *Clupea harengus* and sprat *Sprattus sprattus*. Thus, low densities can be expected to be present within the GyM array area plus 2 km buffer, with higher densities found across the wider NW5 area where a wider range of preferred habitat is likely to be present. The continued presence of red-throated diver within the vicinity of the GyM array area demonstrates that this highly sensitive species to OWF developments has not been entirely displaced by the construction and operation activities of GyM.

Kittiwake were widespread and abundant across the GyM array area and wider NW5 area. The peak predicted estimated abundance of kittiwakes was 1,923 birds in the October 2018 NW5 survey. The predicted high abundances of kittiwakes is unsurprising, since kittiwakes breed in the vicinity of the NW5 survey area at Puffin Island, the Great Orme and the Little Orme and are known to be present in Liverpool Bay for much of the year (Stone et al. 1995; Brenchley et al., 2013).

Common gull were wide spread and abundant across the GyM wind farm area and wider NW5 area. The most up to date peak predicted estimate of common gulls took place in October 2018 NW5 survey with an estimate of 733 individuals recorded.. Common gull are known to overwinter in the area in small numbers (Olsen & Larsson 2003).

Great black-backed gulls were observed in low numbers which peaked in January 2019 within the GyM array area plus 2 km buffer and in October 2018 in the wider NW5 area, with estimates of 58 and 759 individuals present respectively.

Herring gull were recorded throughout the aerial digital surveys, with a peak estimated abundance recorded in January 2019 for the GyM array area plus 2 km buffer when an estimated 105 individuals were present. Numbers peaked in March 2019 in the NW5 area, where 6,448 individuals were estimated, which is significantly higher than the peak estimate of 899 individuals estimated in March 2018.

Lesser black-backed gulls peaked in July 2018 in the GyM array area plus 2 km buffer with an estimated abundance of 28 individuals. In the wider NW5 area numbers peaked in October 2018 when an estimated 69 individuals were present.

Guillemot/razorbills were the most abundant species, after common scoter, across the survey areas. In the GyM array area plus 2 km buffer, guillemots/razorbills peaked during November 2018 at an estimated 757 individuals, whilst across NW5 numbers peaked at an estimated 7,793 individuals during October 2018. Guillemots are known to breed in higher numbers around the Gwynedd coast than razorbills (at an approximate ratio of 10:1; Mitchell et al., 2004). Furthermore, while moderate densities of guillemots are known to overwinter in the waters off the Welsh and Irish coasts, relatively low numbers of razorbills are typically found in the eastern Irish Sea over Winter (Stone et al. 1995). Therefore, it is likely that the majority of individuals identified as guillemot/razorbill were guillemots.

Fulmars were recorded during the February and March 2019 NW5 surveys, peaking at an estimated 82 individuals during February 2019. Higher numbers of fulmars were present during the construction and post-construction surveys in 2012/13 and 2016/17 with peak estimated abundances of 370 and 265 individuals recorded in January 2013 and February 2017, respectively (APEM 2014; APEM 2017). These numbers reflect an increase from pre-construction surveys when an estimated abundance of 47 individuals were recorded in the NW5 survey area (APEM 2012a). Unlike in 2016/17 and 2017/18, no fulmars were recorded in the GyM wind farm plus 2 km buffer in the 2018/19 surveys area, perhaps due to diurnal variation.

In the final year of surveys (2018/19), gannets peaked during July 2018 when an estimated 92 individuals were predicted to be present across the GyM array area plus 2 km buffer. These estimates follow a similar pattern to observations during the 2012/13, 2016/17 and 2017/18 surveys, when numbers also peaked in July, with an estimated 141, 62 and 105 gannets recorded, respectively. In the wider NW5 area, gannet numbers were low during the pre-construction surveys, with a peak estimated abundance of 187 birds in October 2010. No gannets were recorded during the construction phase surveys. Gannet numbers recorded increased in the post-construction phase, with peak estimated abundances of 671 individuals in the 2016/17 survey season, 128 individuals in the 2017/18 survey season, and 671 individuals in the 2018/19 survey season (APEM 2021a; APEM 2014).

Peak estimated abundance of birds recorded as cormorant/shag within the NW5 area varied between survey years, with peak estimated abundances of 926 individuals in the 2016/17 survey season, 1,540 individuals in the 2017/18 survey season, and 476 individuals in the 2018/19 survey season (APEM 2014; APEM 2017). Nearby Puffin Island is a designated SPA for breeding cormorants (Brenchley et al., 2013). Although cormorants peaked outside of the breeding season within the NW5 area in January and February, it is likely that the island is

used year-round as a roost site since cormorants are only partially dispersive during the non-breeding season (Wernham et al., 2002).

Overall, there have been no obvious effects of the operation of GyM on these species. In most cases, slight fluctuations in numbers between the development phases is likely to be due to inter-annual variations of abundance. Inter-annual variation may be explained by a range of factors including environmental variables such as weather patterns, (e.g. changing conditions on wintering or breeding grounds), food availability, or possible (combined) effects following construction in the area or a combination of these factors (e.g. MacLean et al., 2013).

2.2.3 *Rhyl Flats post-construction monitoring*

Post-construction monitoring of Rhyl Flats Offshore Wind Farm (RFOWF) was undertaken across three years, between October 2009 and July 2012 (APEM, 2011; APEM, 2012b). Monitoring was targeted to identify the distribution and abundance of seabird species utilising RFOWF, buffer zones around RFOWF and the wider survey area (which encompassed a large section of NW5). The final monitoring report provides a synthesis of the data collected during the post-construction period (APEM, 2012b).

Of the non-breeding designated species associated with the Liverpool Bay SPA, both common scoter and red-throated diver were recorded widely in the winter period, with neither species recorded in July. Of the breeding designated species associated with the Liverpool Bay SPA there were three records of tern species recorded during the July 2012 survey, two inshore of RFOWF and one to the north-east..

Up to 16,300 common scoter were recorded in the wider survey area during the third year of surveys, with birds recorded in all months between October 2011 and March 2012. The peak count in RFOWF of 753 birds was recorded in March 2012 and was similar across all post-construction monitoring years. No birds were present during July 2012 despite Liverpool Bay SPA being a known moulting location for this species. Birds largely utilised the area between RFOWF and the coast with very small numbers recorded further offshore from RFOWF. Distribution altered between 2010/11 and 2011/12, with greater numbers utilising the areas to the east of the RFOWF during the latter and birds were largely absent from this area in the former. In general, there was a low level of displacement of common scoter from RFOWF during the post-construction phase and no displacement from the wider survey area.

Red-throated divers (and diver species not identified to species level) were recorded between October and February during the 2011/12 surveys. A peak count of 143 birds was estimated for the wider survey area in November 2011, which was earlier than the peak of 153 in December 2010. Small numbers of birds were recorded within the footprint of the RFOWF during the 2011/12 winter indicating that despite the high sensitivity of this species to disturbance, displacement was not total. Diver occurrence within RFOWF and wider survey area was comparable to the historic levels with birds recorded largely to the east of the RFOWF in both offshore and inshore areas.

2.2.4 *WWT all Wales common scoter survey*

WWT carried out a programme of comprehensive surveys of nearshore waters in Wales and north-west England between 2001 and 2004. Surveys were carried out using an aerial observer approach and covered the area from the shore to approximately 20 km offshore. Results were presented within irregularly shaped blocks. The most relevant blocks for this

study were Colwyn, Conwy and Red Wharf (which between them captured the entire AyM array area and buffer, although the entirety of the offshore portions of the Conwy and Red Wharf blocks were not covered on all surveys). A map showing the location of the survey blocks, together with exact survey dates are given in WWT (2004).

Although the surveys are not specific to the AyM study area, they give a useful overview of the species present in the region at different times of year. The results suggest that scoters and divers were present in numbers considered of importance during the winter and migratory seasons. It was considered that the majority of divers and scoter were red-throated diver and common scoter respectively. Auks, gulls and cormorant species were present throughout the year with peak numbers during the migratory and winter seasons.

2.2.5 Liverpool Bay/Bae Lerpwl area of search (Lawson et al., 2016)

JNCC commissioned an assessment of the birds within the Liverpool Bay area, primarily in order to inform the SPA selection/extension process. Aerial observer surveys were flown over eight winter seasons (2001/02, 2002/03, 2003/04, 2004/05, 2005/06, 2006/07, 2007/08 and 2010/11) with results analysed using a distance sampling method. The report focused on three key species of relevance to the SPA selection process: red-throated diver, common scoter and little gull. Population estimates for those species were calculated, based on the five-year mean peak abundance between 2004/05 and 2010/11, as; 1,171 red-throated diver, 56,679 common scoter and 319 little gull. The density maps for each of those species, based on all eight years of surveys, are presented below in **Figure 3**, **Figure 4** and **Figure 5**. Note that the Liverpool Bay SPA boundary shown in those figures has since been revised (extended).

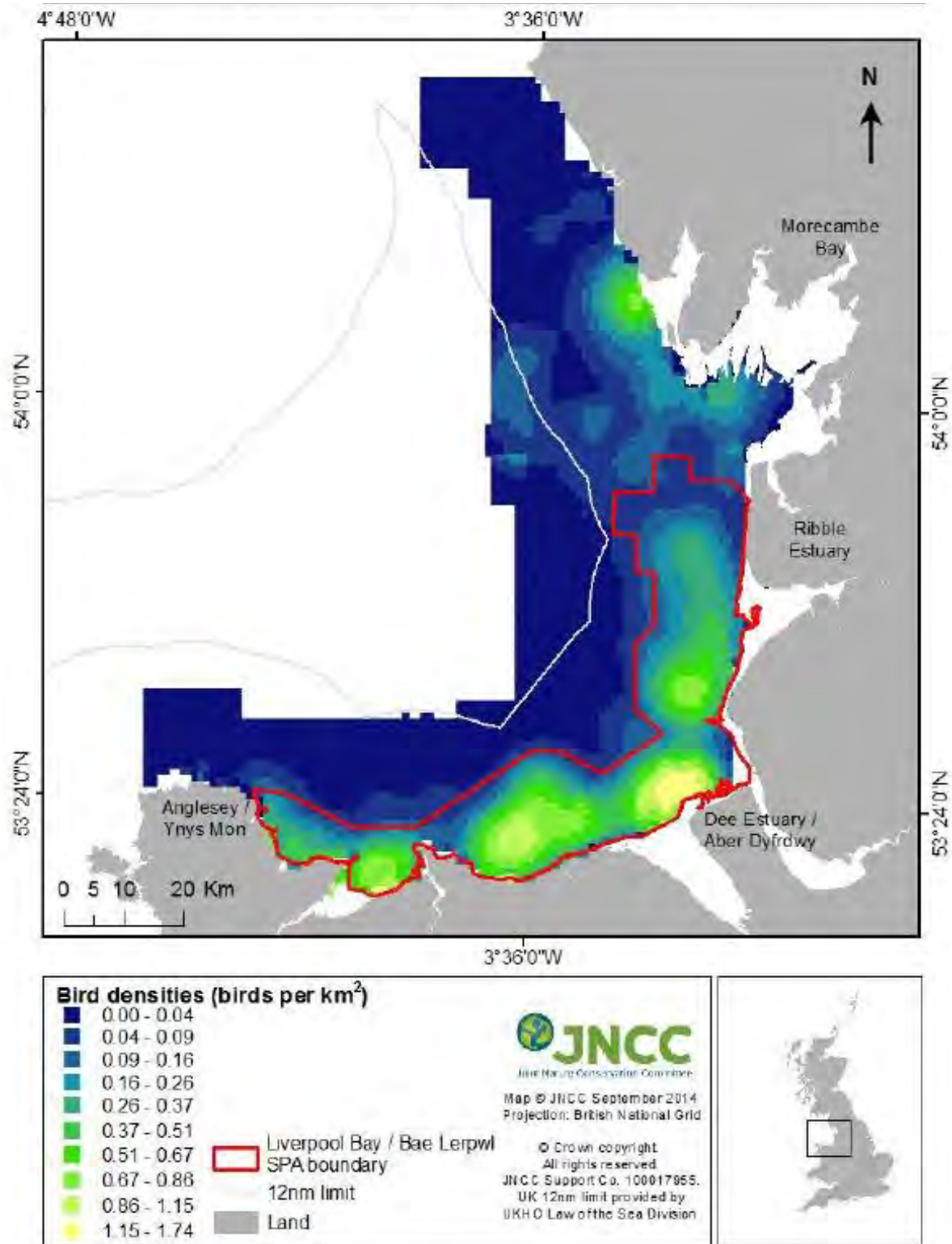


Figure 3 Estimated mean density surface of red-throated diver recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).

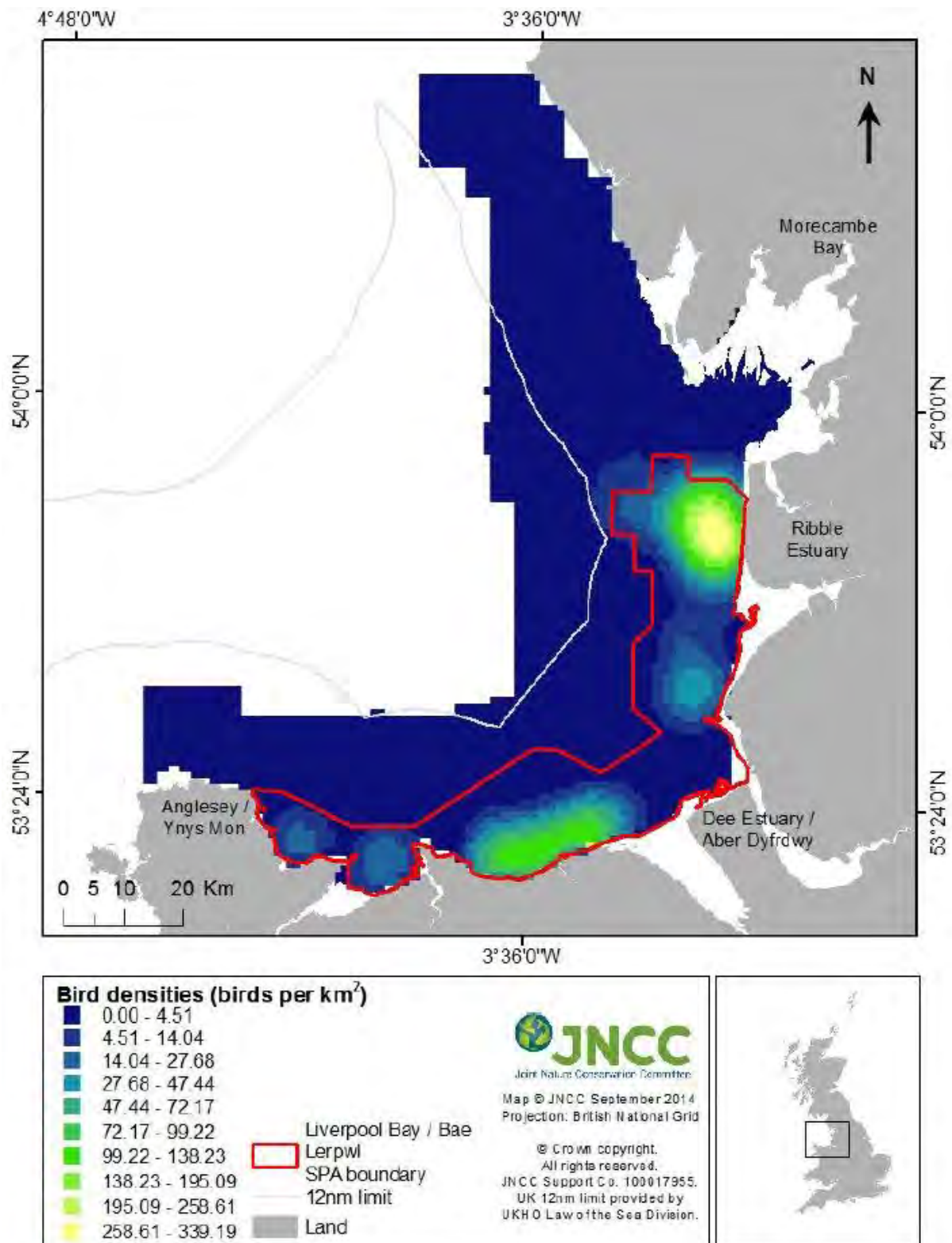


Figure 4 Estimated mean density surface of common scoter recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).

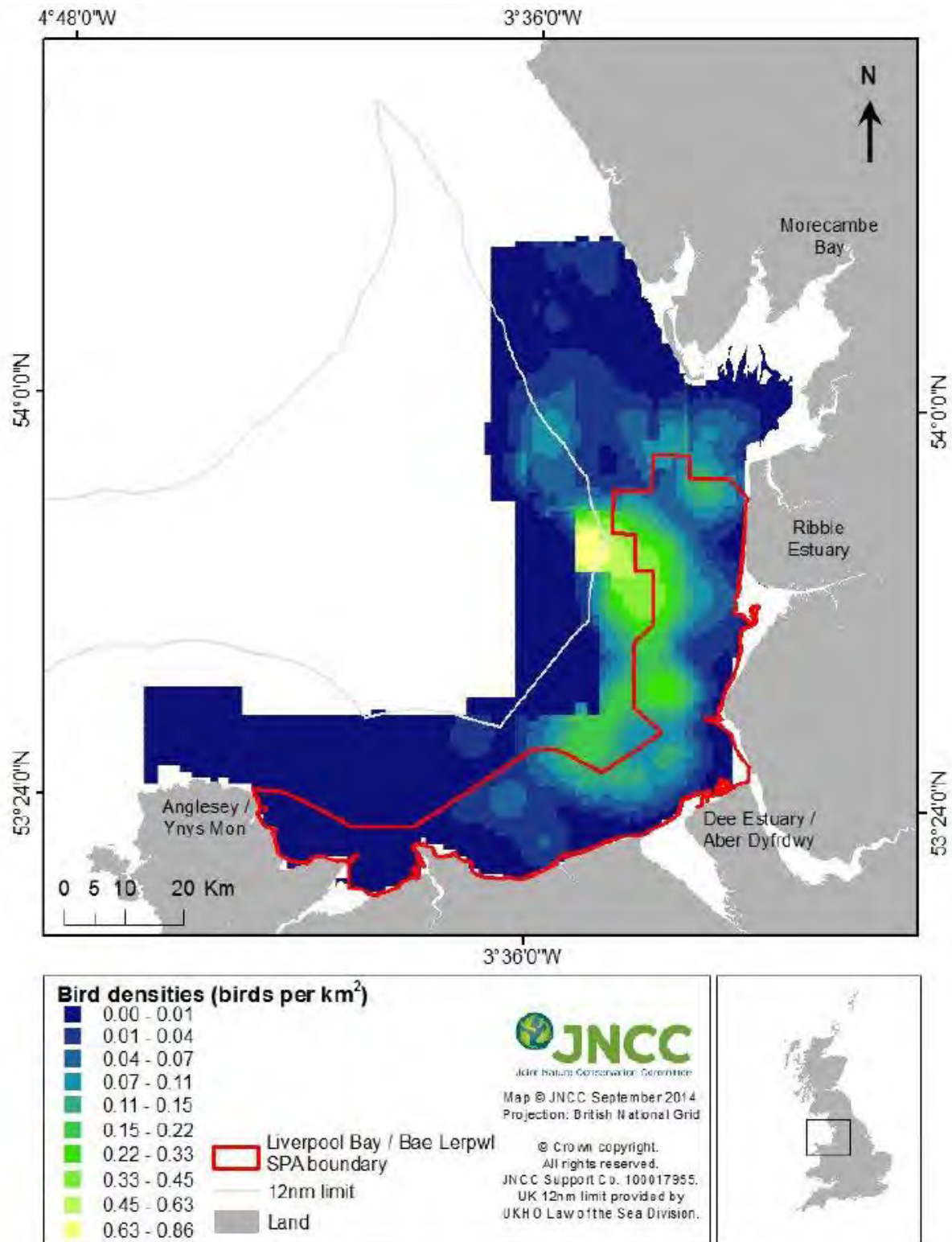


Figure 5 Estimated mean density surface of little gull recorded from aerial surveys within Liverpool Bay area of search (2004/05, 2005/06, 2006/07, 2007/08, 2010/11). From Lawson et al. (2016).

2.2.6 European Seabirds at Sea (ESAS)

The ESAS database (Camphuysen *et al.*, 2004) consists of observations collected through aerial visual and boat-based surveys between 1979 and 1996. **Table 2** shows the combined raw count of birds recorded in the ESAS database within the wider AyM study area plus 4km. Note that this total number is compiled from numerous different surveys carried out across several years, and in various months. The most recent survey in these data that contributed to the counts below was in 1993, and therefore these data are currently at least 28 years old. The numbers of birds in **Table 2** should, therefore, be treated with caution, although the data may provide some indication of the relative abundances of common species.

Table 2 Total number of birds of each species recorded by ESAS surveys in the wider AyM study area +4 km.

Species	Total number of birds
Arctic skua	1
Common or arctic tern	1
Common gull	1
Cormorant	1
Fulmar	28
Gannet	65
Great black-backed gull	4
Great skua	1
Guillemot	15
Gull species	10
Herring gull	17
Kittiwake	26
Lesser black-backed gull	9
Little gull	1
Little stint	1
Mediterranean gull	1
Razorbill	5
Red knot	1
Sandwich tern	1

2.3 Contemporary aerial observer and aerial digital surveys

2.3.1 WWT waterbird surveys

WWT carried out a programme of comprehensive surveys of UK nearshore waters between 2004 and 2009. Surveys were carried out using an aerial observer approach and covered the area from the shore to approximately 40 km offshore. Results were presented by irregularly shaped blocks, where each block consisted of the area that could be surveyed in a single day (approximately 600 km of flight lines). The most relevant blocks for this study were NW5 and NW6b, which between them captured the entire AyM array area and approximately 90% of the wider AyM study area. Waterbird surveys were carried out at various points during the year, between 2004 and 2008. A map showing the location of the NW5 and NW6b blocks and exact survey dates are given in WWT (2009).

Although the surveys are not specific to the AyM study area, they give a useful overview of the species present in the region at different times of year. The results suggest that key species present all year round include gulls, cormorant and shag. Common scoter, kittiwake, auks, divers were most numerous in winter along with smaller, but regionally significant, numbers of red-breasted merganser and eider.

The raw count results are presented in **Appendix 2**. Note that these are raw counts and no analysis has been carried out for these data.

2.3.2 AyM aerial digital surveys

The most up-to-date and relevant data for the AyM study area were collected and analysed by APEM through a programme of 24 monthly aerial digital surveys undertaken between March 2019 and February 2021, inclusive. Surveys were carried out by APEM using high-resolution camera systems to capture digital still imagery, in order to assess the abundance, density, behaviour and distribution of birds within the AyM study area. The survey method was designed to optimise data collection for all bird species using a grid-based survey design at 2 cm ground sampling distance (GSD) to achieve a minimum of 10% coverage of AyM and buffer. The survey dates, start and finish times and percentage coverage are provided in **Table 3**.

Table 3 **Dates, times and coverage of the first 24 aerial digital surveys of the AyM study area.**

Survey	Survey Date	Survey Flight Times (UTC)	Coverage (%)
March 2019*	01/04/2019	08:47 – 10:51	11.89
April 2019	29/04/2019	07:59 – 08:59	11.20
May 2019	13/05/2019	14:49 – 15:41	11.20
June 2019	14/06/2019	18:22 – 19:24	11.20
July 2019	14/07/2019	13:55 – 15:25	11.05
August 2019	05/08/2019	11:05 – 12:11	12.83
September 2019	02/09/2019	13:17 – 14:28	12.73
October 2019	11/10/2019	13:47 – 14:51	12.83
November 2019	30/11/2019	14:09 – 15:33	12.83
December 2019	17/12/2019	10:37 – 11:57	12.81
January 2020	03/01/2020	10:18 – 11:36	12.83
February 2020	06/02/2020	10:37 – 11:57	12.85
March 2020	02/03/2020	16:11 – 17:13	12.83
April 2020	01/04/2020	10:09 – 11:12	12.83
May 2020	02/05/2020	12:00 – 13:22	12.83
June 2020	07/06/2020	13:08 – 14:10	12.83
July 2020	13/07/2020	16:50 – 17:57	12.83
August 2020	02/08/2020	13:33 – 14:38	12.83
September 2020	03/09/2020	09:49 – 10:50	11.74
October 2020	08/10/2020	10:19 – 11:23	11.67
November 2020	03/11/2020	10:43 – 11:55	11.73
December	22/12/2020	13:03 – 13:56	11.67
January 2021	01/01/2021	10:24 – 11:27	11.59
February 2021	01/02/2021	12:53 – 13:51	11.33

Table Note: *The March 2019 survey was delayed due to poor weather conditions, though for clarity, it is referred to as the March 2019 survey throughout this report.

2.3.3 Data analysis

As any effects on birds within the GyM array area were accounted for with the impact assessments for that project, bird data collected during these contemporary surveys from within GyM have been excluded from the buffer around AyM for abundance and density estimate calculations in order to reduce any instances of double-counting from previous baseline data and impact assessments (**Figure 1**).

Image Analysis

The aerial digital still images were analysed to locate, identify and record all birds in the image. Internal quality assurance (QA) was carried out on the data collected from each survey. Images were assessed in batches with a different staff member responsible for each batch. Each image containing birds was reviewed and checked by APEM's dedicated QA team, ensuring that 100% of birds found were subject to internal QA to ensure that species identification was correct. Images containing no birds were removed and kept separately for further internal QA. Of these 'blank' images, 10% were randomly selected for QA. If there was less than 90% agreement, the entire batch was re-analysed independently by a different staff member than who initially analysed the imagery.

Bird Abundance and Density Estimates

For each monthly aerial digital survey, geo-referenced locations of all birds are recorded within each individual digital still image, which were used to generate raw counts. Bird locations contained within the study area were then extracted using ArcGIS or QGIS, providing raw count data.

The raw counts were then divided by the number of images collected to give the mean number of birds per image (*i*). Population estimates (*N*) for each survey month were then generated by multiplying the mean number of animals per image by the total number of images required to cover the entire Study Area (*A*):

$$N=iA$$

Non-parametric bootstrap methods were used for variance estimation. A variability statistic was generated by re-sampling 999 times with replacement from the raw count data. The statistic was evaluated from each of these 999 bootstrap samples and upper and lower 95% confidence intervals of these 999 values were taken as the variability of the statistic over the population (Efron & Tibshirani, 1993).

A measure of precision was calculated using a Poisson estimator, suitable for a pseudo-Poisson over-dispersed distribution. This produced a CV based on the relationship of the standard error to the mean.

All analyses and data manipulation carried out by APEM were conducted in the R programming language (R Development Core Team, 2020) and non-parametric 95% confidence intervals were generated using the 'boot' library of function (Canty & Ripley, 2010). All analyses and data manipulation carried out by APEM were conducted in the R programming language (R Development Core Team, 2020) and non-parametric 95% confidence intervals were generated using the 'boot' library of function (Canty & Ripley, 2010). This results in species-specific monthly abundance estimates being calculated from the raw

count data, with upper and lower confidence limits. Where appropriate, a level of precision is also presented for each monthly abundance estimate. Dividing the monthly abundance estimates by the size of the area covered calculates the associated density (e.g. birds per km²) for any given species.

Species Identification

All birds were first assigned to a species group and where possible, each of these then further identified to species level. Birds which could not be positively identified to species level remained assigned to the broader species group level. For example, a bird first assigned to the species group 'auk species' if not identified as a guillemot, would remain as an 'auk species' if no species level identification was determined. The grouping for unidentified birds and the species of which they comprise are listed in **Table 4**.

Instances can occur where birds cannot be identified to species level but are instead identified to group level. In order to apportion individuals identified at group level down to species level for assessment purposes, the following rules were applied, in order of preference:

- 1) Use the proportion of speciated individuals from the same month from a different year; or
- 2) Use the total average proportion of speciated individuals across data from 24 surveys available for this baseline report.

Auks during the non-breeding season, where apportionment is still not possible using this approach given the difficulties associated with speciating auks in winter plumage and poor light conditions, have been apportioned using the Biologically Defined Minimum Population Scale (BDMPS) in Furness (2015). This means in some instances during the non-breeding months auk species might have a raw count of zero but due to apportionment still end up with an abundance value to species level.

Where no individuals were identified to species level across all surveys, apportionment was not possible and so results have been presented for the group only. Examples where this occurred includes storm petrel, passerine and wader species groups.

Table 4 **Grouping levels for birds with no species level identification.**

Species	Species Grouping Level 1	Species Grouping Level 2	Species Grouping Level 3
Kittiwake	Small gull species	N/A	Unknown gull species
Little gull			
Common gull			
Great black-backed gull	Black-backed gull species	Large gull species	
Lesser black-backed gull			

Species	Species Grouping Level 1	Species Grouping Level 2	Species Grouping Level 3
Herring gull	N/A		
Sandwich tern	N/A	Tern species	N/A
Common tern	Arctic / common ('commic') tern		
Arctic tern			
Guillemot	Guillemot / razorbill	Auk species	N/A
Razorbill			
Black guillemot	N/A		
Puffin	N/A		
Cormorant	Cormorant / shag	N/A	N/A
Shag			

Abundance and density estimates in **Section 4** are inclusive of apportionment. Additional tables in **Appendix 3** provide abundance estimates of each species and species group prior to apportionment, as well as behaviour information relating to flying and sitting birds.

As common terns and Arctic terns are very difficult to distinguish using aerial digital surveys, apportionment to species level was limited and therefore 'commic' tern has been treated as comparable to a species-level unit for analysis.

Correction for Availability Bias

For auk species such as guillemot, razorbill and puffin that make foraging dives underwater, a proportion will not be detectable at the surface during the analysis of the survey images. Density and abundance estimates need to be adjusted to allow for this 'availability bias'.

A fixed species-specific correction factor was applied to the number of each auk species recorded on the sea surface. The correction factors are derived from time spent under water (during the chick-rearing stage) from Thaxter *et al.*, (2010) for guillemots and razorbills and from records from data loggers from Spencer (2012) for puffins. A species-specific correction factor for black guillemots is currently unavailable and therefore this species has not been adjusted. The correction factors used to multiply the relative abundance estimate of guillemots, razorbills and puffins sitting on the sea surface are 1.311, 1.211 and 1.165, respectively.

Abundance and density estimates in **Section 4** are the corrected monthly abundance and density estimates, having been subjected to this process. Additional tables in **Appendix 3** provide abundance and density estimates of each species and species group prior to correction for availability bias.

Consideration of Biological Seasons

Bird behaviour and abundance is recognised to differ across a calendar year dependent upon the bio-season. Separate bio-seasons are recognised in this baseline characterisation report in order to establish the level of importance any seabird species has within the AyM study area during any particular period of time. The BDMPS bio-seasons are based on those in Furness (2015), hereafter referred to as BDMPS bio-seasons or bio-seasons (**Figure 5**). The bio-seasons are defined within this baseline technical report as: return migration, migration-free breeding, post-breeding, migration-free winter, breeding and non-breeding bio-seasons. These six bio-seasons can be applied to different periods within the annual cycle for most species, though not all six are applicable for all seabird species, with different combinations used depending on the biology and life history of a species:

- Return migration: when birds are migrating to breeding grounds;
- Migration-free breeding: when birds are attending colonies, nesting and provisioning young;
- Post-breeding migration: when birds are migrating to wintering areas or dispersing from colonies;
- Migration-free winter: when non-breeding birds are over-wintering in an area;
- Breeding: from modal arrival to the colony at the beginning of breeding to modal departure from the colony; and
- Non-breeding: from modal departure from the colony at the end of breeding to modal return to the colony the following year.

Table 5 Bio-seasons used as the basis for the detailed species accounts presented in Section 4, based on Furness (2015) unless specified otherwise.

Species	Return Migration	Migration-free Breeding	Post-breeding Migration	Migration-free Winter	Breeding	Non-breeding
Common scoter*	N/A	N/A	N/A	N/A	May to August	September to April
Kittiwake	January to April	May to July	August to December	N/A	N/A	N/A
Little gull‡	March to April	May to September	October to December	January to February	N/A	N/A
Common gull**	January to April	May to July	August to December	N/A	N/A	N/A
Great black-backed gull	N/A	N/A	N/A	N/A	April to August	September to March
Herring gull	N/A	N/A	N/A	N/A	April to August	September to March
Lesser black-backed gull	March to April	May to July	August to October	November to February	N/A	N/A
'Commic' tern***	April to May	June	July to September	N/A	N/A	N/A
Guillemot	N/A	N/A	N/A	N/A	March to July	August to February
Razorbill	January to March	April to July	August to October	November to December	N/A	N/A
Red-throated diver	February to April	May to August	September to November	December to January	N/A	N/A
Fulmar	December to March	April to August	September to October	November	N/A	N/A
Manx shearwater	March to May	June to July	August to October	N/A	N/A	N/A
Gannet	December to March	April to August	September to November	N/A	N/A	N/A
Cormorant†	N/A	N/A	N/A	N/A	April to August	September to March

Table Notes: *Cramp & Simmons (1977); **Common gull is not included in Furness (2015) - based on kittiwake as closely related and have a similar life history; ***Furness (2015) includes separate entries for common and Arctic terns; however, the bio-seasons used here are appropriate for either; †Royal HaskoningDHV (2019); ‡Robinson (2005).

3 Results

3.1 Spatial distribution

For the purposes of this report, the spatial distribution of seabirds within the AyM array area and a buffer are presented in the form of heatmaps within each species account. The heatmaps present data on a bio-season basis, pooling multiple months over separate bio-seasons (using the definitions in **Table 5**) in order to account for species-specific spatial and temporal distributions for the purposes of defining the AyM ornithological baseline.

To create the heatmaps, point shapefiles were loaded into QGIS and the heatmap plugin for QGIS was installed. The shapefiles were then inputted to the heatmap plugin and a kernel radius of 4 km was selected, which was determined to provide the most appropriate smoothing between the data points leaving no gaps in the model outputs. The output raster pixel size was set to 10 m. All other default settings within the QGIS heatmap plugin were accepted. The heatmap plugin for each species was then run to generate GeoTIFF heatmaps. Note that heatmaps were produced using data from the entire survey area, which includes some birds recorded outside of the array area plus buffer. Due to the relatively low abundance recorded and importance of commons scoter and red-throated diver within the survey area, to provide greater clarity of these species distribution, the distribution point data are included in the heatmaps to provide greater clarity of species distribution within the survey area.

3.2 Flight height/ direction

Data were provided on flight direction from the aerial digital surveys, which are presented in **Appendix 4**. Note that flight direction data were recorded from birds across the entire survey area, which may include a small number of birds outside the study area for this report (**Figure 1**), as a result of refinements to the array area boundary and excluding GyM from the buffer zone for abundance estimate purposes.

3.3 Species recorded

The following bird species (**Table 6**) were recorded within the study area between March 2019 and February 2021, inclusive. A number of species were only recorded in the study area in numbers determined by expert judgement to be too low to warrant detailed species accounts (these species are in italic font within the table). Instead, data for these species are presented in the form of raw counts, abundance and density estimates, and behaviour within **Appendix 3**. Those species highlighted in bold in **Table 6** form the basis of detailed accounts for this baseline technical report. The justification for species being deemed in negligible numbers is provided in Section 4.9 of **Volume 2, Chapter 4: Offshore Ornithology (Application ref 6.2.4)**.

Table 6 Bird species recorded in site-specific aerial digital surveys of AyM study area.

Divers and pelagics	Gulls	Terns	Auks	Other
Red-throated diver	Kittiwake	'Commic' tern*	Guillemot	Common scoter
Gannet	Common gull	<i>Sandwich tern</i>	Razorbill	<i>Cormorant</i>
Fulmar	Herring gull		<i>Puffin</i>	<i>Red-breasted merganser</i>
Manx shearwater	Great black-backed gull		<i>Black guillemot</i>	<i>Wader sp.</i>
<i>Storm petrel sp.</i>	Lesser black-backed gull			<i>Great crested grebe</i>

Table Note: *'Commic' tern represents tern sightings of unidentified Arctic tern and common tern.

4 Species accounts

The below species accounts present apportioned and corrected (where applicable) abundance and density estimates for ornithology receptors recorded within AyM plus corresponding buffers. Abundance and density estimates within species-specific buffers of relevance are presented only for those species to be considered at risk of disturbance and displacement. For all other species of importance, estimated abundance and density are presented for the AyM array area alone. Additional spatial distribution maps are presented in bio-seasons for most ornithology receptors considered of ecological importance, where enough data were available to run heat maps combining data from multiple months.

Estimated abundance and density before correction and apportionment are presented for all species recorded during surveys are presented in full across the AyM array and relevant buffers in **Appendix 3**.

4.1 Common scoter

4.1.1 AyM Survey Data (aerial digital survey data 2019-2021)

Common scoters were not recorded within the AyM array area, although they were present within the 4 km buffer in three of the 24 aerial digital surveys (**Appendix 3**). The highest density within the AyM 4 km buffer was recorded in January 2020, with 0.24 individuals/ km², which equates to an estimated abundance of 61 individuals (**Table 7**).

Table 7 Common scoter raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM 4 km buffer only.

Survey	AyM 4 km buffer only								
	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Oct-19	1	9	0.03	0	0	0.00	1	9	0.03
Jan-20	7	61	0.24	0	0	0.00	7	61	0.24
Apr-20	2	17	0.07	0	0	0.00	2	17	0.07

4.1.2 Biological Season Mean Peak Estimates

Common scoter were only recorded within the non-breeding bio-season with a peak density of 0.20 individuals/ km² within the AyM 4 km buffer, which equates to a mean peak abundance of 31 individuals across the two years of data (**Table 8**).

Table 8 Common scoter bio-season mean peak abundance and density (individuals per km²) in AyM 4 km buffer only.

AyM 4 km buffer only						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	0.00	0.00	0.00	0.00	0.00	0.00
Non-breeding	31.00	0.20	0.00	0.00	31.00	0.20

4.1.3 Spatial Density Distribution and Flight Direction

Common scoters were recorded in very low densities within the AyM 4 km buffer during the non-breeding bio-season in comparison to the known densities within the wider region (**Figure 6**). Common scoter are a wintering species only within North Wales, typically migrating to boreal and subarctic zones of Eurasia to breed (Wernham et al., 2002). Common scoter were primarily distributed close to shore on the southern edge of the survey area, within close proximity and even bordering the RFOWF array area. These areas of higher density likely correspond with shallower waters which make for preferable foraging habitat (Snow & Perrins 1998; **Figure 6**).

Monthly flight directions from across the AyM survey area show a dominant flight direction of east/ west, relating to movements parallel to the coast, likely relating to movements between foraging and roosting areas (**Appendix 4**). All flight behaviour was observed outside of the AyM array area plus 4 km buffer.

4.2 Kittiwake

4.2.1 AyM Survey Data (aerial survey data 2019-2021)

Kittiwake were recorded in 21 of the 24 aerial digital surveys within the AyM array area (**Appendix 3**). Peak abundances were highest during in March 2019 ($n = 238$) for the first year of data and April 2020 ($n = 357$) for the second year of data in the AyM array area (**Appendix 3**). Kittiwake densities ranged from 0.10 individuals/ km² in June and September 2020 to 4.58 individuals/ km² in April 2020 (**Appendix 3**).

Table 9 Kittiwake raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

Survey	AyM array area								
	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	22	238	3.05	8	83	1.06	14	155	1.99
Apr-19	8	76	0.97	2	19	0.24	6	57	0.73
May-19	7	66	0.85	6	57	0.73	1	9	0.12
Jul-19	9	76	0.97	7	59	0.76	2	17	0.22
Sep-19	4	33	0.42	3	25	0.32	1	8	0.10
Oct-19	10	81	1.04	6	49	0.63	4	32	0.41
Nov-19	16	131	1.68	15	123	1.58	1	8	0.10
Dec-19	3	24	0.31	2	16	0.21	1	8	0.10
Jan-20	7	65	0.83	6	49	0.63	1	16	0.21
Feb-20	15	144	1.86	12	99	1.27	3	45	0.59
Mar-20	14	112	1.44	11	88	1.13	3	24	0.31
Apr-20	43	357	4.58	22	178	2.28	21	178	2.28
May-20	12	97	1.24	8	65	0.83	4	32	0.41
Jun-20	1	8	0.10	1	8	0.10	0	0	0.00
Jul-20	4	48	0.62	3	24	0.31	1	24	0.31
Aug-20	4	32	0.41	2	16	0.21	2	16	0.21
Sep-20	1	8	0.10	0	0	0.00	1	8	0.10
Nov-20	4	33	0.42	4	33	0.42	0	0	0.00
Dec-20	4	32	0.41	4	32	0.41	0	0	0.00
Jan-21	9	78	1.00	8	65	0.83	1	13	0.17
Feb-21	5	41	0.53	3	24	0.31	2	16	0.21

4.2.1 Biological Season Mean Peak Estimates

Kittiwake were present in greatest abundance in the AyM array area during the return migration bio-season with an estimated mean peak abundance of 298 individuals and a mean peak density of 3.81 individuals/ km² (**Table 10**).

Table 10 Kittiwake bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	298	3.81	131	1.67	167	2.13
Migration-free breeding	87	1.11	62	0.79	25	0.31
Post-breeding (autumn) migration	82	1.05	78	1.00	24	0.31

4.2.2 Spatial Density Distribution and Flight Direction

Kittiwakes were loosely distributed throughout the survey area within all bio-seasons (**Figure 7**). Highest densities of kittiwakes were recorded in the return migration bio-season, to the west of the array area. Kittiwake density reduced markedly in the migration-free breeding and post-breeding migration bio-seasons by comparison.

Monthly flight directions from across the AyM survey area during the migration-free breeding bio-season were loosely travelling in an east/ west direction, which could suggest flights from the array area towards nearby colonies located on the Great/Little Orme and/ or Anglesey (Brenchley et al., 2013; **Appendix 4**). In the migratory bio-seasons flight directions were in an east/ west orientation, as to be expected with birds migrating to and from breeding colonies parallel to the coastline.

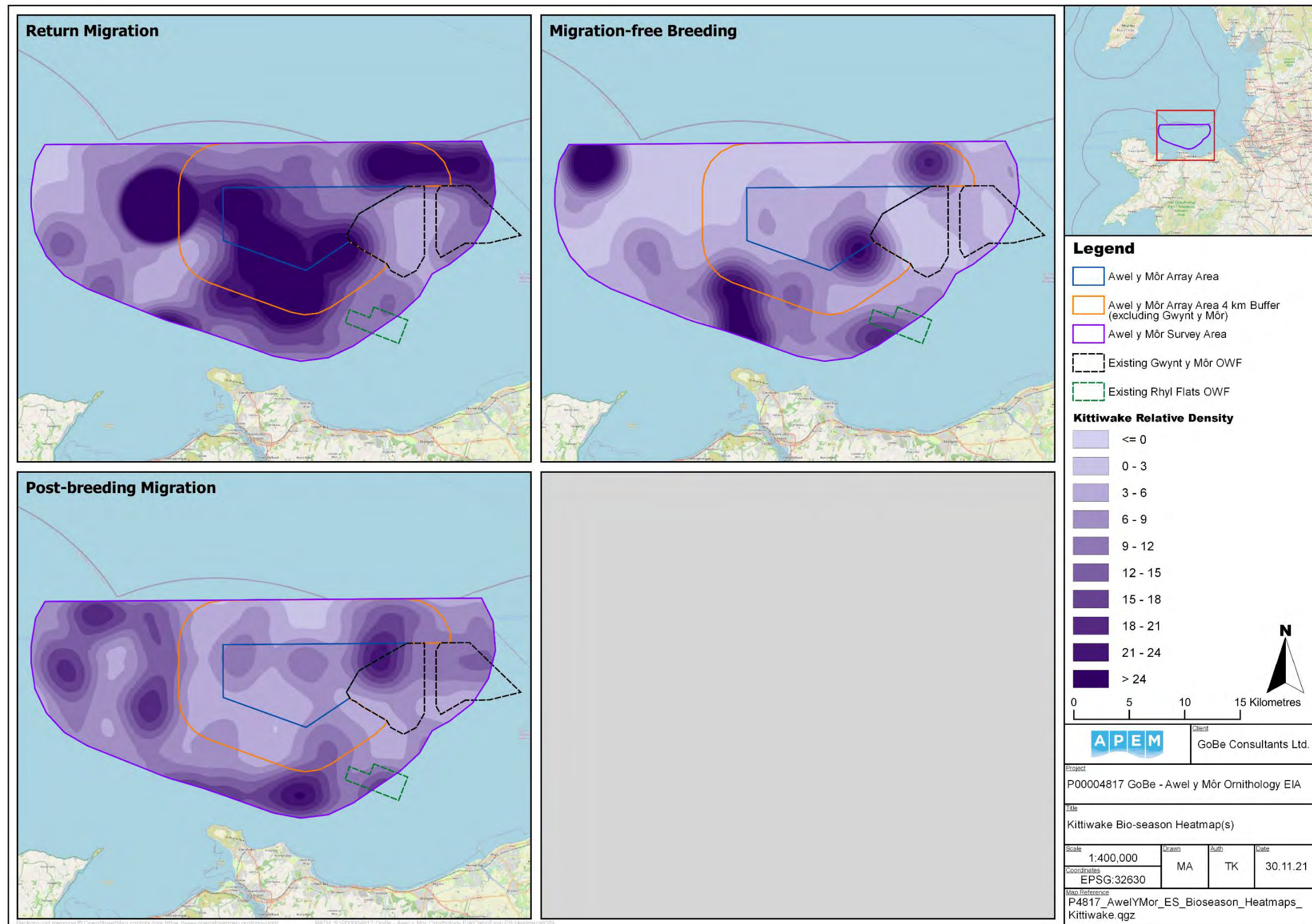


Figure 7 Heatmaps of kittiwake distribution in each bio-season.

4.3 Common gull

4.3.1 AyM Survey Data (aerial survey data 2019-2021)

Common gull were recorded in four of the 24 aerial digital surveys within the AyM array area (**Appendix 3**). Peak abundances were highest in February 2020 ($n = 41$) for the first year of data and January 2021 ($n = 33$) for the second year of data (**Table 11**). Of the relatively small number of common gulls recorded across the survey programme, all were observed to be flying (**Table 11**).

Table 11 Common gull raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Feb-20	5	41	0.53	5	41	0.53	0	0	0.00
Dec-20	2	16	0.21	2	16	0.21	0	0	0.00
Jan-21	4	33	0.42	4	33	0.42	0	0	0.00
Feb-21	3	24	0.31	3	24	0.31	0	0	0.00

4.3.2 Biological Season Mean Peak Estimates

Common gulls were present in greatest abundance in the AyM array area during the return migration bio-season with an estimated mean peak abundance of 37 individuals and a mean peak density of 0.47 individuals/ km² (**Table 12**).

Table 12 Common gull bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	37	0.47	37	0.47	0	0.00
Migration-free breeding	0	0.00	0	0.00	0	0.00
Post-breeding (autumn) migration	8	0.10	8	0.10	0	0.00

4.3.3 *Spatial Density Distribution and Flight Direction*

Common gulls were recorded flying within the AyM array area during both the return migration and post-breeding migration bio-seasons only (**Figure 8**). In North Wales common gull are an infrequent wintering visitor found primarily along the coast, Therefore as expected no individuals were recorded within the migration-free breeding bio-season (Brenchley et al., 2013).

Common gulls were recorded in flight during the migratory bio-seasons only across the AyM survey area. Monthly flight directions during the migratory bio-seasons shows a predominant flight direction of east/ west orientation, as to be expected with birds migrating to and from breeding colonies and wintering areas parallel to the coastline (**Appendix 4**).

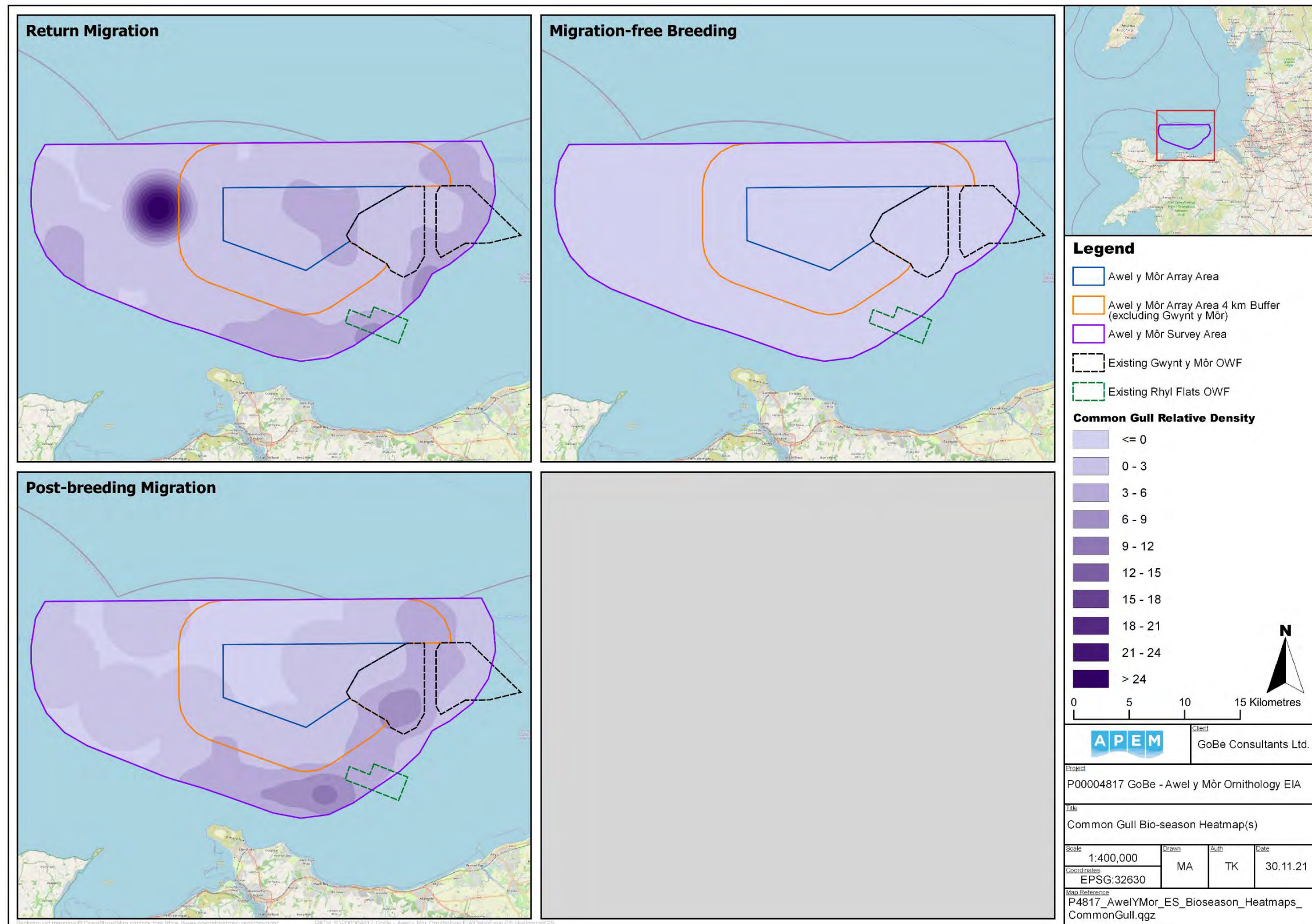


Figure 8 Heatmaps of common gull distribution in each bio-season.

4.4 Great black-backed gull

4.4.1 AyM Survey Data (aerial survey data 2019-2021)

Great black-backed gulls were recorded to species level in nine of the 24 aerial digital surveys within the AyM array area and in one further month a proportion of unidentified gulls were apportioned to great black-backed gull (**Appendix 3**). Great black-backed gulls were recorded in consistently low abundance across the two years, with a peak abundance of 17 individuals in July 2019 for the first year of data and 24 individuals in February 2021 for the second year of data (**Table 13**). Great black-backed gull densities ranged from 0.05 individuals/ km² in January 2020 to 0.31 individuals/ km² in February 2021 (**Table 13**).

Table 13 Great black-backed gull raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

Survey	AyM array area								
	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	1	10	0.13	1	10	0.13	0	0	0.00
Jun-19	1	10	0.13	1	10	0.13	0	0	0.00
Jul-19	2	17	0.22	2	17	0.22	0	0	0.00
Nov-19	1	8	0.10	1	8	0.10	0	0	0.00
Jan-20	0	4	0.05	0	0	0.00	0	4	0.05
Feb-20	1	10	0.12	0	0	0.00	1	10	0.12
May-20	1	8	0.10	1	8	0.10	0	0	0.00
Aug-20	1	8	0.10	1	8	0.10	0	0	0.00
Jan-21	1	13	0.17	0	0	0.00	1	13	0.17
Feb-21	3	24	0.31	0	0	0.00	3	24	0.31

4.4.2 Biological Season Mean Peak Estimates

The bio-season mean peak abundance of great black-backed gull was highest in the breeding bio-season (n = 13), although only marginally higher than that recorded in the non-breeding bio-season (n = 10; **Table 14**).

Table 14 Great black-backed gull bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area			
	All behaviours	Flying	Sitting

Bio-season	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	13	0.16	13	0.16	0	0.00
Non-breeding	10	0.13	9	0.12	5	0.06

4.4.3 Spatial Density Distribution and Flight Direction

Great black-backed gull was sparsely distributed throughout the survey area, with low densities recorded within the AyM array area for both the breeding and non-breeding bio-season (**Figure 9**). In the breeding bio-season, great black-backed gulls were mainly recorded in the south of the survey area. In the non-breeding bio-season, a distinct density hotspot is visible to the west of the array area, while lower densities of great black-backed gull are present in the south and east of the survey area.

Monthly flight directions from across the AyM survey area during the breeding bio-season were orientated in a north/ south direction, indicating likely flights to and from probable breeding sites along the coastline or further inland (Brenchley et al., 2013; **Appendix 4**). In the non-breeding bio-season directional data show a predominant flight direction of east/ west orientation, suggesting birds were observed migrating to and from breeding colonies and wintering areas parallel to the coastline.

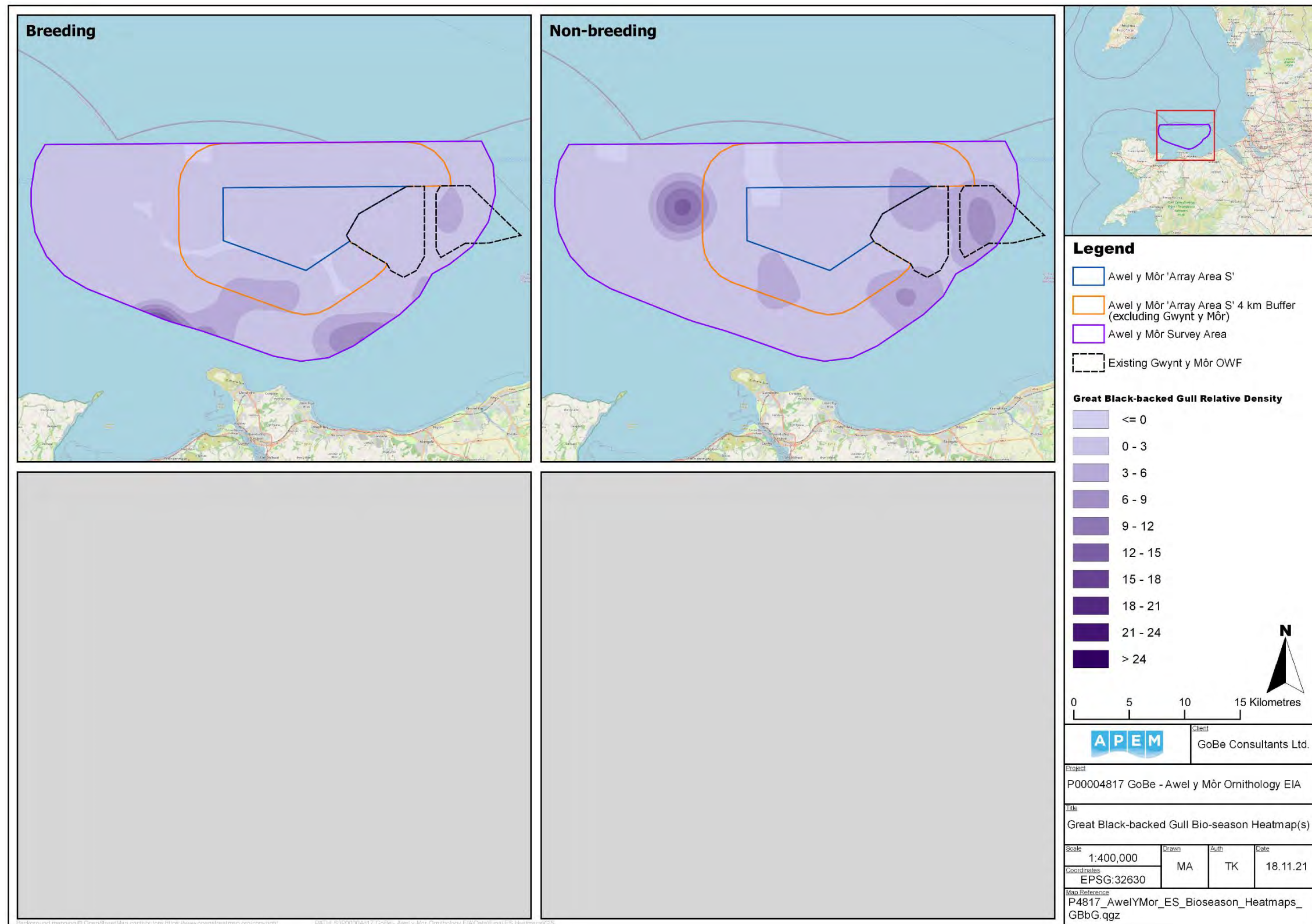


Figure 9 Heatmaps of great black-backed gull distribution in each bio-season.

4.5 Herring gull

4.5.1 AyM Survey Data (aerial survey data 2019-2021)

Herring gull were recorded to species level in nine of the 24 aerial digital surveys within the AyM array area, and in one further month a proportion of unidentified gulls were apportioned to herring gull (**Appendix 3**). Peak abundances were highest in March 2019 ($n = 73$) for the first year of data and April 2020 ($n = 41$) for the second year of data (**Table 15**). Herring gull densities ranged from 0.05 individuals/ km² in January 2020 to 0.94 individuals/ km² in March 2019 (**Table 15**).

Table 15 Herring gull raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	7	73	0.94	0	0	0.00	7	73	0.94
May-19	5	56	0.72	0	0	0.00	5	56	0.72
Nov-19	1	16	0.21	0	0	0.00	1	16	0.21
Jan-20	0	4	0.05	0	0	0.00	0	4	0.05
Feb-20	2	18	0.23	1	8	0.10	1	10	0.12
Apr-20	5	41	0.53	2	16	0.21	3	24	0.31
Jun-20	1	8	0.10	1	8	0.10	0	0	0.00
Dec-20	3	24	0.31	0	0	0.00	3	24	0.31
Jan-21	3	29	0.38	2	16	0.21	1	13	0.17
Feb-21	2	16	0.21	0	0	0.00	2	16	0.21

4.5.2 Biological Season Mean Peak Estimates

The bio-season mean peak abundance of herring gull was highest in the breeding bio-season ($n = 49$), although only marginally higher than that recorded in the non-breeding bio-season ($n = 40$; **Table 16**).

Table 16 Herring gull bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	49	0.62	8	0.10	40	0.51

Non-breeding	40	0.51	8	0.10	38	0.48
--------------	----	------	---	------	----	------

4.5.3 *Spatial Density Distribution and Flight Direction*

Herring gull distributions differed between the two bio-seasons. During the breeding bio-season herring gulls were predominantly recorded to the south of the AyM array area, whereas during the non-breeding bio-season were widely distributed within the survey area (**Figure 10**). Herring gulls being found predominantly closer to shore during the breeding bio-season could be due to birds foraging close to known breeding sites along the coast (Brenchley et al., 2013).

Monthly flight directions show no predominant flight patterns across the AyM survey area during either bio-season (**Appendix 4**).

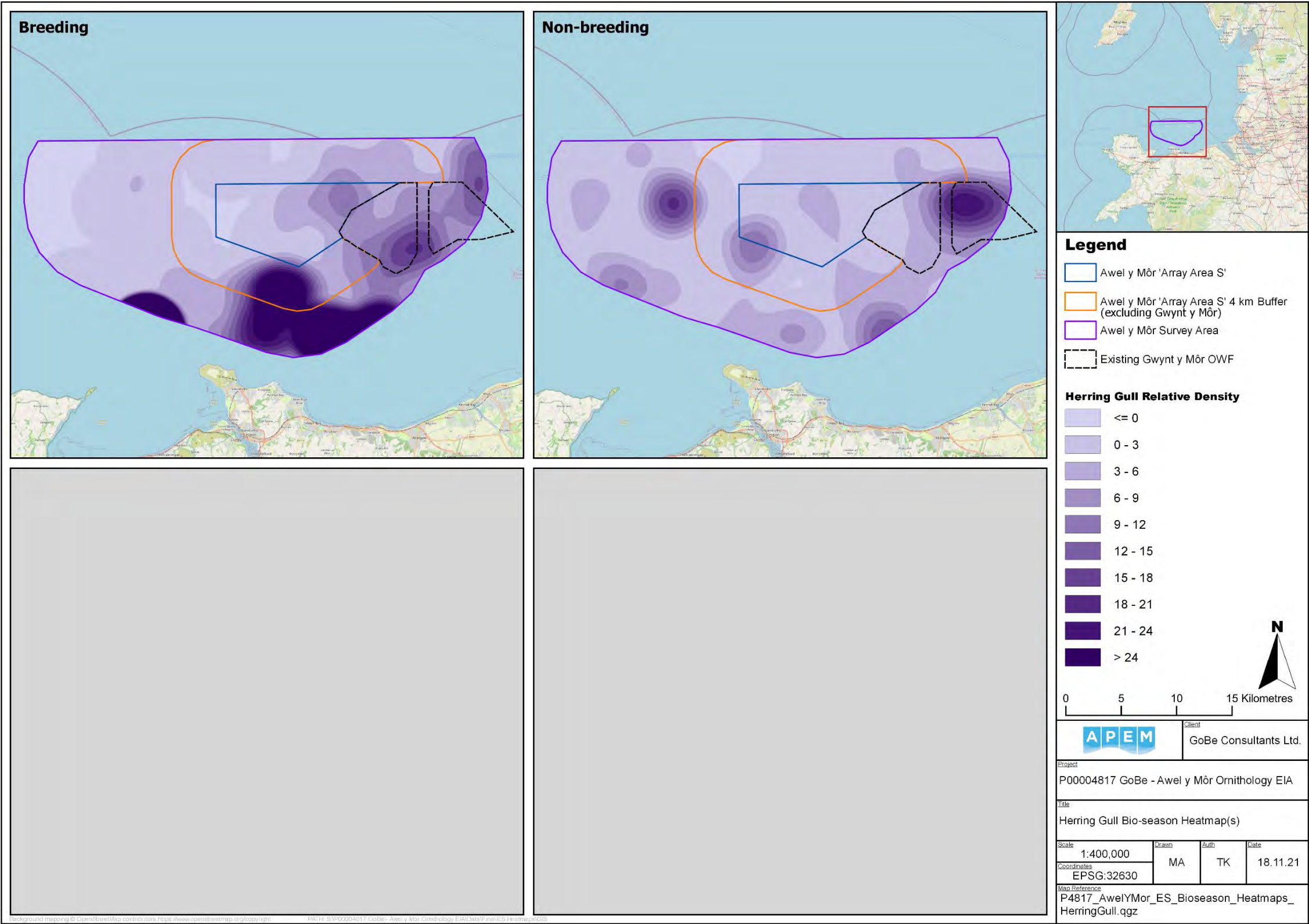


Figure 10 Heatmaps of herring gull distribution in each bio-season.

4.6 'Commic' tern

4.6.1 AyM Survey Data (aerial survey data 2019-2021)

'Commic' tern were recorded in two of the 24 aerial digital surveys within the AyM array area, in August and September 2019 (**Appendix 3**). The mean density within the AyM array area was 0.10 individuals/ km², with an estimated peak abundance of eight individuals (**Table 17**).

Table 17 'Commic' tern raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Aug-19	1	8	0.10	1	8	0.10	0	0	0.00
Sep-19	1	8	0.10	1	8	0.10	0	0	0.00

4.6.2 Biological Season Mean Peak Estimates

'Commic' terns were only recorded during the post-breeding migration bio-season with a mean peak abundance of four individuals (**Table 18**).

Table 18 'Commic' tern bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	0	0.00	0	0.00	0	0.00
Migration-free breeding	0	0.00	0	0.00	0	0.00
Post-breeding (autumn) migration	4	0.05	4	0.05	0	0.00

4.6.3 Spatial Density Distribution and Flight Direction

'Commic' tern were recorded in the AyM array area only in the post-breeding migration bio-season, although there were recorded in the wider survey area both in the migration-free breeding and the return migration bio-seasons (**Figure 11**). During the return migration birds were recorded to the south of the AyM array area indicating birds following the coastline to breeding colonies along the west coast of the UK. During the migration-free breeding bio-season only a single hotspot was recorded on the western edge of the wider survey area, likely due to the wider survey area being at the outermost limit of terns from breeding colonies on Anglesey foraging ranges (Brenchley et al., 2013). During the post-breeding bio-season terns were loosely distributed within the survey area likely due to terns from both the UK and Ireland breeding colonies migrating south within the Celtic sea to wintering grounds along the west coast of Africa (Wernham et al., 2002).

Monthly flight directions from across the AyM survey area indicate that in the return migration bio-season, 'commic' tern were generally observed flying in an east/ west direction parallel to the coast, indicating individuals migrating to their breeding colonies (**Appendix 4**). During the migration-free breeding bio-season 'commic' tern were observed flying in a north-west direction. During the post-breeding migration bio-season, 'commic' tern were predominantly recorded flying in a south-west direction indicating individuals migrating from breeding colonies to wintering ground along the west coast of Africa (Wernham et al., 2002).

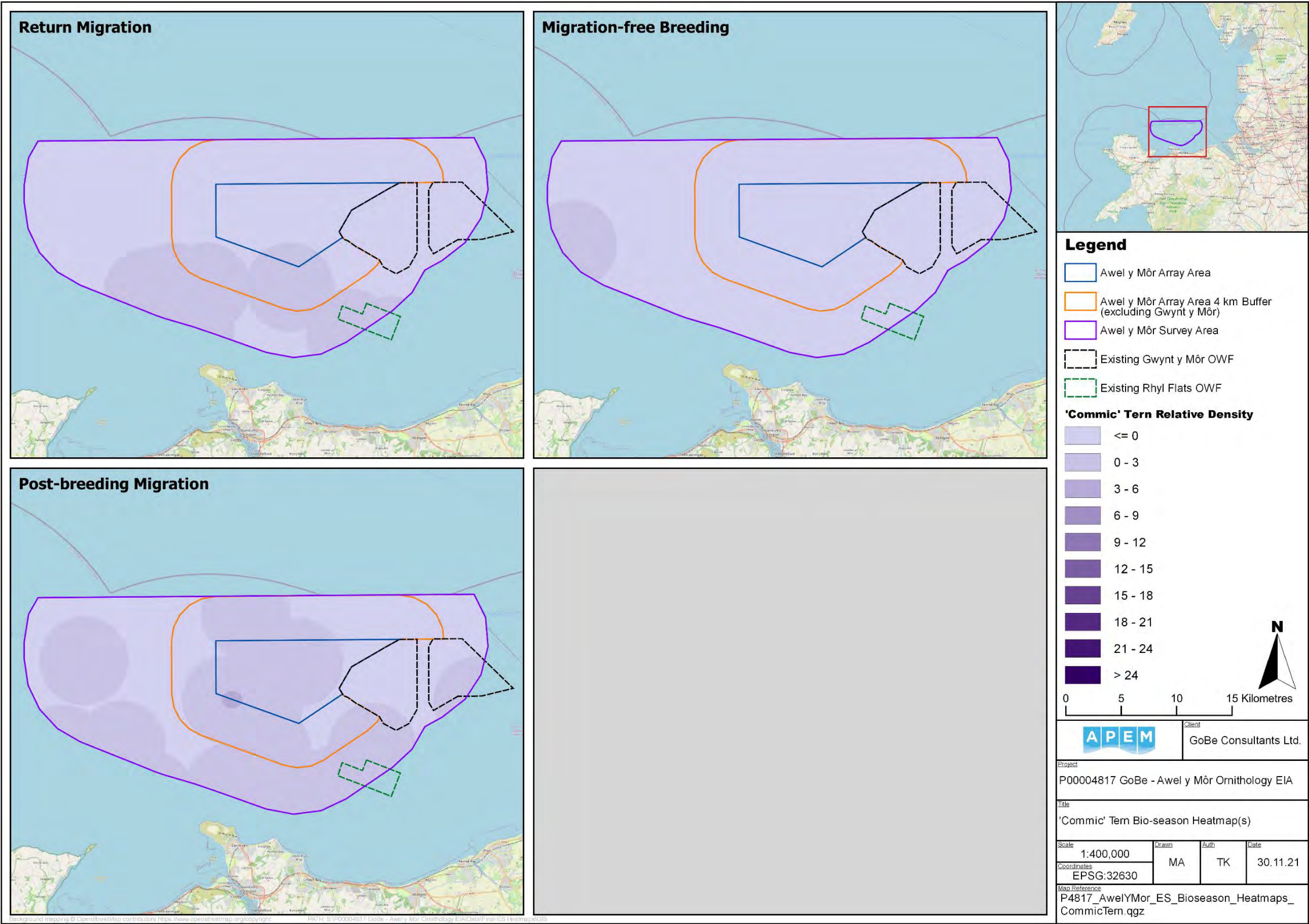


Figure 11 Heatmaps of 'commic' tern distribution in each bio-season.

4.7 Guillemot

4.7.1 AyM Survey Data (aerial survey data 2019-2021)

Guillemot were identified to species level in 12 of the 24 aerial digital surveys in the AyM array area. Individuals identified to group level and apportioned to guillemot (guillemot/razorbill and/ or auk species) were recorded in a further 12 surveys, such that guillemots had estimated abundances in all 24 months (**Appendix 3**). Guillemot estimated densities ranged from 0.13 to 15.93 individuals/ km², with a mean density of 3.78 individuals/ km². Guillemot abundance was highest in March 2019 (n = 706) and in February 2021 (n = 1,243).

Within the AyM array area plus 2 km buffer, guillemots or individuals apportioned to guillemot were recorded in all 24 of the aerial digital surveys, with a peak estimated abundance of 3,886 in February 2021 (**Appendix 3**). Most guillemots observed were sitting, with only a small number of birds recorded flying.

Within the AyM array area plus 4 km buffer, guillemots were again identified and/ or apportioned to species level across all 24 months of survey. Estimated abundance again peaked in February 2021 at 5,599 estimated individuals. (**Appendix 3**).

Table 19 Guillemot raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area and corresponding buffers.

Survey	AyM array area								
	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	25	706	9.05	0	0	0.00	25	706	9.05
Apr-19	10	228	2.93	0	0	0.00	10	228	2.93
May-19	11	284	3.65	0	0	0.00	11	284	3.65
Jun-19	2	75	0.96	0	0	0.00	2	75	0.96
Jul-19	13	140	1.80	1	8	0.10	12	132	1.70
Aug-19	1	10	0.13	0	0	0.00	1	10	0.13
Sep-19	0	42	0.54	0	0	0.00	0	42	0.54
Oct-19	0	61	0.78	0	5	0.07	0	56	0.71
Nov-19	0	231	2.96	0	0	0.00	0	231	2.96
Dec-19	0	179	2.29	0	6	0.08	0	172	2.21
Jan-20	0	154	1.97	0	0	0.00	0	154	1.97
Feb-20	27	885	11.35	7	58	0.74	20	827	10.61
Mar-20	0	546	7.00	0	8	0.10	0	538	6.90
Apr-20	23	597	7.65	1	8	0.10	22	589	7.55
May-20	47	618	7.92	0	0	0.00	47	618	7.92
Jun-20	12	116	1.49	8	64	0.82	4	52	0.67
Jul-20	6	213	2.73	0	0	0.00	6	213	2.73
Aug-20	1	10	0.13	0	0	0.00	1	10	0.13
Sep-20	0	48	0.61	0	0	0.00	0	48	0.61
Oct-20	0	27	0.35	0	0	0.00	0	27	0.35
Nov-20	0	74	0.94	0	0	0.00	0	74	0.94

Dec-20	0	381	4.89	0	18	0.24	0	363	4.65
Jan-21	0	207	2.65	0	5	0.07	0	202	2.59
Feb-21	0	1243	15.93	0	0	0.00	0	1243	15.93
AyM array area plus 2 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	57	1738	11.06	0	0	0.00	57	1738	11.06
Apr-19	16	532	3.38	0	0	0.00	16	532	3.38
May-19	14	464	2.95	0	0	0.00	14	464	2.95
Jun-19	7	184	1.17	0	0	0.00	7	184	1.17
Jul-19	18	251	1.60	1	11	0.07	17	240	1.53
Aug-19	2	28	0.18	0	0	0.00	2	28	0.18
Sep-19	0	92	0.59	0	0	0.00	0	92	0.59
Oct-19	0	153	0.98	0	7	0.05	0	146	0.93
Nov-19	0	347	2.21	0	0	0.00	0	347	2.21
Dec-19	0	375	2.38	0	8	0.05	0	366	2.33
Jan-20	0	284	1.81	0	0	0.00	0	284	1.81
Feb-20	41	1951	12.41	7	86	0.54	34	1866	11.86
Mar-20	1	1400	8.90	0	10	0.06	1	1390	8.84
Apr-20	31	1008	6.41	2	21	0.13	29	987	6.27
May-20	66	1104	7.02	1	11	0.07	65	1093	6.95
Jun-20	16	242	1.54	10	117	0.74	6	125	0.79
Jul-20	13	518	3.30	0	0	0.00	13	518	3.30
Aug-20	1	14	0.09	0	0	0.00	1	14	0.09
Sep-20	0	89	0.57	0	0	0.00	0	89	0.57
Oct-20	0	54	0.34	0	0	0.00	0	54	0.34
Nov-20	0	150	0.96	0	0	0.00	0	150	0.96
Dec-20	0	704	4.47	0	25	0.16	0	679	4.32
Jan-21	0	372	2.36	0	7	0.05	0	364	2.32
Feb-21	0	3886	24.71	0	0	0.00	0	3886	24.71
AyM array area plus 4 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	93	2645	10.21	4	55	0.21	89	2590	10.00
Apr-19	208	4802	18.54	0	10	0.04	208	4792	18.50
May-19	27	565	2.18	1	10	0.04	26	555	2.14
Jun-19	14	253	0.98	4	41	0.16	10	212	0.82
Jul-19	35	549	2.12	1	18	0.07	34	531	2.05
Aug-19	4	45	0.17	0	0	0.00	4	45	0.17
Sep-19	0	302	1.17	0	0	0.00	0	302	1.17
Oct-19	0	560	2.16	0	6	0.02	0	554	2.14
Nov-19	0	572	2.21	0	0	0.00	0	572	2.21
Dec-19	0	735	2.84	0	7	0.03	0	728	2.81
Jan-20	0	775	2.99	0	11	0.04	0	764	2.95
Feb-20	71	3276	12.65	18	167	0.65	53	3109	12.00

Mar-20	3	2683	10.36	0	9	0.03	3	2674	10.32
Apr-20	51	1459	5.63	4	34	0.13	47	1425	5.50
May-20	83	1078	4.16	2	17	0.07	81	1061	4.09
Jun-20	37	512	1.98	13	120	0.46	24	392	1.51
Jul-20	30	984	3.80	1	8	0.03	29	976	3.77
Aug-20	3	56	0.22	0	0	0.00	3	56	0.22
Sep-20	0	174	0.67	0	0	0.00	0	174	0.67
Oct-20	0	130	0.50	0	0	0.00	0	130	0.50
Nov-20	0	410	1.58	0	0	0.00	0	410	1.58
Dec-20	0	1443	5.57	0	26	0.10	0	1417	5.47
Jan-21	0	884	3.41	0	6	0.02	0	878	3.39
Feb-21	0	5599	21.61	0	54	0.21	0	5545	21.41

4.7.2 Biological Season Mean Peak Estimates

Within the AyM array area only, mean peak abundance of guillemot was highest in the non-breeding bio-season ($n = 1,064$), with the majority of these birds sitting on the sea surface (**Table 20**). Mean peak abundance was approximately halved during the breeding season with an estimated 662 guillemots present.

A similar pattern was recorded in the AyM array area plus 2 km buffer (**Table 20**), with mean peak abundance greatest in the non-breeding bio-season ($n = 2,919$) and least in the breeding migration bio-season ($n = 1,569$).

Within the AyM array area plus 4 km buffer, mean peak abundance was more similar across the bio-seasons, with 3,743 estimated individuals in the breeding bio-season, and 4,438 estimated individuals in the non-breeding bio-season (**Table 20**).

Table 20 Guillemot bio-season mean peak abundance and density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	662	8.49	36	0.46	662	8.49
Non-breeding	1,064	13.64	38	0.49	1,035	13.27
AyM array area plus 2 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	1,569	9.98	65	0.41	1,564	9.95

Non-breeding	2,919	18.56	55	0.35	2,876	18.29
AyM array area plus 4 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Breeding	3,743	14.45	88	0.34	3733	14.41
Non-breeding	4,438	17.13	111	0.43	4327	16.70

4.7.3 Spatial Density Distribution and Flight Direction

There is a clear contrast in the density distributions of guillemots between the two bio-seasons. During the breeding bio-season two density hotspots are apparent to the west and south of the survey area likely associated with individuals foraging from breeding sites on the Great Orme and Anglesey (Brenchley et al., 2013; **Figure 12**). In the non-breeding bio-season, guillemot densities are more widely distributed within the survey area, with a single hotspot located to the south of the AyM array area and North of the Great Orme, possibly relating to an area of preferable foraging habitat (**Figure 12**).

Monthly flight directions from across the AyM survey area indicate that in the breeding bio-season, guillemots were predominantly observed to be flying in a north/ south orientation, suggesting birds flying to and from breeding colonies and foraging sites. No guillemots identified to species level were observed flying during the non-breeding bio-season (**Appendix 4**).

4.8 Razorbill

4.8.1 AyM Survey Data (aerial survey data 2019-2021)

In the AyM array area, razorbills were identified to species level in seven of the 24 surveys in the AyM array area (**Appendix 3**). Individuals identified to group level and apportioned to razorbill (guillemot/razorbill and/ or auk species) were recorded in a further 11 of the 18 aerial digital surveys, such that razorbills were estimated to be present in 18 of the surveys in total. Razorbill estimated abundance within the AyM array area was greatest in March 2019 (n = 340) for the first year of data and in March 2020 (n = 259) for the second year of data. Razorbill densities ranged from 0.17 to 4.35 individuals/ km² within the AyM array area.

Within the AyM array area plus 2 km buffer, razorbills were identified and/ or apportioned to species level in the same surveys as for the AyM array only, with the exception of March 2020 where birds were absent from the 2 km buffer (**Appendix 3**). Estimated abundance was greatest in March 2019 (n = 507) and February 2021 (n = 317), broadly following the patterns seen in the AyM array only. Densities ranged from 0.16 individuals/ km² in October 2020, to 3.23 individuals/ km² in March 2019.

With the AyM array area plus 4 km buffer, razorbills were identified to species level in eight surveys, including July 2019, with birds apportioned to species level in a further 10 surveys. Abundance was again highest during the return migration months of March 2019 (n = 887) and April 2019 (n = 915), with densities ranging from 3.42 to 3.53 individuals/ km².

Table 21 Razorbill raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area and corresponding buffers.

Survey	AyM array area								
	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	13	340	4.35	0	0	0.00	13	340	4.35
Apr-19	2	42	0.54	0	0	0.00	2	42	0.54
Sep-19	0	21	0.26	0	0	0.00	0	21	0.26
Oct-19	0	30	0.39	0	3	0.04	0	27	0.35
Nov-19	0	64	0.82	0	0	0.00	0	64	0.82
Dec-19	0	50	0.64	0	2	0.02	0	48	0.61
Jan-20	0	76	0.97	0	0	0.00	0	76	0.97
Feb-20	4	123	1.58	1	8	0.10	3	115	1.47
Mar-20	0	259	3.31	0	0	0.00	0	259	3.31
Apr-20	3	74	0.95	0	0	0.00	3	74	0.95
May-20	4	48	0.61	0	0	0.00	4	48	0.61
Jul-20	3	99	1.27	0	0	0.00	3	99	1.27
Sep-20	1	33	0.43	0	0	0.00	1	33	0.43
Oct-20	0	13	0.17	0	0	0.00	0	13	0.17
Nov-20	0	20	0.26	0	0	0.00	0	20	0.26
Dec-20	0	107	1.38	0	6	0.07	0	102	1.31
Jan-21	0	102	1.31	0	3	0.04	0	99	1.27

Feb-21	0	172	2.21	0	0	0.00	0	172	2.21
AyM array area plus 2 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	18	507	3.23	0	0	0.00	18	507	3.23
Apr-19	2	61	0.39	0	0	0.00	2	61	0.39
Sep-19	0	45	0.29	0	0	0.00	0	45	0.29
Oct-19	0	76	0.48	0	4	0.02	0	72	0.46
Nov-19	0	96	0.61	0	0	0.00	0	96	0.61
Dec-19	0	104	0.66	0	3	0.02	0	101	0.64
Jan-20	0	140	0.89	0	0	0.00	0	140	0.89
Feb-20	4	165	1.05	1	12	0.08	3	152	0.97
Apr-20	7	220	1.40	0	0	0.00	7	220	1.40
May-20	4	63	0.40	0	0	0.00	4	63	0.40
Jul-20	5	185	1.17	0	0	0.00	5	185	1.17
Sep-20	1	56	0.36	0	0	0.00	1	56	0.36
Oct-20	0	25	0.16	0	0	0.00	0	25	0.16
Nov-20	0	42	0.26	0	0	0.00	0	42	0.26
Dec-20	0	196	1.25	0	7	0.05	0	189	1.20
Jan-21	0	183	1.16	0	4	0.02	0	179	1.14
Feb-21	0	317	2.01	0	0	0.00	0	317	2.01
AyM array area plus 4 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	33	887	3.42	0	0	0.00	33	887	3.42
Apr-19	43	915	3.53	0	0	0.00	43	915	3.53
Jul-19	1	15	0.06	0	0	0.00	1	15	0.06
Sep-19	0	149	0.57	0	0	0.00	0	149	0.57
Oct-19	0	276	1.06	0	3	0.01	0	273	1.05
Nov-19	0	158	0.61	0	0	0.00	0	158	0.61
Dec-19	0	204	0.79	0	2	0.01	0	202	0.78
Jan-20	0	382	1.47	0	6	0.02	0	376	1.45
Feb-20	6	235	0.91	2	19	0.07	4	216	0.84
Apr-20	7	196	0.76	0	0	0.00	7	196	0.76
May-20	5	61	0.23	0	0	0.00	5	61	0.23
Jul-20	8	249	0.96	0	0	0.00	8	249	0.96
Sep-20	1	95	0.37	0	0	0.00	1	95	0.37
Oct-20	0	63	0.24	0	0	0.00	0	63	0.24
Nov-20	0	113	0.44	0	0	0.00	0	113	0.44
Dec-20	0	401	1.55	0	8	0.03	0	393	1.52
Jan-21	0	435	1.68	0	3	0.01	0	432	1.67
Feb-21	0	393	1.52	0	6	0.02	0	387	1.49

4.8.2 Biological Season Mean Peak Estimates

Within the AyM array area only, mean peak abundance of razorbill was highest in the return migration bio-season ($n = 299$), with all of these birds sitting on the sea surface. Mean peak abundance was lowest in the post-breeding migration bio-season with 71 sitting individuals (**Table 22**).

A similar pattern was recorded in the AyM array area plus 2 km buffer (**Table 22**). With mean peak abundance greatest in the return migration bio-season ($n = 336$) and least in the post-breeding migration bio-season ($n = 66$). The majority of birds were again sitting on the sea surface.

Within the AyM array area plus 4 km buffer, mean peak abundance was greatest in the return migration bio-season again ($n = 632$), but also in the migration-free breeding season ($n = 582$) (**Table 22**).

Table 22 Razorbill bio-season mean peak abundance and density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	299	3.83	5	0.07	299	3.83
Migration-free breeding	71	0.90	0	0.00	71	0.90
Post-breeding (autumn) migration	32	0.41	1	0.02	30	0.39
Migration-free winter	86	1.10	4	0.05	83	1.06
AyM array area plus 2 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	336	2.14	8	0.05	330	2.10
Migration-free breeding	140	0.89	0	0.00	140	0.89

Post-breeding (autumn) migration	66	0.42	2	0.01	64	0.41
Migration-free winter	150	0.95	5	0.03	145	0.92
AyM array area plus 4 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	634	2.45	12	0.05	631	2.44
Migration-free breeding	582	2.25	0	0.00	582	2.25
Post-breeding (autumn) migration	186	0.72	2	0.00	184	0.71
Migration-free winter	302	1.17	5	0.02	297	1.15

4.8.3 Spatial Density Distribution and Flight Direction

Razorbill density distributions varied between the three recorded bio-seasons. Clusters of density hotspots are present in the return migration and the migration-free breeding bio-seasons to the southwest of the survey area. These hotspots are likely due to razorbills either staging or foraging close to the known breeding sites on the Great Orme and Anglesey (Brenchley et al., 2013; **Figure 13**). During the post-breeding bio-season razorbills are loosely distributed within the survey area. No razorbills were identified to species level during the migration-free winter bio-season hence why the relative density zero for this bio-season

Monthly flight directions from across the AyM survey area were recorded on two occasions for razorbills identified to species level, both within the return migration bio-season. During the return migration bio-season, the flight direction of razorbills observed followed an east/northeast direction (**Appendix 4**).

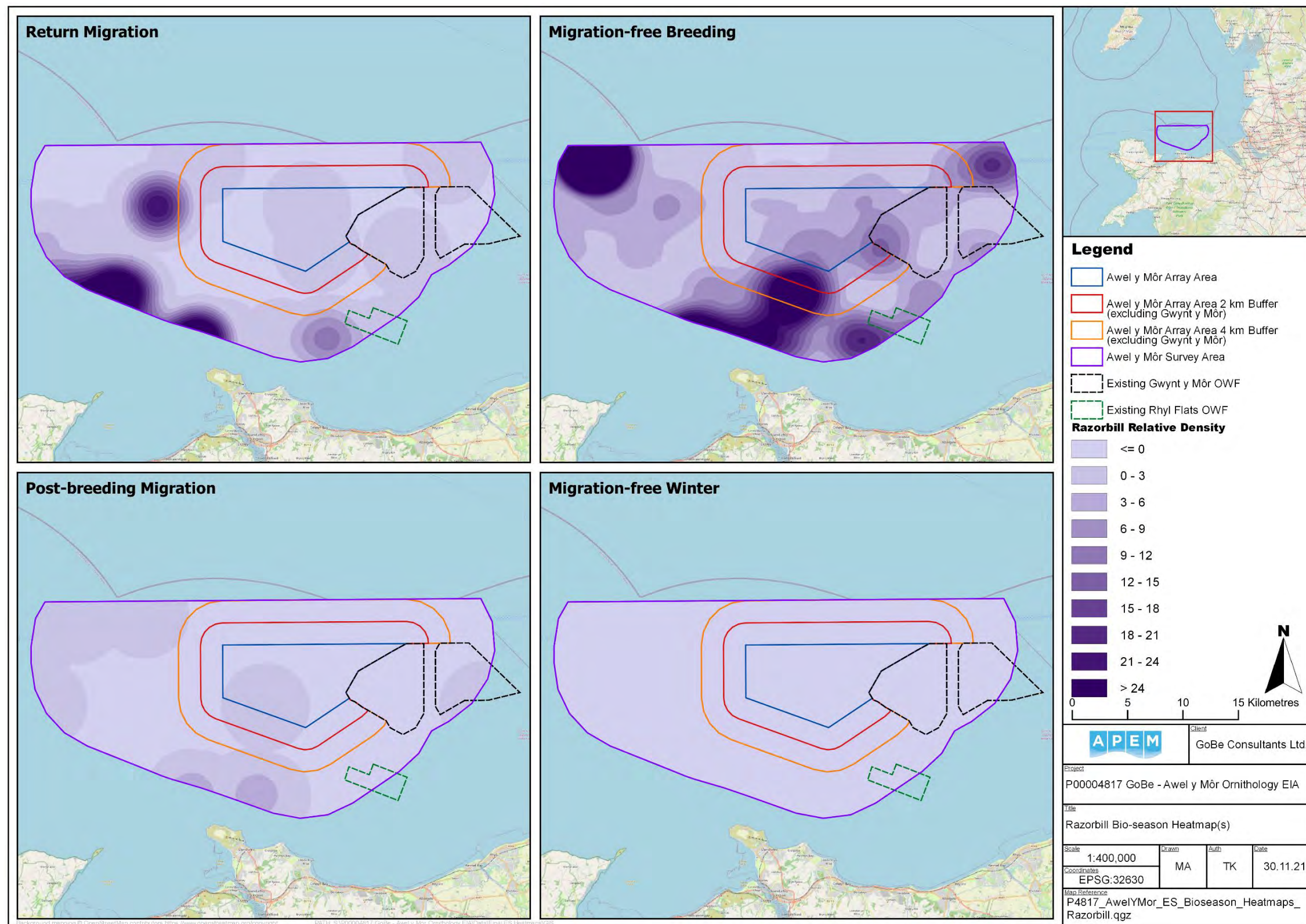


Figure 13 Heatmaps of razorbill distribution in each bio-season.

4.9 Red-throated diver

4.9.1 AyM Survey Data (aerial survey data 2019-2021)

Within the AyM array area, red-throated diver were recorded in four of the 24 aerial digital surveys (**Appendix 3**). Densities ranged from 0.10 to 0.13 individuals/ km² within the AyM array area. The peak estimated abundance of 10 individuals was recorded in April 2019.

In the AyM 0-5 km buffer only area, red-throated divers were recorded in five of the 24 surveys, with a peak estimated abundance of 46 in March 2019 (**Appendix 3**). Red-throated diver were observed sitting in four of the five surveys, with March 2020 the only month where red-throated diver were seen in flight. Densities ranged from 0.04 to 0.21 individuals / km² within the AyM 0-5 km buffer only area.

In the AyM 5-8 km buffer only area, red-throated divers were recorded in 11 out of the 24 surveys, with a peak estimated abundance of 77 individuals in January 2020 (**Appendix 3**). Red-throated divers were observed sitting in nine of the 11 surveys, with birds recorded in flight only in March 2019 and November 2020. Densities ranged from 0.05 to 0.57 individuals / km² within the AyM 5-8 km buffer only area.

Table 23 Red-throated diver raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Apr-19	1	10	0.13	0	0	0.00	1	10	0.13
Oct-19	1	8	0.10	0	0	0.00	1	8	0.10
Feb-20	1	8	0.10	0	0	0.00	1	8	0.10
Dec-20	1	8	0.10	0	0	0.00	1	8	0.10
AyM 0-5 km buffer only									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	4	46	0.21	0	0	0.00	4	46	0.21
Apr-19	3	32	0.15	0	0	0.00	3	32	0.15
Dec-19	1	9	0.04	0	0	0.00	1	9	0.04
Mar-20	1	9	0.04	1	9	0.04	0	0	0.00
Jun-20	1	9	0.04	0	0	0.00	1	9	0.04
AyM 5-8 km buffer only									
Survey	All behaviours			Flying			Sitting		

	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	5	54	0.40	0	0	0.00	5	54	0.40
Oct-19	8	66	0.49	0	0	0.00	8	66	0.49
Nov-19	2	17	0.13	1	10	0.07	1	7	0.05
Dec-19	1	9	0.07	0	0	0.00	1	9	0.07
Jan-20	9	77	0.57	0	0	0.00	9	77	0.57
Feb-20	5	42	0.31	0	0	0.00	5	42	0.31
Mar-20	5	41	0.30	0	0	0.00	5	41	0.30
Apr-20	3	22	0.16	0	0	0.00	3	22	0.16
Oct-20	1	7	0.05	0	0	0.00	1	7	0.05
Nov-20	6	49	0.36	0	0	0.00	6	49	0.36
Feb-21	7	57	0.42	0	0	0.00	7	57	0.42

4.9.2 Biological Season Mean Peak Estimates

Within the AyM array area, the greatest bio-season mean peak abundance of red-throated divers was recorded in the return migration bio-season ($n = 9$, **Table 24**).

This pattern was also seen across the AyM 0-5 km buffer only area with a bio-season mean peak abundance of 28 recorded in the return migration bio-season (**Table 24**). A mean peak abundance of five flying birds was estimated in the AyM 0-5km buffer only area during return migration, with all other birds sitting on the sea surface (**Table 24**).

Within the AyM 5-8 km buffer only area, the greatest bio-season mean peak abundance of red-throated diver was recorded in the post-breeding migration bio-season ($n=58$, **Table 24**). As in the two other areas, only one bio-season recorded birds in flight with all other records attributed with birds sitting on the sea surface. A mean peak abundance of five red-throated diver were recorded in flight within the post-breeding migration bio-season (**Table 24**).

Table 24 Red-throated diver bio-season mean peak abundance and density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	9	0.12	0	0.00	9	0.12
Migration-free breeding	0	0.00	0	0.00	0	0.00
Post-breeding (autumn) migration	4	0.05	0	0.00	4	0.05
Migration-free winter	4	0.05	0	0.00	4	0.05
AyM 0-5 km buffer only						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	28	0.13	5	0.02	23	0.10
Migration-free breeding	5	0.02	0	0.00	5	0.02
Post-breeding (autumn) migration	0	0.00	0	0.00	0	0.00
Migration-free winter	5	0.02	0	0.00	5	0.02
AyM 5-8 km buffer only						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	50	0.36	0	0.00	50	0.36

Migration-free breeding	0	0.00	0	0.00	0	0.00
Post-breeding (autumn) migration	58	0.42	5	0.04	58	0.42
Migration-free winter	39	0.28	0	0.00	39	0.28

4.9.3 Spatial Density Distribution and Flight Direction

Red-throated divers were found in low densities within the AyM survey area for all bio-seasons. A clear pattern can be distinguished in the density distributions of red-throated divers across all bio-seasons within the survey area (**Figure 14**), with highest densities present in the south-east of the survey area surrounding Rhyl Flats OWF, correlating with the known areas of high red-throated diver abundance in **Figure 3**.

Of the few red-throated divers recorded in flight, monthly flight directions from across the AyM survey area indicate that in the return migration bio-season, red-throated divers were observed to fly in a north-west direction (**Appendix 4**). During the post-breeding migration bio-season, red-throated divers were observed to be flying in a north-east direction.

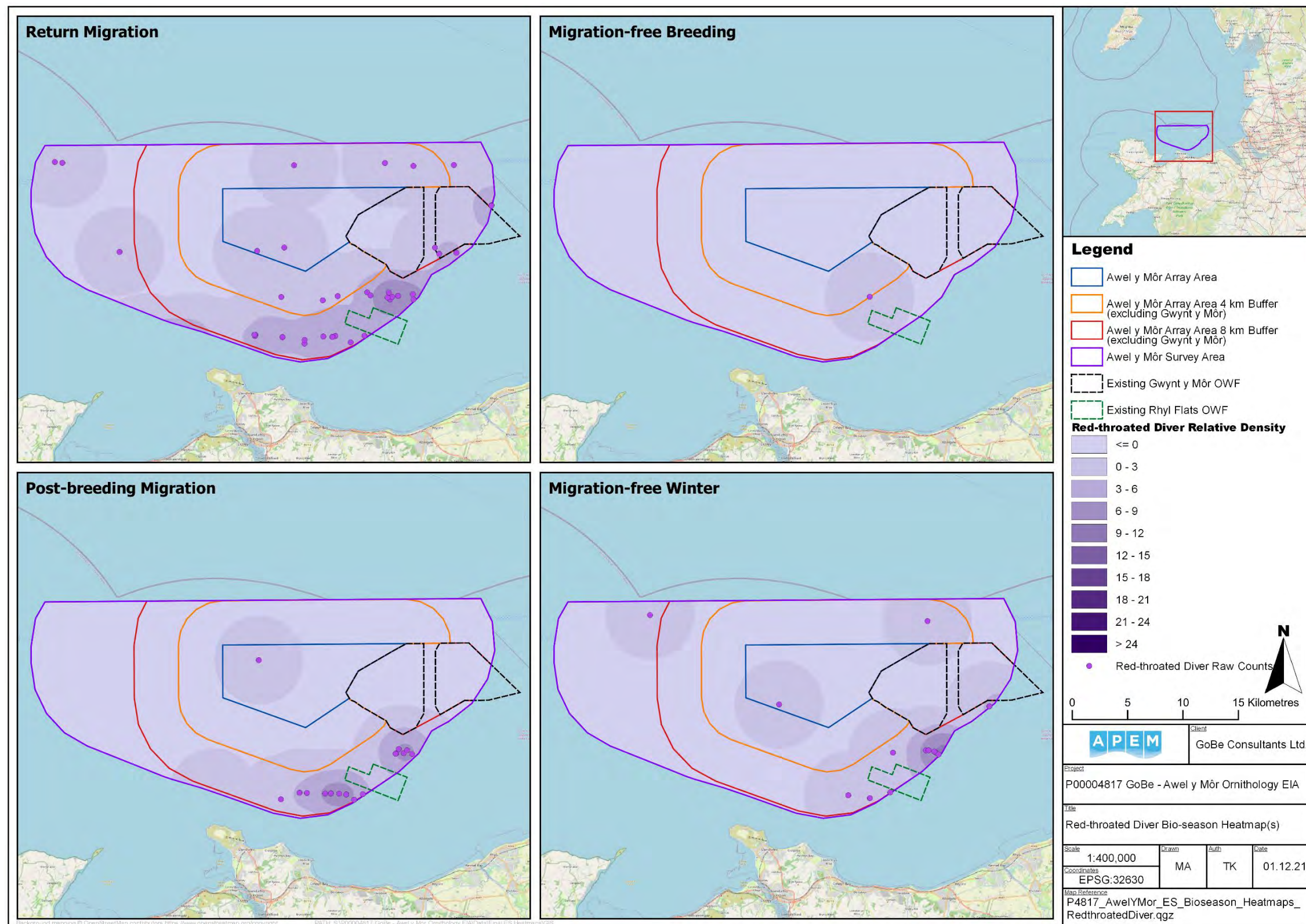


Figure 14 Heatmaps of red-throated diver distribution in each bio-season.

4.10 Fulmar

4.10.1 AyM Survey Data (aerial survey data 2019-2021)

Fulmar were recorded in six of the 24 aerial digital surveys within the AyM array area (**Appendix 3**). Fulmar were recorded in consistently low abundance across the two years, with a peak abundance of 10 individuals in June 2019 for the first year of data and 56 individuals in March 2020 for the second year of data (**Table 25**). Fulmar densities ranged from 0.10 individuals/ km² in September 2020 and February 2021 to 0.72 individuals/ km² in March 2020 (**Table 25**).

Table 25 Fulmar raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Jun-19	1	10	0.13	1	10	0.13	0	0	0.00
Mar-20	7	56	0.72	2	16	0.21	5	40	0.51
Jul-20	2	16	0.21	0	0	0.00	2	16	0.21
Sep-20	1	8	0.10	1	8	0.10	0	0	0.00
Dec-20	2	16	0.21	0	0	0.00	2	16	0.21
Feb-21	1	8	0.10	0	0	0.00	1	8	0.10

4.10.2 Biological Season Mean Peak Estimates

The bio-season mean peak abundance of fulmars was highest in the return migration bio-season (n = 36), before declining in the migration-free breeding bio-season (n= 13) and further still in the post-breeding migration bio-season (n= 4; **Table 26**). No fulmar was recorded within the AyM array area during the migration-free winter bio-season (**Table 26**).

Table 26 Fulmar bio-season mean peak abundance and density (individuals per km²) in AyM array area.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	36	0.46	8	0.10	28	0.36

Migration-free breeding	13	0.17	5	0.06	8	0.10
Post-breeding (autumn) migration	4	0.05	4	0.05	0	0.00
Migration-free winter	0	0.00	0	0.00	0	0.00

4.10.3 Spatial Density Distribution and Flight Direction

Fulmar were loosely distributed within the AyM survey area in low densities across the three bio-seasons recorded (**Figure 15**).

Data presented in rose diagrams (**Appendix 4**) of monthly flight directions within the survey area indicates that in the return migration bio-season, fulmar were predominantly observed flying in a north-west orientation. During the migration-free winter bio-season, fulmars were observed to fly in either a north or easterly direction. During the post-breeding migration, fulmar were observed flying in a westerly direction.

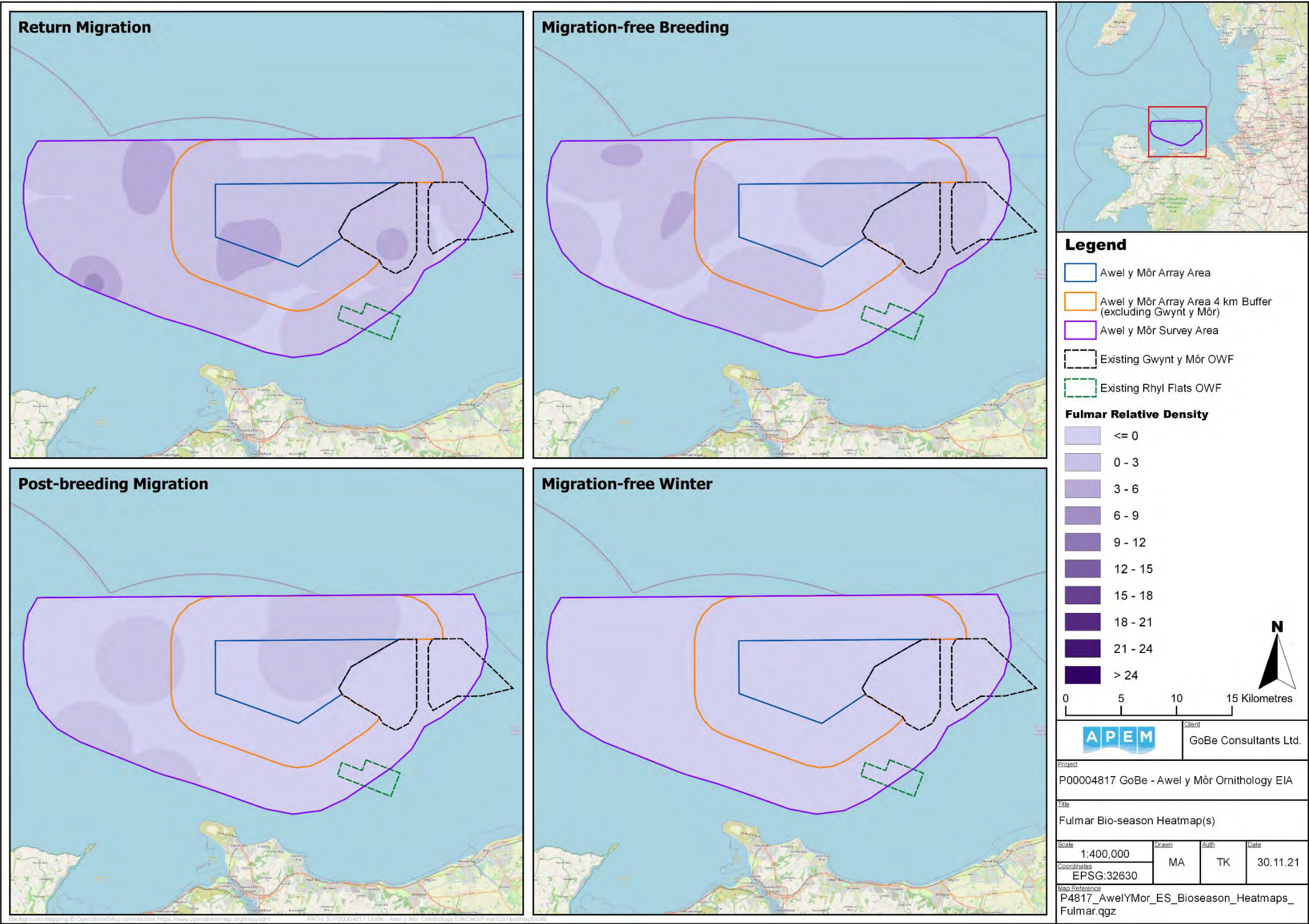


Figure 15 Heatmaps of fulmar distribution in each bio-season.

4.11 Manx shearwater

4.11.1 AyM Survey Data (aerial survey data 2019-2021)

Within the AyM array area, Manx shearwaters were recorded in six of the 24 aerial digital surveys within the AyM array area, with a peak estimated abundance of 292 individuals in August 2020. Manx shearwater densities ranged from 0.10 to 3.74 individuals/ km², with a mean density of 0.24 individuals/ km² (**Appendix 3**).

Within the AyM array area plus 2 km buffer, Manx shearwaters were again recorded during the same six surveys, with the highest densities recorded in May 2020 (2.17 individuals/ km²) and August 2020 (2.65 individuals/ km²; **Table 27**).

Across the AyM array area plus 4 km buffer, Manx shearwaters were also recorded in April 2019, with birds present in seven of the 24 aerial digital surveys (**Appendix 3**). Raw counts were highest in August 2020, giving rise to a peak density of 2.67 individuals/ km².

Table 27 Manx shearwater raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
May-19	1	9	0.12	0	0	0.00	1	9	0.12
Jul-19	1	8	0.10	1	8	0.10	0	0	0.00
Aug-19	1	8	0.10	1	8	0.10	0	0	0.00
May-20	13	106	1.36	4	32	0.41	9	73	0.94
Jul-20	4	32	0.41	3	24	0.31	1	8	0.10
Aug-20	36	292	3.74	11	89	1.14	25	203	2.60
AyM array area plus 2 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
May-19	1	13	0.08	0	0	0.00	1	13	0.08
Jul-19	1	11	0.07	1	11	0.07	0	0	0.00
Aug-19	1	11	0.07	1	11	0.07	0	0	0.00
May-20	32	341	2.17	23	245	1.56	9	96	0.61
Jul-20	4	41	0.26	3	31	0.20	1	10	0.06
Aug-20	39	417	2.65	13	139	0.88	26	278	1.77
AyM array area plus 4 km buffer									
Survey	All behaviours			Flying			Sitting		

	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Apr-19	9	91	0.35	0	0	0.00	9	91	0.35
May-19	1	10	0.04	0	0	0.00	1	10	0.04
Jul-19	2	17	0.07	2	17	0.07	0	0	0.00
Aug-19	14	120	0.46	5	43	0.17	9	77	0.30
May-20	32	275	1.06	23	198	0.76	9	77	0.30
Jul-20	5	42	0.16	4	34	0.13	1	8	0.03
Aug-20	80	691	2.67	43	371	1.43	37	320	1.24

4.11.2 Biological Season Mean Peak Estimates

Within the AyM array area only, the bio-season mean peak abundance of Manx shearwater was greatest in the post-breeding migration ($n = 150$; **Table 28**).

This same pattern was observed across both the AyM array area plus 2 km buffer ($n = 214$), and the AyM array area plus 4 km buffer ($n = 406$), with similar numbers of birds sitting and in flight (**Table 28**).

Table 28 Manx shearwater bio-season mean peak abundance and density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	58	0.74	16	0.21	41	0.53
Migration-free breeding	20	0.26	16	0.21	4	0.05
Post-breeding (autumn) migration	150	1.92	49	0.62	102	1.30

AyM array area plus 2 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	177	1.13	123	0.78	96	0.61
Migration-free breeding	26	0.17	21	0.13	5	0.03
Post-breeding (autumn) migration	214	1.36	75	0.48	139	0.88
AyM array area plus 4 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	183	0.71	99	0.38	84	0.32
Migration-free breeding	30	0.11	26	0.10	4	0.02
Post-breeding (autumn) migration	406	1.57	207	0.80	199	0.77

4.11.3 Spatial Density Distribution and Flight Direction

Manx shearwater were loosely distributed throughout the survey area in very low densities within all bio-seasons, with scattered clusters of medium to high density hotspots (**Figure 16**). Density hotspots differed across the bio-seasons, in both their distribution and frequency. Hotspots were more defined in the post-breeding migration bio-season, with three prominent hotspots surrounding the AyM array area present within the survey area.

Monthly flight directions from across the AyM survey area indicate that in the return migration bio-season, Manx shearwater were flying in a west to northwest direction. During the migration-free breeding and post-breeding migration bio-seasons, Manx shearwater were observed to fly in a westerly direction (**Appendix 4**).

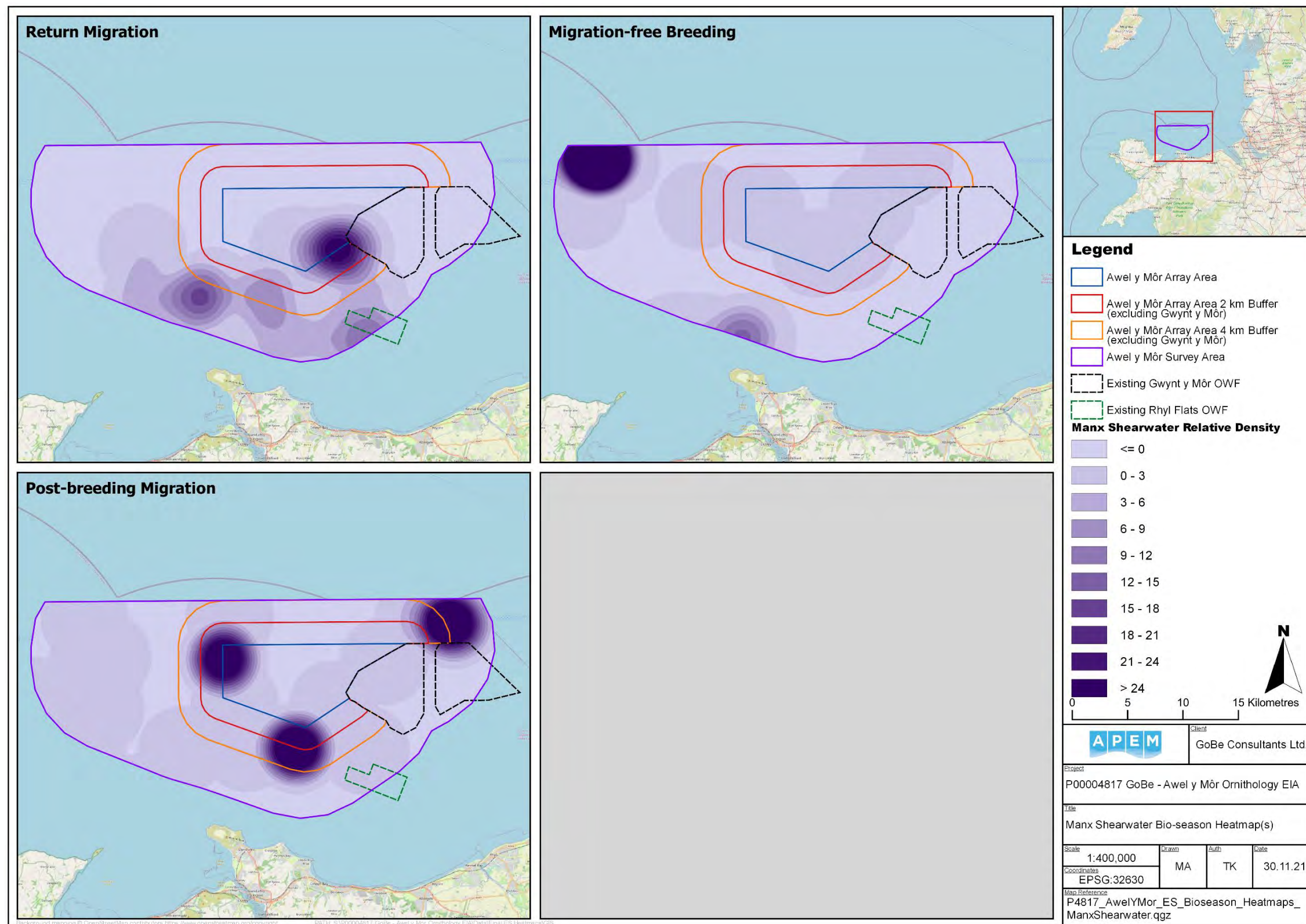


Figure 16 Heatmaps of Manx shearwater distribution in each bio-season.

4.12 Gannet

4.12.1 AyM Survey Data (aerial survey data 2019-2021)

Within the AyM array area, gannets were recorded in 13 of the 24 aerial digital surveys within the AyM array area, with a peak estimated abundance of 312 individuals in July 2019. Gannet densities ranged from 0.10 to 4.00 individuals/ km², with a mean density of 0.42 individuals/ km² (**Appendix 3**).

Across the AyM array area plus 2 km buffer, gannets were recorded in 14 surveys, with the addition of October 2020 (**Appendix 3**). Abundance again peaked in July 2019 with a peak estimated abundance of 538 individuals, with broadly similar numbers recorded sitting and in flight.

Densities ranged from 0.07 to 5.11 individuals/ km² across the AyM array area plus 4 km buffer, with peak numbers recorded in April 2019 (**Table 29**).

Table 29 Gannet raw counts, total estimated abundance and total estimated density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Apr-19	2	19	0.24	2	19	0.24	0	0	0.00
Jun-19	2	19	0.24	1	10	0.13	1	10	0.13
Jul-19	37	312	4.00	15	126	1.62	22	185	2.37
Aug-19	3	24	0.31	0	0	0.00	3	24	0.31
Sep-19	6	49	0.63	6	49	0.63	0	0	0.00
Oct-19	17	138	1.77	11	89	1.14	6	49	0.63
Apr-20	3	24	0.31	0	0	0.00	3	24	0.31
May-20	1	8	0.10	1	8	0.10	0	0	0.00
Jun-20	1	8	0.10	1	8	0.10	0	0	0.00
Jul-20	1	8	0.10	1	8	0.10	0	0	0.00
Aug-20	9	73	0.94	5	41	0.53	4	32	0.41
Sep-20	11	88	1.13	6	48	0.62	5	40	0.51
Nov-20	1	8	0.10	1	8	0.10	0	0	0.00
AyM array area plus 2 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Apr-19	3	38	0.24	2	25	0.16	1	13	0.08
Jun-19	4	51	0.32	1	13	0.08	3	38	0.24
Jul-19	50	538	3.42	19	204	1.30	31	333	2.12

Aug-19	3	32	0.20	0	0	0.00	3	32	0.20
Sep-19	7	76	0.48	6	65	0.41	1	11	0.07
Oct-19	19	203	1.29	11	117	0.74	8	85	0.54
Apr-20	4	42	0.27	0	0	0.00	4	42	0.27
May-20	3	32	0.20	3	32	0.20	0	0	0.00
Jun-20	2	21	0.13	1	11	0.07	1	11	0.07
Jul-20	2	21	0.13	1	10	0.06	1	10	0.06
Aug-20	11	117	0.74	7	75	0.48	4	43	0.27
Sep-20	19	198	1.26	9	94	0.60	10	104	0.66
Oct-20	1	10	0.06	1	10	0.06	0	0	0.00
Nov-20	2	21	0.13	1	11	0.07	1	11	0.07
AyM array area plus 4 km buffer									
Survey	All behaviours			Flying			Sitting		
	Raw Count	Abundance	Density	Raw Count	Abundance	Density	Raw Count	Abundance	Density
Mar-19	3	33	0.13	2	22	0.08	1	11	0.04
Apr-19	131	1325	5.11	3	30	0.12	128	1295	5.00
May-19	3	30	0.12	0	0	0.00	3	30	0.12
Jun-19	8	81	0.31	2	20	0.08	6	61	0.24
Jul-19	80	694	2.68	26	226	0.87	54	468	1.81
Aug-19	11	94	0.36	3	26	0.10	8	69	0.27
Sep-19	17	150	0.58	12	106	0.41	5	44	0.17
Oct-19	24	207	0.80	12	104	0.40	12	104	0.40
Apr-20	9	78	0.30	2	17	0.07	7	60	0.23
May-20	14	120	0.46	6	52	0.20	8	69	0.27
Jun-20	2	17	0.07	1	9	0.03	1	9	0.03
Jul-20	2	17	0.07	1	8	0.03	1	8	0.03
Aug-20	16	138	0.53	9	78	0.30	7	60	0.23
Sep-20	28	237	0.91	16	136	0.52	12	102	0.39
Oct-20	2	17	0.07	1	8	0.03	1	8	0.03
Nov-20	3	26	0.10	2	17	0.07	1	9	0.03

4.12.2 Biological Season Mean Peak Estimates

Within the AyM array area, the bio-season peak estimated abundance for gannets was highest in the migration-free breeding bio-season ($n = 193$; **Table 30**).

This pattern was also observed across the AyM array area plus 2 km buffer ($n = 328$), and the AyM array area plus 4 km buffer ($n = 732$), with more birds observed sitting on the sea surface than in flight during this bio-season (**Table 30**).

Table 30 Gannet bio-season mean peak abundance and density (individuals per km²) in AyM array area and corresponding buffers.

AyM array area						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	0	0.00	0	0.00	0	0.00
Migration-free breeding	193	2.47	84	1.07	109	1.39
Post-breeding (autumn) migration	113	1.45	69	0.88	45	0.57
AyM array area plus 2 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	0	0.00	0	0.00	0	0.00
Migration-free breeding	328	2.08	140	0.89	188	1.20
Post-breeding (autumn) migration	201	1.27	106	0.67	95	0.60
AyM array area plus 4 km buffer						
Bio-season	All behaviours		Flying		Sitting	
	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density	Bio-season mean peak abundance	Bio-season mean peak density
Return (spring) migration	17	0.06	11	0.04	6	0.02
Migration-free breeding	732	2.82	152	0.59	682	2.63
Post-breeding	222	0.86	212	0.47	103	0.40

(autumn) migration						
-----------------------	--	--	--	--	--	--

4.12.3 Spatial Density Distribution and Flight Direction

Gannet densities were loosely distributed the AyM survey area in both the migration-free breeding and post-breeding migration bio-seasons (**Figure 17**). In the migration-free breeding bio-season the highest densities were observed to the south of the AyM array area, while in the post-breeding migration bio-season the highest recorded densities were within the GyM array area.

Monthly flight directions from across the AyM survey area indicate that in the return migration bio-season gannets were observed flying in an north-easterly direction or in a westerly direction (**Appendix 4**). During the migration-free breeding bio-season no dominant flight direction was noted. During the post-breeding migration gannets were observed to fly in a south-westerly direction.

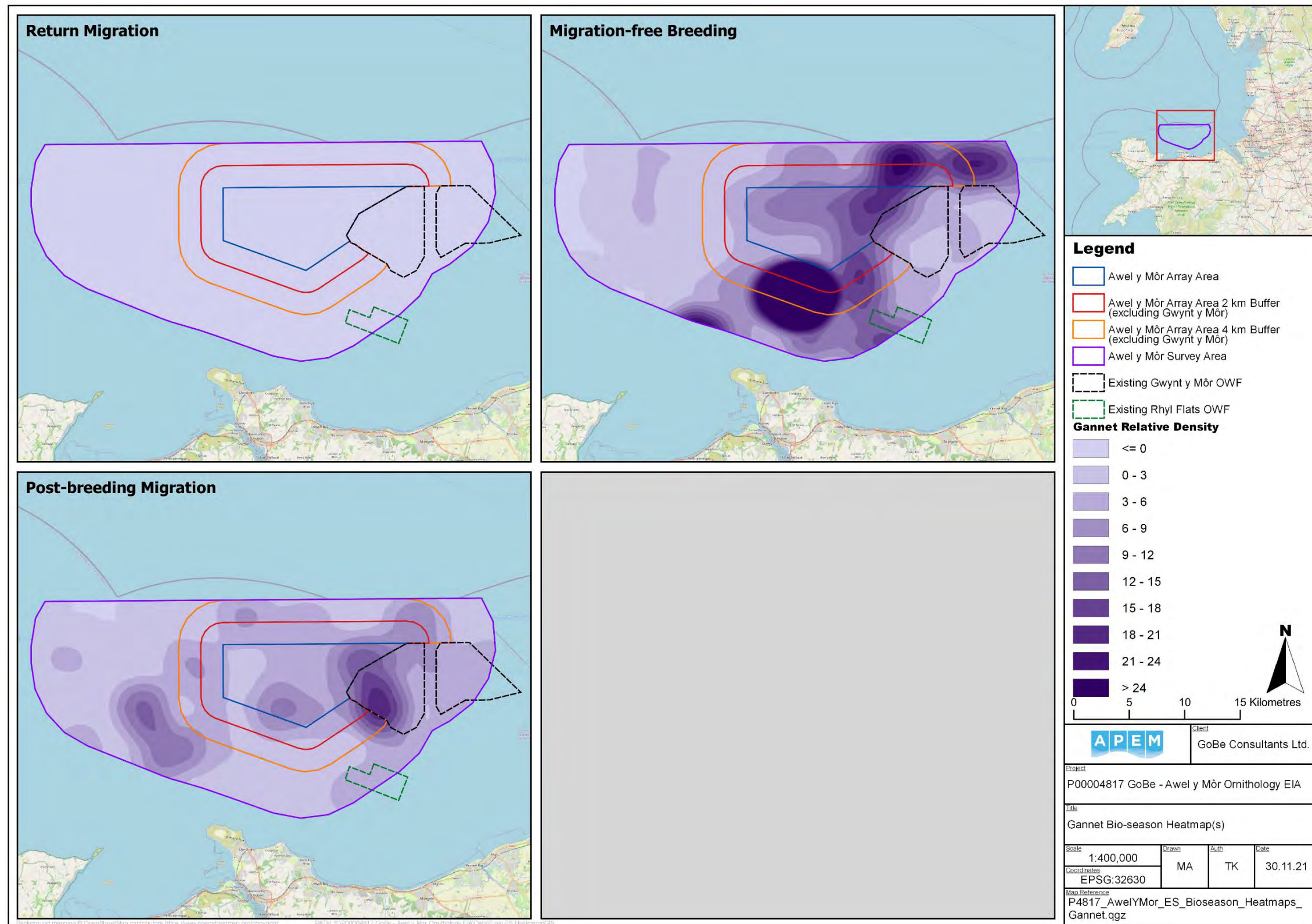


Figure 17 Heatmaps of gannet distribution in each bio-season.

4.13 Other Species Recorded

4.13.1 AyM Survey Data (aerial survey data 2019-2021)

Cormorant were recorded in the AyM array area in a single aerial digital survey, with a peak estimated abundance of eight individuals in February 2020, corresponding to a density of 0.10 individuals/ km² within the AyM array area (**Appendix 3**). Within the wider survey area cormorants were recorded in greatest abundance to the south of the survey area likely corresponding with preferable foraging habitat close to shore (**Figure 18**).

Lesser black-backed gull were recorded in the AyM array area in a single aerial digital survey, with an estimated abundance of eight individuals in July 2020. The small number of lesser black-backed gulls recorded across the survey area were loosely distributed throughout (**Figure 18**). All lesser black-backed gulls recorded within the survey area were all observed to be flying (**Appendix 3**).

Sandwich tern was not recorded in the AyM array area in any of the 24 months of aerial digital survey. In the AyM array area plus 4 km buffer, Sandwich tern were recorded in three aerial digital surveys (July 2019, August 2019 and July 2020) with a peak estimated abundance of 17 individuals in July 2019 (**Appendix 3**). All records of sandwich tern within the survey area were observed flying and within the post-breeding bio-season (Furness 2015). The small number of sandwich terns recorded across the survey area were primarily distributed to the south of survey area (**Figure 18**), correlating with typical behaviour of the species following the coastline whilst migrating (Stienen et al., 2007).

Puffin were recorded in the AyM array area in a single aerial digital survey, with an estimated abundance of eight individuals in April 2020. In the array area plus 4 km buffer, puffins were recorded in four (March 2019, June 2019, July 2019 and April 2020) of the aerial digital surveys with a peak estimated abundance of 22 individuals in March 2019 (**Appendix 3**). The small number of puffins recorded across the survey area were loosely distributed throughout (**Figure 18**).

Black guillemot was not recorded in the AyM array area in any aerial digital survey. In the array area plus 4 km buffer, black guillemot were recorded in a single aerial digital survey, with an estimated abundance of nine individuals in April 2020 (**Appendix 3**).

Great crested grebe were recorded in the AyM array area in three (December 2019, February 2020 and January 2021) of the 24 aerial digital surveys. The peak estimated abundance was 16 individuals in December 2019 (**Appendix 3**). In the array area plus 4 km buffer, great crested grebe were recorded in four (November 2019, December 2019, February 2020 and January 2021) of the aerial digital surveys, with a peak estimated abundance of 17 individuals in both November and December 2019. As presented in **Figure 18**, the small number of great crested grebes recorded were loosely distributed throughout the survey area.

Red breasted merganser was not recorded in the AyM array area or array area plus 4 km buffer in any aerial digital survey. In the wider survey area, Red breasted merganser was recorded in a single aerial digital survey to the west of the AyM array area plus 4 km buffer in February 2020 (**Figure 18**).

The distribution of species recorded in densities too low to produce bio-season heatmaps are instead depicted in **Figure 18** based on distribution point data for all records of those species in the wider survey area across the 24 months of aerial digital surveys.

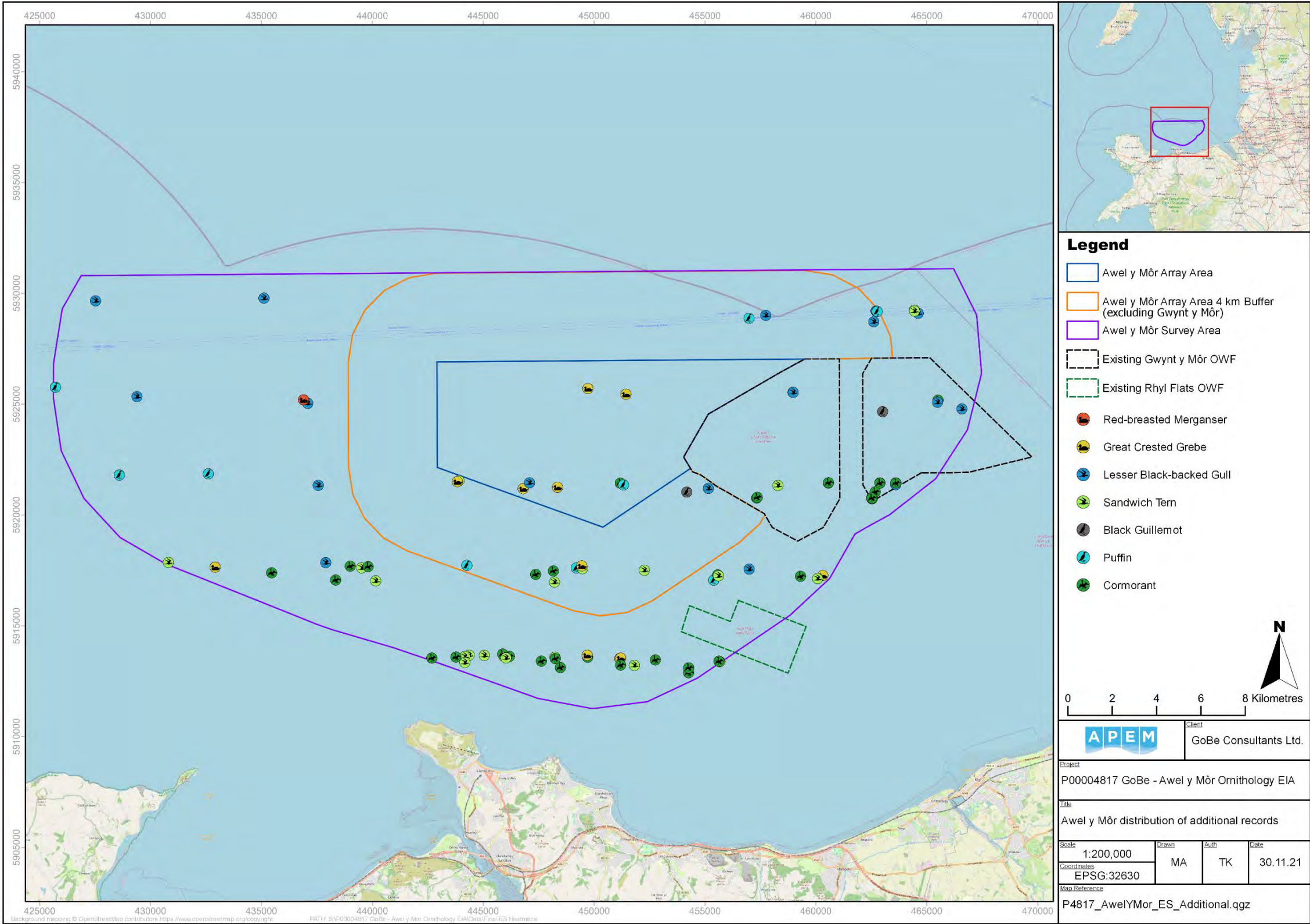


Figure 18 Other species recorded in the AyM aerial surveys 2019 - 2021

5 References

APEM (2011) Rhyl Flats Aerial and Boat Surveys – Post-Construction Year Two: Final Report. Report to RWE npower renewables. 140 pp.

APEM (2012a) *Gwynt y Môr Offshore Wind Farm Aerial Surveys: Annual Report 2010/ 11*, APEM Scientific Report 411206, RWE npower Renewables.

APEM (2012b). Rhyl Flats Aerial Surveys – Post-Construction Year Three: Final Report. Report to RWE npower renewables, 121 pp.

APEM (2014) *Gwynt y Môr Offshore Wind Farm Aerial Surveys: Annual Report 2012/ 13*, Report to RWE npower Renewables.

APEM (2017) *Gwynt y Môr Offshore Wind Farm Post-construction Aerial Surveys Annual Report 2016/2017*, APEM Scientific Report P00000577. Gwynt y Môr Offshore Wind Farm Ltd.

APEM (2018) *Gwynt y Môr Offshore Wind Farm Post-construction Aerial Surveys Annual Report 2017/2018*, APEM Scientific Report P00001859. Gwynt y Môr Offshore Wind Farm Ltd.

APEM (2019) *Gwynt y Môr Offshore Wind Farm Post-construction Aerial Surveys Annual Report 2018/2019*, APEM Scientific Report P00002798. Gwynt y Môr Offshore Wind Farm Ltd.

APEM (2020) *Awel y Môr: Annual Report - Aerial Bird & Marine Mammal, March 2019 to February 2020*, APEM Scientific Report P3481. RWE Renewables UK Limited.

Balmer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I. and Fuller, R. (2013) *Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland*, BTO Books, Thetford.

Band, W. (2012) *Using a collision risk model to assess bird collision risks for offshore wind farms*, The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02. SOSS Website. Original published Sept 2011, extended to deal with flight height distribution data March 2012.

BirdLife International. (2004) *Birds in Europe: population estimates, trends and conservation status*. (Birdlife Conservation Series No. 12). BirdLife, Cambridge.

Bradbury G, Trinder M, Furness B, Banks AN, Caldow RWG, et al. (2014) *Mapping Seabird Sensitivity to Offshore Wind farms*, PLoS ONE 9(9): e106366. doi:10.1371/journal.pone.0106366

Brenchley, A., Gibbs, G., Pritchard, R. and Spence, I.M. (2013). *The Breeding Birds of North Wales*. Liverpool University Press, Liverpool.

Brown, A. and Grice, P. (2005) *Birds in England*, T and AD Poyser, London.

British Ornithologists' Union. (2019). *The British List: A Checklist of Birds of Britain (9th edition)*, Ibis 160: 190-240. Available at: <https://bou.org.uk/british-list/> (Accessed: 18 March 2021).

Camphuysen, K.J., Fox, A.D., Leopold, M.F. & Petersen, I.K. (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*, NIOZ report to COWRIE (BAM – 02-2002), Texel, 37pp. Available at <https://tethys.pnnl.gov/sites/default/files/publications/Camphuysen-et-al-2004-COWRIE.pdf> [accessed 18/03/2021]

Canty, A. & Ripley, B. (2010) *boot: bootstrap R (S-Plus) functions*, R package version 1.2-42.

Cook, A.S.C.P., Wright, L.J., and Burton, N.H.K. (2012) *A review of flight heights and avoidance rates of birds in relation to offshore wind farms*, The Crown Estate Strategic Ornithological Support Services (SOSS). SOSS Website.

Cook, A.S.C.P., Humphries, E.M., Masden, E.A., and Burton, N.H.K. (2014). *The avoidance rates of collision between birds and offshore turbines*, BTO research Report No 656 to Marine Scotland Science

Cramp S. and Simmons K.E.L. (Eds.) (1977 - 1994). *The Birds of the Western Palearctic*, Oxford University Press, Oxford.

Cranswick, P.A., Hall, C. and Smith, L. (2004) *All Wales Common Scoter Survey: report on 2002/03 work programme*, WWT Wetlands Advisory Service report to Countryside Council for Wales, CCW Contract Report Number: 615. Available at <https://monitoring.wwt.org.uk/wp-content/uploads/2013/08/WAS-Cranswicketal-2004-AWCSS0203.pdf> [accessed 18/03/2021].

Del Hoyo, J., Elliott, A. and Sargatal, J. (Eds.) (1992 – 2011) *Handbook of the Birds of the World*, Lynx Editions, Madrid.

Dierschke, V., Furness, R.W., Gray, C.E., Petersen, I.K., Schmutz, J., Zydels, R. and Daunt, F. (2017) *Possible behavioural, energetic and demographic effects of displacement of red-throated divers*, JNCC Report No 605, JNCC, Peterborough.

Drewitt, A.L. and Langston, R.H.W. (2006) *Assessing the impacts of wind farms on birds*, Ibis, 148 (Suppl. 1), 4-7.

Eaton, M., Holling, M. and the Rare Breeding Birds Panel. (2020) *Rare breeding birds in the United Kingdom in 2018*, British Birds, 113, 737–791.

Efron, B. & Tibshirani, R.J. (1993) *An introduction to the bootstrap*. Chapman & Hall, London.

Frost, T.M., Calbrade, N.A., Birtles, G.A., Mellan, H.J., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E., and Austin, G.E. (2020). *Waterbirds in the UK 2018/19: The Wetland Bird Survey*, BTO, RSPB and JNCC, in association with WWT. British Trust for Ornithology, Thetford.

Furness, R.W. and Wade, H. (2012). *Vulnerability of Scottish seabirds to offshore wind turbines*, The Scottish Government, Edinburgh.
<http://www.scotland.gov.uk/Resource/0040/00401641.pdf>

Furness, R.W., Wade, H.M. and Masden, E.A. (2013) Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management*, 119, 56-66.

Furness, R.W. (2015) *Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS)*, Natural England Commissioned Report Number 164.

Garthe, S and Hüppop, O. (2004) *Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index*, *Journal of Applied Ecology*, 41, 724-734.

Horswill, C., O'Brien, S.H. and Robinson, R.A. (2017) *Density dependence and marine bird populations: are wind farm assessments precautionary?*, *Journal of Applied Ecology* 54, 1406-1414.

Innogy (2020). *Awel y Mor Environmental Impact Assessment: Scoping Report*

Jarrett, D., Cook, A.S.C.P., Woodward, I., Ross, K., Horswill, C., Dadam, D. and Humphreys, E.M. (2018) *Short-term behavioural responses of wintering waterbirds to marine activity*, *Scottish Marine and Freshwater Science* 9 (7).

JNCC, 2020. *Seabird Monitoring Programme Online Database*. Available at: <http://jncc.defra.gov.uk/smp/> [Accessed 18 March 2021].

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, E.H.K. (2014a) *Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines*, *Journal of Applied Ecology*, 51, 31-41.

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, N.H.K. (2014b) *corrigendum*, *Journal of Applied Ecology*, 51, doi: 10.1111/1365-2664.12260.

Kaiser, M.J., Galanidi, M. Showler, D., Elliot, A.J., Caldow, R.W., Rees, E.I.S., Stillman, R.A. & Sutherland, W. (2006) Distribution and behaviour of Common Scoter *Melanitta nigra* relative to prey resources and environmental parameters. *Ibis*, 148, 110–128.

Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L.J. and Reid, J.B. (2010) *An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs*, JNCC Report, No. 431. JNCC, Peterborough.

Langston, R.H.W. (2010) *Offshore wind farms and birds: Round 3 zones, extensions to Round 1 and Round 2 sites and Scottish Territorial Waters*, RSPB Research Report No. 39. RSPB, Sandy.

Lawson, J., Kober, K., Win, I., Allcock, Z., Black, J. Reid, J.B., Way, L. & O'Brien, S.H. 2016. An assessment of the numbers and distribution of wintering waterbirds and seabirds in Liverpool Bay/Bae Lerpwl area of search. JNCC Report No 576. JNCC, Peterborough.

Leopold, M.F. and Verdaat, H.J.P. (2018) *Pilot field study: observations from a fixed platform on occurrence and behaviour of common guillemots and other seabirds in offshore wind farm Luchterduinen (WOZEP Birds-2)*, Wageningen Marine Research Report C068/18.

Maclean, I., Rehfish, M., Skov, H. & Thaxter, C. (2013). Evaluating the statistical power of detecting changes in the abundance of seabirds at sea. *Ibis*. 155. 113-126.

Mendel, B., Schwemmer, P., Peschko, V., Müller, S., Schwemmer, H., Mercker, M. and Garthe, S. (2019) *Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of loons (Gavia spp.)*, *Journal of Environmental Management* 231, 429-438.

Mitchell, P.I., Newton, S.F., Ratcliffe, N. & Dunn, T.E. (2004) *Seabird Populations of Britain and Ireland*, JNCC, Peterborough, ISBN 0 7136 6901 2.

Musgrove, A.J., Aebischer, N.J., Eaton, M.A., Hearn, R.D., Newson, S.E., Noble, D.G., Parsons, M., Risely, K. and Stroud, D.A. (2013) *Population estimates on birds in Great Britain and the United Kingdom*, *British Birds*, 106, 64–100.

Npower Renewables Limited (2005) *Gwynt Y Môr Offshore Wind Farm Environmental Statement Volume 1*.

Olsen, K. M. & Larsson, H. (2003). *Gulls of Europe, Asia and North America*. Christopher Helm, London.

R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

Robinson, R.A. (2005) *Bird Facts: profiles of birds occurring in Britain and Ireland*, BTO Research Report 407, BTO, Thetford.

Skov, H. & Prins, E. (2001). Impact of estuarine fronts on the dispersal of piscivorous birds in the German Bight. *Marine Progress Series* 214, 279-287.

SNCB (2017) *Joint SNCB Interim Displacement Advice Note. Advice on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm (OWF) developments*.

Snow, D.W. & Perrins, C.M. (1998) *The Birds of the Western Palearctic: Volume 1, Non-Passerines*. Oxford University Press.

Speakman, J., Gray, H. and Furness, L. (2009) *University of Aberdeen report on effects of offshore wind farms on the energy demands of seabirds*, Report to the Department of Energy and Climate Change.

Spencer SM. (2012) *Diving behavior and identification of sex of breeding Atlantic puffins (Fratrula arctica), and nest-site characteristics of alcids on Petit Manan Island, Maine*, M.Sc. thesis, University of Massachusetts, Amherst. 75 p.

Stienen, E.W., Waeyenberge, V., Kuijken, E. and Seys, J. (2007) *Trapped within the corridor of the southern North Sea: the potential impact of offshore wind farms on seabirds*. In *Birds and Wind farms*. de Lucas, M., Janss, G.F.E. and Ferrer, M. (Eds). Quercus, Madrid.

Stone, C.J. Webb, A., Barton, C., Ratcliffe, N., Reed, T.C. Tasker, M.L. Camphuysen, C.J. and Pienkowski, M.W. (1995) *An atlas of seabird distribution in north-west European waters*. JNCC, Peterborough.

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

Thaxter CB, Wanless S, Daunt F, Harris MP, Benvenuti S, Watanuki Y, Grémillet D, Hamer KC (2010) *Influence of wing loading on the trade-off between pursuit-diving and flight in common guillemots and razorbills*. *J Exp Biol* 213:1018–1025

The Planning Inspectorate (PINS) (2020). *Scoping Opinion: Proposed Awel y Môr Wind Farm*. Available at: <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010112/EN010112-000073-AYMO%20-%20Scoping%20Opinion.pdf> [accessed 18 March 2021].

Waggitt, J. (2019) Data from: Distribution maps of cetacean and seabird populations in the North-East Atlantic, Dryad, Dataset, <https://doi.org/10.5061/dryad.mw6m905sz>

Wernham, C.V., Toms, M.P., Marchant, J.H., Clark, J.A., Siriwardena, G.M. and Baillie, S.R. (eds). (2002) *The Migration Atlas: Movements of the birds of Britain and Ireland*, T. and A.D. Poyser, London.

Woodward, I., Thaxter, C.B., Owen, E. and Cook, A.S.C.P. (2019). *Desk-based revision of seabird foraging ranges used for HRA screening*, Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate. BTO Research Report No. 724. The British Trust for Ornithology, Thetford.

Wright, L.J., Ross-Smith, V.H., Massimino, D., Dadam, D., Cook, A.S.C.P. and Burton, N.H.K. (2012) *Assessing the risk of offshore windfarm development to migratory birds designated as features of UK Special Protection Areas (and other Annex I species)*, Strategic Ornithological Support Services. Project SOSS-05. BTO Research Report No. 592.

Wildfowl & Wetlands Trust (2009) *Aerial Surveys of Waterbirds in the UK: 2007/08 Final Report*, WWT Consulting Report to Department of Energy and Climate Change. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/196490/OES_Aerial_Surveys_2007_08.pdf [accessed 18/03/2021].

Wildfowl & Wetlands Trust (2003) *All Wales Common Scoter Survey: report on 2001/02 work programme*, CCW Contract Science Report Number: 568.

Wildfowl & Wetlands Trust (2013). *Seabird sensitivity mapping for English territorial waters: Spatial modelling, wind farm sensitivity scores and GIS mapping tool*. Wildfowl & Wetlands Trust, Slimbridge.

Appendix 1 Scientific Names and Taxonomy

Table A 1 Common name and scientific name of species mentioned in this report, listed in taxonomic order as per BOU (2019).

Common name	Scientific name
Common scoter	<i>Melanitta nigra</i>
Red-breasted merganser	<i>Mergus serrator</i>
Great crested grebe	<i>Podiceps cristatus</i>
Slavonian grebe	<i>Podiceps auritus</i>
Black-necked grebe	<i>Podiceps nigricollis</i>
Wader species	Charadrii sp.
Kittiwake	<i>Rissa tridactyla</i>
Little gull	<i>Hydrocoloeus minutus</i>
Mediterranean gull	<i>Ichthyaetus melanocephalus</i>
Common gull	<i>Larus canus</i>
Great black-backed gull	<i>Larus marinus</i>
Herring gull	<i>Larus argentus</i>
Lesser black-backed gull	<i>Larus fuscus</i>
Sandwich tern	<i>Thalasseus sandvicensis</i>
Common tern	<i>Sterna hirundo</i>
Arctic tern	<i>Sterna paradisaea</i>
Great skua	<i>Stercorarius skua</i>
Pomarine skua	<i>Stercorarius pomarinus</i>
Arctic skua	<i>Stercorarius parasiticus</i>
Long-tailed skua	<i>Stercorarius longicaudus</i>
Guillemot	<i>Uria aalge</i>
Razorbill	<i>Alca torda</i>
Black guillemot	<i>Cepphus grille</i>
Puffin	<i>Fratercula arctica</i>
Red-throated diver	<i>Gavia stellate</i>
Great northern diver	<i>Gavia immer</i>
Storm petrel	<i>Hydrobates pelagicus</i>
Leach's petrel	<i>Oceanadroma leucorhoa</i>
Fulmar	<i>Fulmarus glacialis</i>
Manx shearwater	<i>Puffinus puffinus</i>
Gannet	<i>Morus bassanus</i>
Cormorant	<i>Phalacrocorax carbo</i>
Shag	<i>Phalacrocorax aristotelis</i>

Appendix 2 WWT Waterbird Survey Results

Table A 2 Raw counts from WWT Waterbird Surveys of block NW5. Full details of the surveys including dates, locations and methodology are given in WWT (2009).

Species	Period		
	Mid-winter	Breeding (incubation)	Post fledging / moult
Eider	9	-	-
Common scoter	6,608	-	-
Velvet scoter	4	-	-
Red-breasted merganser	5	-	-
Red-throated diver	10	-	-
duck species	1	-	-
Great northern diver	1	-	-
Diver species	14	-	-
Great crested grebe	1	-	-
Fulmar	2	-	-
Gannet	2	-	-
Cormorant	7	-	-
Shag	8	-	-
Cormorant/ shag	21	-	-
Oystercatcher	2	-	-
Kittiwake	53	-	-
Black-headed gull	5	-	-
Common gull	24	-	-
Lesser black-backed gull	2	-	-
Herring gull	42	-	-
Great black-backed gull	6	-	-
Grey gull species	47	-	-
Black-backed gull species	13	-	-
Large gull species	31	-	-
Small gull species	32	-	-
Auk species	560	-	-

Table Note: *Only one survey was undertaken on the NW5 sector with no surveys on NW6b.

Appendix 3 Abundance and behaviour information for all birds (without Apportionment and Correction for Availability Bias)

Table A 3 Common scoter raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate of (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Jan-20	7	61	7	182	0.38	0.24	0	0	0	0	0.00	0.00	7	61	7	182	0.38	0.24
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	2	17	2	52	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	52	0.71	0.07
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

c) AyM array area + 2 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	2	21	2	62	0.71	0.12	0	0	0	0	0.00	0.00	2	21	2	62	0.71	0.12
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

d) AyM 0-4 km buffer only

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	1	9	1	27	1.00	0.05	0	0	0	0	0.00	0.00	1	9	1	27	1.00	0.05
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	7	62	7	187	0.38	0.34	0	0	0	0	0.00	0.00	7	62	7	187	0.38	0.34
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	2	18	2	53	0.71	0.10	0	0	0	0	0.00	0.00	2	18	2	53	0.71	0.10
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

e) AyM 4-8 km buffer only

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	239	2791	350	7613	0.06	16.05	62	724	62	2172	0.13	4.16	177	2067	350	4939	0.08	11.88
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	5	44	5	141	0.45	0.25	0	0	0	0	0.00	0.00	5	44	5	115	0.45	0.25
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	9	79	9	238	0.33	0.45	9	79	9	238	0.33	0.45	0	0	0	0	0.00	0.00
Jan-20	5	44	5	133	0.45	0.25	0	0	0	0	0.00	0.00	5	44	5	133	0.45	0.25
Feb-20	2	18	2	45	0.71	0.10	0	0	0	0	0.00	0.00	2	18	2	45	0.71	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	7	61	7	245	0.38	0.35	0	0	0	0	0.00	0.00	7	61	7	184	0.38	0.35
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	4	35	4	105	0.50	0.20	0	0	0	0	0.00	0.00	4	35	4	105	0.50	0.20

Table A 4 Kittiwake raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	22	228	104	383	0.21	2.92	8	83	31	155	0.35	1.06	14	145	41	280	0.27	1.86
Apr-19	8	76	10	162	0.35	0.97	2	19	2	48	0.71	0.24	6	57	10	124	0.41	0.73
May-19	7	66	7	189	0.38	0.85	6	57	6	161	0.41	0.73	1	9	1	28	1.00	0.12
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	9	76	17	160	0.33	0.97	7	59	17	118	0.38	0.76	2	17	2	51	0.71	0.22
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	4	33	8	66	0.50	0.42	3	25	3	49	0.58	0.32	1	8	1	25	1.00	0.10
Oct-19	10	81	16	162	0.32	1.04	6	49	8	97	0.41	0.63	4	32	4	130	0.50	0.41
Nov-19	16	131	41	253	0.25	1.68	15	123	33	237	0.26	1.58	1	8	1	25	1.00	0.10
Dec-19	3	24	3	57	0.58	0.31	2	16	2	41	0.71	0.21	1	8	1	24	1.00	0.10
Jan-20	7	57	16	106	0.38	0.73	6	49	16	82	0.41	0.63	1	8	1	24	1.00	0.10
Feb-20	15	124	58	214	0.26	1.59	12	99	41	165	0.29	1.27	3	25	3	74	0.58	0.32
Mar-20	14	112	56	168	0.27	1.44	11	88	40	144	0.30	1.13	3	24	3	64	0.58	0.31
Apr-20	43	349	114	657	0.15	4.47	22	178	49	365	0.21	2.28	21	170	49	332	0.22	2.18
May-20	12	97	24	187	0.29	1.24	8	65	8	138	0.35	0.83	4	32	4	97	0.50	0.41
Jun-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Jul-20	4	32	4	87	0.50	0.41	3	24	3	63	0.58	0.31	1	8	1	24	1.00	0.10
Aug-20	4	32	4	73	0.50	0.41	2	16	2	41	0.71	0.21	2	16	2	65	0.71	0.21

Sep-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	4	33	8	65	0.50	0.42	4	33	8	65	0.50	0.42	0	0	0	0	0.00	0.00
Dec-20	4	32	8	64	0.50	0.41	4	32	8	64	0.50	0.41	0	0	0	0	0.00	0.00
Jan-21	9	73	24	130	0.33	0.94	8	65	16	122	0.35	0.83	1	8	1	24	1.00	0.10
Feb-21	5	41	8	73	0.45	0.53	3	24	3	49	0.58	0.31	2	16	2	41	0.71	0.21

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	46	502	328	710	0.15	1.94	21	229	131	338	0.22	0.88	25	273	142	437	0.20	1.05
Apr-19	51	516	202	991	0.14	1.99	20	202	91	324	0.22	0.78	31	314	81	647	0.18	1.21
May-19	16	161	50	323	0.25	0.62	15	151	50	283	0.26	0.58	1	10	1	30	1.00	0.04
Jun-19	3	30	3	71	0.58	0.12	2	20	2	51	0.71	0.08	1	10	1	30	1.00	0.04
Jul-19	22	191	87	321	0.21	0.74	17	147	69	234	0.24	0.57	5	43	9	95	0.45	0.17
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	7	62	26	115	0.38	0.24	4	35	9	71	0.50	0.14	3	26	3	62	0.58	0.10
Oct-19	14	121	43	225	0.27	0.47	9	78	26	138	0.33	0.30	5	43	5	130	0.45	0.17
Nov-19	27	236	113	384	0.19	0.91	25	218	105	358	0.20	0.84	2	17	2	44	0.71	0.07
Dec-19	8	70	26	113	0.35	0.27	7	61	26	104	0.38	0.24	1	9	1	26	1.00	0.03
Jan-20	27	234	130	373	0.19	0.90	14	121	69	182	0.27	0.47	13	113	35	226	0.28	0.44
Feb-20	27	238	124	388	0.19	0.92	15	132	62	221	0.26	0.51	12	106	12	238	0.29	0.41
Mar-20	25	213	128	307	0.20	0.82	22	188	111	273	0.21	0.73	3	26	3	68	0.58	0.10
Apr-20	105	905	569	1284	0.10	3.49	63	543	336	767	0.13	2.10	42	362	198	551	0.15	1.40

May-20	29	249	94	455	0.19	0.96	23	198	52	429	0.21	0.76	6	52	6	120	0.41	0.20
Jun-20	7	60	9	120	0.38	0.23	7	60	17	111	0.38	0.23	0	0	0	0	0.00	0.00
Jul-20	36	306	76	671	0.17	1.18	31	263	59	603	0.18	1.02	5	42	5	93	0.45	0.16
Aug-20	7	60	9	138	0.38	0.23	5	43	5	112	0.45	0.17	2	17	2	52	0.71	0.07
Sep-20	7	59	17	110	0.38	0.23	3	25	3	59	0.58	0.10	4	34	4	76	0.50	0.13
Oct-20	10	85	17	178	0.32	0.33	5	42	5	110	0.45	0.16	5	42	5	119	0.45	0.16
Nov-20	17	147	78	233	0.24	0.57	17	147	69	233	0.24	0.57	0	0	0	0	0.00	0.00
Dec-20	16	137	60	231	0.25	0.53	11	94	34	171	0.30	0.36	5	43	9	94	0.45	0.17
Jan-21	30	259	129	423	0.18	1.00	23	199	104	311	0.21	0.77	7	60	9	147	0.38	0.23
Feb-21	20	173	95	268	0.22	0.67	18	155	78	242	0.24	0.60	2	17	2	43	0.71	0.07

Table A 5 Common gull raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	5	41	8	74	0.45	0.53	5	41	8	74	0.45	0.53	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	2	16	2	48	0.71	0.21	2	16	2	48	0.71	0.21	0	0	0	0	0.00	0.00
Jan-21	4	33	4	89	0.50	0.42	4	33	4	89	0.50	0.42	0	0	0	0	0.00	0.00
Feb-21	3	24	3	65	0.58	0.31	3	24	3	65	0.58	0.31	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19																		
Apr-19																		
May-19																		
Jun-19																		
Jul-19																		
Aug-19																		
Sep-19																		
Oct-19																		
Nov-19																		
Dec-19																		
Jan-20																		
Feb-20																		
Mar-20																		
Apr-20																		

May-20
Jun-20
Jul-20
Aug-20



Table A 6 Great black-backed gull raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	1	10	1	31	1.00	0.13	1	10	1	31	1.00	0.13	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	1	10	1	29	1.00	0.13	1	10	1	29	1.00	0.13	0	0	0	0	0.00	0.00
Jul-19	2	17	2	51	0.71	0.22	2	17	2	51	0.71	0.22	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	8	1	25	1.00	0.10	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Feb-21	3	24	3	65	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	65	0.58	0.31

b) AyM array area + 4 km Buffer

All Behaviours							Flying					Sitting						
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	2	22	2	55	0.71	0.08	1	11	1	44	1.00	0.04	1	11	1	33	1.00	0.04
Apr-19	3	30	3	71	0.58	0.12	3	30	3	81	0.58	0.12	0	0	0	0	0.00	0.00
May-19	1	10	1	30	1.00	0.04	1	10	1	30	1.00	0.04	0	0	0	0	0.00	0.00
Jun-19	1	10	1	30	1.00	0.04	1	10	1	30	1.00	0.04	0	0	0	0	0.00	0.00
Jul-19	5	43	9	95	0.45	0.17	5	43	9	95	0.45	0.17	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	2	17	2	43	0.71	0.07	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03
Feb-20	4	35	9	71	0.50	0.14	2	18	2	44	0.71	0.07	2	18	2	44	0.71	0.07
Mar-20	3	26	3	60	0.58	0.10	2	17	2	43	0.71	0.07	1	9	1	26	1.00	0.03
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	1	8	1	25	1.00	0.03	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00
Aug-20	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	5	43	9	86	0.45	0.17	3	26	3	60	0.58	0.10	2	17	2	43	0.71	0.07
Feb-21	5	43	9	95	0.45	0.17	1	9	1	26	1.00	0.03	4	35	4	78	0.50	0.14

Table A 7 Herring gull raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	7	73	7	218	0.38	0.94	0	0	0	0	0.00	0.00	7	73	7	207	0.38	0.94
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	5	47	5	132	0.45	0.60	0	0	0	0	0.00	0.00	5	47	5	132	0.45	0.60
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	2	16	2	41	0.71	0.21	1	8	1	25	1.00	0.10	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	5	41	5	89	0.45	0.53	2	16	2	49	0.71	0.21	3	24	3	65	0.58	0.31
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	3	24	3	64	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	64	0.58	0.31
Jan-21	3	24	3	73	0.58	0.31	2	16	2	49	0.71	0.21	1	8	1	33	1.00	0.10
Feb-21	2	16	2	41	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	41	0.71	0.21

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	18	197	66	382	0.24	0.76	6	66	11	131	0.41	0.25	12	131	22	328	0.29	0.51
Apr-19	44	445	44	991	0.15	1.72	15	152	30	314	0.26	0.59	29	293	29	779	0.19	1.13
May-19	10	101	20	212	0.32	0.39	3	30	3	81	0.58	0.12	7	71	10	172	0.38	0.27
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	9	79	35	141	0.33	0.30	4	35	9	71	0.50	0.14	5	44	9	88	0.45	0.17
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	6	52	9	112	0.41	0.20	2	17	2	52	0.71	0.07	4	34	4	78	0.50	0.13

May-20	2	17	2	52	0.71	0.07	2	17	2	52	0.71	0.07	0	0	0	0	0.00	0.00
Jun-20	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	3	26	3	60	0.58	0.10	3	26	3	60	0.58	0.10	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	6	51	6	120	0.41	0.20	0	0	0	0	0.00	0.00	6	51	6	120	0.41	0.20
Jan-21	3	26	3	78	0.58	0.10	2	17	2	52	0.71	0.07	1	9	1	26	1.00	0.03
Feb-21	11	95	17	242	0.30	0.37	0	0	0	0	0.00	0.00	11	95	11	242	0.30	0.37

Table A 8 Lesser black-backed gull raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	2	17	2	52	0.71	0.07	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Jul-20	2	17	2	42	0.71	0.07	2	17	2	42	0.71	0.07	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 9 Sandwich tern raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction)

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Aug-19	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	1	8	1	25	1.00	0.03	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 10 'Commic' tern raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Sep-19	1	8	1	25	1.00	0.10	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	2	20	2	61	0.71	0.08	2	20	2	61	0.71	0.08	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	4	34	4	103	0.50	0.13	4	34	4	94	0.50	0.13	0	0	0	0	0.00	0.00
Sep-19	3	26	3	71	0.58	0.10	3	26	3	79	0.58	0.10	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 11 Guillemot raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction)

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	25	259	145	404	0.20	3.32	0	0	0	0	0.00	0.00	25	259	135	394	0.20	3.32
Apr-19	10	95	38	171	0.32	1.22	0	0	0	0	0.00	0.00	10	95	29	171	0.32	1.22
May-19	11	104	38	189	0.30	1.33	0	0	0	0	0.00	0.00	11	104	38	180	0.30	1.33
Jun-19	2	19	2	48	0.71	0.24	0	0	0	0	0.00	0.00	2	19	2	48	0.71	0.24
Jul-19	13	109	42	185	0.28	1.40	1	8	1	25	1.00	0.10	12	101	42	177	0.29	1.29
Aug-19	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	27	223	91	404	0.19	2.86	7	58	7	140	0.38	0.74	20	165	58	305	0.22	2.12
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	23	186	81	300	0.21	2.38	1	8	1	24	1.00	0.10	22	178	81	292	0.21	2.28
May-20	47	382	195	650	0.15	4.90	0	0	0	0	0.00	0.00	47	382	195	625	0.15	4.90
Jun-20	12	97	16	225	0.29	1.24	8	64	8	177	0.35	0.82	4	32	4	72	0.50	0.41
Jul-20	6	47	8	95	0.41	0.60	0	0	0	0	0.00	0.00	6	47	8	95	0.41	0.60
Aug-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	93	1015	753	1310	0.10	3.92	4	44	4	98	0.50	0.17	89	972	699	1256	0.11	3.75
Apr-19	208	2104	708	4027	0.07	8.12	0	0	0	0	0.00	0.00	208	2104	698	3946	0.07	8.12
May-19	27	272	151	424	0.19	1.05	1	10	1	30	1.00	0.04	26	262	151	404	0.20	1.01
Jun-19	14	142	71	223	0.27	0.55	4	41	4	91	0.50	0.16	10	101	41	172	0.32	0.39
Jul-19	35	304	191	416	0.17	1.17	1	9	1	26	1.00	0.03	34	295	173	416	0.17	1.14
Aug-19	4	34	4	86	0.50	0.13	0	0	0	0	0.00	0.00	4	34	4	77	0.50	0.13
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	71	626	318	953	0.12	2.42	18	159	44	300	0.24	0.61	53	468	194	768	0.14	1.81
Mar-20	3	26	3	68	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	68	0.58	0.10
Apr-20	51	439	302	595	0.14	1.69	4	34	9	69	0.50	0.13	47	405	267	569	0.15	1.56

May-20	83	713	412	1065	0.11	2.75	2	17	2	43	0.71	0.07	81	696	404	1005	0.11	2.69
Jun-20	37	317	180	497	0.16	1.22	13	111	17	248	0.28	0.43	24	205	111	325	0.20	0.79
Jul-20	30	255	136	399	0.18	0.98	1	8	1	25	1.00	0.03	29	246	127	365	0.19	0.95
Aug-20	3	26	3	60	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	60	0.58	0.10
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

c) AyM array area + 2 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	57	731	488	1026	0.13	4.65	0	0	0	0	0.00	0.00	57	731	475	1014	0.13	4.65
Apr-19	16	203	89	329	0.25	1.29	0	0	0	0	0.00	0.00	16	203	89	342	0.25	1.29
May-19	14	177	76	279	0.27	1.13	0	0	0	0	0.00	0.00	14	177	76	304	0.27	1.13
Jun-19	7	89	38	152	0.38	0.57	0	0	0	0	0.00	0.00	7	89	25	152	0.38	0.57
Jul-19	18	194	86	312	0.24	1.23	1	11	1	32	1.00	0.07	17	183	86	312	0.24	1.16
Aug-19	2	21	2	53	0.71	0.13	0	0	0	0	0.00	0.00	2	21	2	53	0.71	0.13
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Feb-20	41	447	218	742	0.16	2.84	7	76	7	196	0.38	0.48	34	371	164	665	0.17	2.36
Mar-20	1	10	1	31	1.00	0.06	0	0	0	0	0.00	0.00	1	10	1	31	1.00	0.06
Apr-20	31	329	170	520	0.18	2.09	2	21	2	53	0.71	0.13	29	308	159	478	0.19	1.96
May-20	66	703	373	1087	0.12	4.47	1	11	1	32	1.00	0.07	65	693	362	1098	0.12	4.41
Jun-20	16	169	53	348	0.25	1.07	10	106	10	274	0.32	0.67	6	63	21	127	0.41	0.40
Jul-20	13	134	52	248	0.28	0.85	0	0	0	0	0.00	0.00	13	134	52	238	0.28	0.85
Aug-20	1	11	1	32	1.00	0.07	0	0	0	0	0.00	0.00	1	11	1	32	1.00	0.07
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 12 Razorbill raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction)

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	13	135	52	228	0.28	1.73	0	0	0	0	0.00	0.00	13	135	62	228	0.28	1.73
Apr-19	2	19	2	48	0.71	0.24	0	0	0	0	0.00	0.00	2	19	2	48	0.71	0.24
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	4	33	4	91	0.50	0.42	1	8	1	25	1.00	0.10	3	25	3	74	0.58	0.32
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	3	24	3	65	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	65	0.58	0.31
May-20	4	32	4	73	0.50	0.41	0	0	0	0	0.00	0.00	4	32	4	73	0.50	0.41
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	3	24	3	71	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	71	0.58	0.31
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	33	360	218	513	0.17	1.39	0	0	0	0	0.00	0.00	33	360	218	535	0.17	1.39
Apr-19	43	435	101	931	0.15	1.68	0	0	0	0	0.00	0.00	43	435	111	911	0.15	1.68
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	6	53	9	115	0.41	0.20	2	18	2	44	0.71	0.07	4	35	4	97	0.50	0.14
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	7	60	7	129	0.38	0.23	0	0	0	0	0.00	0.00	7	60	9	138	0.38	0.23

May-20	5	43	5	94	0.45	0.17	0	0	0	0	0.00	0.00	5	43	9	86	0.45	0.17
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	8	68	17	144	0.35	0.26	0	0	0	0	0.00	0.00	8	68	17	136	0.35	0.26
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.03
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

c) AyM array area + 2 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	18	231	103	372	0.24	1.47	0	0	0	0	0.00	0.00	18	231	103	372	0.24	1.47
Apr-19	2	25	2	63	0.71	0.16	0	0	0	0	0.00	0.00	2	25	2	63	0.71	0.16
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Feb-20	4	44	4	120	0.50	0.28	1	11	1	33	1.00	0.07	3	33	3	98	0.58	0.21
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	7	74	11	159	0.38	0.47	0	0	0	0	0.00	0.00	7	74	11	149	0.38	0.47
May-20	4	43	4	96	0.50	0.27	0	0	0	0	0.00	0.00	4	43	4	96	0.50	0.27
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	5	52	5	124	0.45	0.33	0	0	0	0	0.00	0.00	5	52	5	124	0.45	0.33
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	1	10	1	31	1.00	0.06	0	0	0	0	0.00	0.00	1	10	1	31	1.00	0.06
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 13 Guillemot/razorbill raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	41	425	280	591	0.16	5.45	0	0	0	0	0.00	0.00	41	425	269	601	0.16	5.45
Apr-19	10	95	29	181	0.32	1.22	0	0	0	0	0.00	0.00	10	95	29	181	0.32	1.22
May-19	12	113	12	312	0.29	1.45	0	0	0	0	0.00	0.00	12	113	12	350	0.29	1.45
Jun-19	4	38	4	86	0.50	0.49	0	0	0	0	0.00	0.00	4	38	4	95	0.50	0.49
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	6	49	8	90	0.41	0.63	0	0	0	0	0.00	0.00	6	49	16	99	0.41	0.63
Oct-19	9	73	24	130	0.33	0.94	1	8	1	24	1.00	0.10	8	65	16	122	0.35	0.83
Nov-19	28	229	106	360	0.19	2.94	0	0	0	0	0.00	0.00	28	229	114	368	0.19	2.94
Dec-19	22	179	90	293	0.21	2.29	1	8	1	24	1.00	0.10	21	171	81	277	0.22	2.19
Jan-20	22	180	65	367	0.21	2.31	0	0	0	0	0.00	0.00	22	180	65	351	0.21	2.31
Feb-20	65	536	355	759	0.12	6.87	0	0	0	0	0.00	0.00	65	536	346	767	0.12	6.87
Mar-20	79	632	184	1327	0.11	8.10	1	8	1	24	1.00	0.10	78	624	176	1279	0.11	8.00
Apr-20	38	308	73	730	0.16	3.95	0	0	0	0	0.00	0.00	38	308	65	697	0.16	3.95
May-20	9	73	9	146	0.33	0.94	0	0	0	0	0.00	0.00	9	73	9	146	0.33	0.94
Jun-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Jul-20	14	110	55	165	0.27	1.41	0	0	0	0	0.00	0.00	14	110	55	165	0.27	1.41
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	7	56	16	104	0.38	0.72	0	0	0	0	0.00	0.00	7	56	24	104	0.38	0.72
Oct-20	3	24	3	56	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	56	0.58	0.31
Nov-20	9	73	24	138	0.33	0.94	0	0	0	0	0.00	0.00	9	73	24	138	0.33	0.94
Dec-20	47	377	257	522	0.15	4.83	3	24	3	64	0.58	0.31	44	353	233	490	0.15	4.53
Jan-21	30	244	130	374	0.18	3.13	1	8	1	24	1.00	0.10	29	236	130	366	0.19	3.03
Feb-21	134	1090	740	1521	0.09	13.97	0	0	0	0	0.00	0.00	134	1090	724	1529	0.09	13.97

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	127	1387	1048	1703	0.09	5.35	1	11	1	33	1.00	0.04	126	1376	1037	1736	0.09	5.31
Apr-19	186	1882	334	4138	0.07	7.27	1	10	1	30	1.00	0.04	185	1872	384	4178	0.07	7.23
May-19	16	161	30	383	0.25	0.62	0	0	0	0	0.00	0.00	16	161	30	363	0.25	0.62
Jun-19	6	61	10	122	0.41	0.24	0	0	0	0	0.00	0.00	6	61	10	111	0.41	0.24
Jul-19	14	121	52	217	0.27	0.47	1	9	1	26	1.00	0.03	13	113	43	191	0.28	0.44
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	40	353	194	538	0.16	1.36	0	0	0	0	0.00	0.00	40	353	203	521	0.16	1.36
Oct-19	76	657	372	1002	0.11	2.54	1	9	1	26	1.00	0.03	75	648	380	968	0.12	2.50
Nov-19	65	567	349	829	0.12	2.19	0	0	0	0	0.00	0.00	65	567	358	811	0.12	2.19
Dec-19	84	731	522	966	0.11	2.82	1	9	1	26	1.00	0.03	83	722	505	975	0.11	2.79
Jan-20	105	911	590	1258	0.10	3.52	2	17	2	43	0.71	0.07	103	893	572	1232	0.10	3.45
Feb-20	233	2056	1562	2603	0.07	7.94	1	9	1	26	1.00	0.03	232	2047	1535	2603	0.07	7.90
Mar-20	237	2023	1374	2816	0.06	7.81	1	9	1	26	1.00	0.03	236	2014	1323	2876	0.07	7.77
Apr-20	90	775	439	1275	0.11	2.99	0	0	0	0	0.00	0.00	90	775	431	1275	0.11	2.99

May-20	11	94	17	189	0.30	0.36	0	0	0	0	0.00	0.00	11	94	17	198	0.30	0.36
Jun-20	12	103	34	180	0.29	0.40	1	9	1	26	1.00	0.03	11	94	34	171	0.30	0.36
Jul-20	60	509	289	781	0.13	1.96	0	0	0	0	0.00	0.00	60	509	289	772	0.13	1.96
Aug-20	2	17	2	52	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	69	0.71	0.07
Sep-20	24	203	119	288	0.20	0.78	0	0	0	0	0.00	0.00	24	203	127	296	0.20	0.78
Oct-20	17	144	76	229	0.24	0.56	0	0	0	0	0.00	0.00	17	144	76	220	0.24	0.56
Nov-20	47	406	259	587	0.15	1.57	0	0	0	0	0.00	0.00	47	406	259	578	0.15	1.57
Dec-20	167	1432	1097	1835	0.08	5.53	4	34	4	77	0.50	0.13	163	1397	1046	1843	0.08	5.39
Jan-21	120	1036	716	1373	0.09	4.00	1	9	1	26	1.00	0.03	119	1027	708	1364	0.09	3.96
Feb-21	534	4609	3211	6327	0.04	17.79	7	60	9	147	0.38	0.23	527	4549	3159	6241	0.04	17.56

c) AyM array area + 2 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	61	783	513	1090	0.13	4.98	0	0	0	0	0.00	0.00	61	783	513	1078	0.13	4.98
Apr-19	18	228	101	392	0.24	1.45	0	0	0	0	0.00	0.00	18	228	89	380	0.24	1.45
May-19	14	177	25	507	0.27	1.13	0	0	0	0	0.00	0.00	14	177	25	431	0.27	1.13
Jun-19	4	51	4	114	0.50	0.32	0	0	0	0	0.00	0.00	4	51	4	114	0.50	0.32
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	10	108	43	194	0.32	0.69	0	0	0	0	0.00	0.00	10	108	43	184	0.32	0.69
Oct-19	17	181	85	309	0.24	1.15	1	11	1	32	1.00	0.07	16	171	75	288	0.25	1.09
Nov-19	32	344	172	548	0.18	2.19	0	0	0	0	0.00	0.00	32	344	172	548	0.18	2.19
Dec-19	35	374	203	555	0.17	2.38	1	11	1	32	1.00	0.07	34	363	203	544	0.17	2.31
Jan-20	31	332	150	579	0.18	2.11	0	0	0	0	0.00	0.00	31	332	161	590	0.18	2.11

Feb-20	106	1156	763	1581	0.10	7.35	1	11	1	33	1.00	0.07	105	1145	753	1560	0.10	7.28
Mar-20	101	1060	441	2110	0.10	6.74	1	10	1	31	1.00	0.06	100	1050	399	2120	0.10	6.68
Apr-20	52	552	212	1105	0.14	3.51	0	0	0	0	0.00	0.00	52	552	191	1168	0.14	3.51
May-20	11	117	21	245	0.30	0.74	0	0	0	0	0.00	0.00	11	117	21	245	0.30	0.74
Jun-20	4	42	4	95	0.50	0.27	1	11	1	32	1.00	0.07	3	32	3	74	0.58	0.20
Jul-20	27	279	134	475	0.19	1.77	0	0	0	0	0.00	0.00	27	279	145	444	0.19	1.77
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	10	104	42	177	0.32	0.66	0	0	0	0	0.00	0.00	10	104	42	177	0.32	0.66
Oct-20	5	52	10	104	0.45	0.33	0	0	0	0	0.00	0.00	5	52	10	104	0.45	0.33
Nov-20	14	149	64	245	0.27	0.95	0	0	0	0	0.00	0.00	14	149	64	256	0.27	0.95
Dec-20	66	694	473	947	0.12	4.41	3	32	3	84	0.58	0.20	63	663	431	894	0.13	4.22
Jan-21	41	437	245	671	0.16	2.78	1	11	1	43	1.00	0.07	40	426	234	639	0.16	2.71
Feb-21	303	3226	1736	5292	0.06	20.51	0	0	0	0	0.00	0.00	303	3226	1619	5377	0.06	20.51

Table A 14 Red-throated diver raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	1	10	1	29	1.00	0.13	0	0	0	0	0.00	0.00	1	10	1	29	1.00	0.13
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM 0-5 km Buffer only

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	4	46	4	105	N/A	0.21	0	0	0	0	0.00	0.00	4	46	4	117	N/A	0.21
Apr-19	3	32	3	85	N/A	0.15	0	0	0	0	N/A	0.00	3	32	3	85	N/A	0.15
May-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Jun-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Jul-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Aug-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Sep-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Oct-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Nov-19	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Dec-19	1	9	1	27	N/A	0.04	0	0	0	0	N/A	0.00	1	9	1	27	N/A	0.04
Jan-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Feb-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Mar-20	1	9	1	26	N/A	0.04	1	9	1	26	N/A	0.04	0	0	0	0	N/A	0.00
Apr-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00

May-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Jun-20	1	9	1	26	N/A	0.04	0	0	0	0	N/A	0.00	1	9	1	26	N/A	0.04
Jul-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Aug-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Sep-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Oct-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Nov-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Dec-20	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Jan-21	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00
Feb-21	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00	0	0	0	0	N/A	0.00

c) AyM 5-8 km Buffer only

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	5	54	5	139	NA	0.40	0	0	0	0	NA	0.00	5	54	5	139	NA	0.40
Apr-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
May-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Jun-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Jul-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Aug-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Sep-19	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Oct-19	8	66	8	168	NA	0.49	0	0	0	0	NA	0.00	8	66	8	168	NA	0.49
Nov-19	2	17	2	53	NA	0.13	1	10	1	31	NA	0.07	1	7	1	22	NA	0.05
Dec-19	1	9	1	27	NA	0.07	0	0	0	0	NA	0.00	1	9	1	27	NA	0.07

Jan-20	9	77	9	197	NA	0.57	0	0	0	0	NA	0.00	9	77	9	197	NA	0.57
Feb-20	5	42	5	118	NA	0.31	0	0	0	0	NA	0.00	5	42	5	118	NA	0.31
Mar-20	5	41	5	114	NA	0.30	0	0	0	0	NA	0.00	5	41	5	114	NA	0.30
Apr-20	3	22	3	52	NA	0.16	0	0	0	0	NA	0.00	3	22	3	59	NA	0.16
May-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Jun-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Jul-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Aug-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Sep-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Oct-20	1	7	1	22	NA	0.05	0	0	0	0	NA	0.00	1	7	1	22	NA	0.05
Nov-20	6	49	6	131	NA	0.36	0	0	0	0	NA	0.00	6	49	6	122	NA	0.36
Dec-20	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Jan-21	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00	0	0	0	0	NA	0.00
Feb-21	7	57	7	141	NA	0.42	0	0	0	0	NA	0.00	7	57	7	141	NA	0.42

Table A 15 Fulmar raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	1	10	1	29	1.00	0.13	1	10	1	29	1.00	0.13	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	7	56	8	104	0.38	0.72	2	16	2	40	0.71	0.21	5	40	5	96	0.45	0.51
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	2	16	2	47	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	47	0.71	0.21
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	2	16	2	40	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	40	0.71	0.21
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10

b) AyM array area + 4 km Buffer

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	1	10	1	30	1.00	0.04	1	10	1	30	1.00	0.04	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	2	18	2	44	0.71	0.07	2	18	2	44	0.71	0.07	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	13	111	34	205	0.28	0.43	3	26	3	60	0.58	0.10	10	85	17	171	0.32	0.33
Apr-20	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Jul-20	2	17	2	51	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	51	0.71	0.07
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	1	8	1	25	1.00	0.03	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	43	0.71	0.07
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	3	26	3	69	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	78	0.58	0.10

Table A 16 Manx shearwater raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	1	9	1	28	1.00	0.12	0	0	0	0	0.00	0.00	1	9	1	28	1.00	0.12
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	1	8	1	25	1.00	0.10	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00
Aug-19	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	13	106	13	317	0.28	1.36	4	32	4	97	0.50	0.41	9	73	9	292	0.33	0.94
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	4	32	4	71	0.50	0.41	3	24	3	63	0.58	0.31	1	8	1	24	1.00	0.10
Aug-20	36	292	36	876	0.17	3.74	11	89	11	268	0.30	1.14	25	203	25	608	0.20	2.60

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying					Sitting						
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	9	91	9	253	0.33	0.35	0	0	0	0	0.00	0.00	9	91	9	273	0.33	0.35
May-19	1	10	1	40	1.00	0.04	0	0	0	0	0.00	0.00	1	10	1	40	1.00	0.04
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	2	17	2	43	0.71	0.07	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00
Aug-19	14	120	14	300	0.27	0.46	5	43	5	111	0.45	0.17	9	77	9	231	0.33	0.30
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	32	275	32	678	0.18	1.06	23	198	23	524	0.21	0.76	9	77	9	232	0.33	0.30
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	5	42	8	85	0.45	0.16	4	34	4	76	0.50	0.13	1	8	1	25	1.00	0.03
Aug-20	80	691	80	1745	0.11	2.67	43	371	43	968	0.15	1.43	37	320	37	855	0.16	1.24
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 17 Gannet raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	2	19	2	48	0.71	0.24	2	19	2	48	0.71	0.24	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	2	19	2	48	0.71	0.24	1	10	1	29	1.00	0.13	1	10	1	29	1.00	0.13
Jul-19	37	312	194	446	0.16	4.00	15	126	59	202	0.26	1.62	22	185	93	303	0.21	2.37
Aug-19	3	24	3	56	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	56	0.58	0.31
Sep-19	6	49	6	148	0.41	0.63	6	49	6	140	0.41	0.63	0	0	0	0	0.00	0.00
Oct-19	17	138	57	235	0.24	1.77	11	89	32	154	0.30	1.14	6	49	8	97	0.41	0.63
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	3	24	3	65	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	65	0.58	0.31
May-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Jun-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Jul-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Aug-20	9	73	9	162	0.33	0.94	5	41	5	105	0.45	0.53	4	32	4	73	0.50	0.41
Sep-20	11	88	40	153	0.30	1.13	6	48	16	96	0.41	0.62	5	40	8	72	0.45	0.51

Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	1	8	1	24	1.00	0.10	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	3	33	3	87	0.58	0.13	2	22	2	55	0.71	0.08	1	11	1	33	1.00	0.04
Apr-19	131	1325	131	3349	0.09	5.11	3	30	3	71	0.58	0.12	128	1295	128	3227	0.09	5.00
May-19	3	30	3	81	0.58	0.12	0	0	0	0	0.00	0.00	3	30	3	81	0.58	0.12
Jun-19	8	81	20	142	0.35	0.31	2	20	2	51	0.71	0.08	6	61	10	122	0.41	0.24
Jul-19	80	694	486	911	0.11	2.68	26	226	130	330	0.20	0.87	54	468	304	659	0.14	1.81
Aug-19	11	94	34	171	0.30	0.36	3	26	3	60	0.58	0.10	8	69	17	137	0.35	0.27
Sep-19	17	150	71	256	0.24	0.58	12	106	35	221	0.29	0.41	5	44	9	88	0.45	0.17
Oct-19	24	207	95	337	0.20	0.80	12	104	35	190	0.29	0.40	12	104	35	207	0.29	0.40
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	9	78	26	138	0.33	0.30	2	17	2	52	0.71	0.07	7	60	17	121	0.38	0.23
May-20	14	120	17	292	0.27	0.46	6	52	9	103	0.41	0.20	8	69	8	198	0.35	0.27
Jun-20	2	17	2	43	0.71	0.07	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03

Jul-20	2	17	2	42	0.71	0.07	1	8	1	25	1.00	0.03	1	8	1	25	1.00	0.03
Aug-20	16	138	52	242	0.25	0.53	9	78	17	156	0.33	0.30	7	60	9	121	0.38	0.23
Sep-20	28	237	144	347	0.19	0.91	16	136	59	229	0.25	0.52	12	102	51	161	0.29	0.39
Oct-20	2	17	2	42	0.71	0.07	1	8	1	34	1.00	0.03	1	8	1	34	1.00	0.03
Nov-20	3	26	3	60	0.58	0.10	2	17	2	43	0.71	0.07	1	9	1	35	1.00	0.03
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

c) AyM array area + 2 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	3	38	3	89	0.58	0.24	2	25	2	63	0.71	0.16	1	13	1	38	1.00	0.08
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	4	51	13	102	0.50	0.32	1	13	1	38	1.00	0.08	3	38	3	89	0.58	0.24
Jul-19	50	538	344	753	0.14	3.42	19	204	108	323	0.23	1.30	31	333	183	527	0.18	2.12
Aug-19	3	32	3	74	0.58	0.20	0	0	0	0	0.00	0.00	3	32	3	74	0.58	0.20
Sep-19	7	76	7	216	0.38	0.48	6	65	6	184	0.41	0.41	1	11	1	32	1.00	0.07
Oct-19	19	203	96	363	0.23	1.29	11	117	43	224	0.30	0.74	8	85	21	149	0.35	0.54
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Apr-20	4	42	4	106	0.50	0.27	0	0	0	0	0.00	0.00	4	42	4	96	0.50	0.27
May-20	3	32	3	64	0.58	0.20	3	32	3	75	0.58	0.20	0	0	0	0	0.00	0.00
Jun-20	2	21	2	53	0.71	0.13	1	11	1	32	1.00	0.07	1	11	1	32	1.00	0.07
Jul-20	2	21	2	52	0.71	0.13	1	10	1	31	1.00	0.06	1	10	1	31	1.00	0.06
Aug-20	11	117	32	235	0.30	0.74	7	75	11	171	0.38	0.48	4	43	4	107	0.50	0.27
Sep-20	19	198	104	313	0.23	1.26	9	94	31	167	0.33	0.60	10	104	52	167	0.32	0.66
Oct-20	1	10	1	31	1.00	0.06	1	10	1	31	1.00	0.06	0	0	0	0	0.00	0.00
Nov-20	2	21	2	53	0.71	0.13	1	11	1	32	1.00	0.07	1	11	1	32	1.00	0.07
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 18 Cormorant raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Feb-20	2	18	2	44	0.71	0.07	0	0	0	0	0.00	0.00	2	18	2	44	0.71	0.07
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 19 Great crested grebe raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate of (prior to apportionment and correction).

a) AyM array area																		
All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	2	16	2	41	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	41	0.71	0.21
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	2	17	2	44	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	44	0.71	0.07
Dec-19	2	17	2	44	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	44	0.71	0.07
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 20 Black guillemot raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 21 Puffin raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	2	22	2	55	0.71	0.08	0	0	0	0	0.00	0.00	2	22	2	55	0.71	0.08
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	1	10	1	30	1.00	0.04	0	0	0	0	0.00	0.00	1	10	1	30	1.00	0.04
Jul-19	2	17	2	52	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	52	0.71	0.07
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 22 Auk species raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	3	24	3	65	0.58	0.31	0	0	0	0	0.00	0.00	3	24	3	65	0.58	0.31
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	8	63	8	150	0.35	0.81	0	0	0	0	0.00	0.00	8	63	8	158	0.35	0.81
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03

May-20	3	26	3	77	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	69	0.58	0.10
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	15	127	17	272	0.26	0.49	0	0	0	0	0.00	0.00	15	127	17	280	0.26	0.49
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.03
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 23 Gull species raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	2	16	2	39	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	39	0.71	0.21
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	2	16	2	41	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	41	0.71	0.21
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	3	25	3	59	0.58	0.10	0	0	0	0	0.00	0.00	3	25	3	51	0.58	0.10
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	3	26	3	69	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	69	0.58	0.10
Jan-21	4	35	9	69	0.50	0.14	0	0	0	0	0.00	0.00	4	35	9	69	0.50	0.14
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 24 Large gull species raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	1	9	1	28	1.00	0.12	0	0	0	0	0.00	0.00	1	9	1	28	1.00	0.12
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	8	1	25	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.10
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	1	10	1	30	1.00	0.04	0	0	0	0	0.00	0.00	1	10	1	30	1.00	0.04
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	43	0.71	0.07
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	4	34	4	94	0.50	0.13	1	9	1	26	1.00	0.03	3	26	3	69	0.58	0.10
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	5	43	5	129	0.45	0.17	0	0	0	0	0.00	0.00	5	43	5	129	0.45	0.17

Table A 25 Small gull species raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	1	10	1	31	1.00	0.13	0	0	0	0	0.00	0.00	1	10	1	31	1.00	0.13
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	1	8	1	24	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
Feb-20	2	16	2	49	0.71	0.21	0	0	0	0	0.00	0.00	2	16	2	49	0.71	0.21
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	1	8	1	32	1.00	0.10	0	0	0	0	0.00	0.00	1	8	1	24	1.00	0.10
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying						Sitting					
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	3	33	3	76	0.58	0.13	0	0	0	0	0.00	0.00	3	33	3	76	0.58	0.13
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	3	26	3	61	0.58	0.10	0	0	0	0	0.00	0.00	3	26	3	61	0.58	0.10
Feb-20	4	35	4	88	0.50	0.14	0	0	0	0	0.00	0.00	4	35	4	88	0.50	0.14
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	2	17	2	43	0.71	0.07	0	0	0	0	0.00	0.00	2	17	2	43	0.71	0.07

May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	1	8	1	25	1.00	0.03	0	0	0	0	0.00	0.00	1	8	1	25	1.00	0.03
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 26 Storm petrel species raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

May-20	1	9	1	26	1.00	0.03	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Table A 27 Cormorant/ shag raw count, mean abundance estimates, lower and upper 95% confidence interval abundance estimates, precision (Coefficient of Variance, CV) and mean density estimate (prior to apportionment and correction).

a) AyM array area																		
Survey	All Behaviours						Flying						Sitting					
	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

b) AyM array area + 4 km Buffer

All Behaviours							Flying							Sitting				
Survey	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density	Raw Count	Abundance	Lower CL	Upper CL	CV	Density
Mar-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jul-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-19	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-20	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Feb-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Mar-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Apr-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
May-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jun-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Jul-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Aug-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Sep-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Oct-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Nov-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Dec-20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Jan-21	1	9	1	26	1.00	0.03	0	0	0	0	0.00	0.00	1	9	1	26	1.00	0.03
Feb-21	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00

Appendix 4 Flight Direction Rose Diagrams

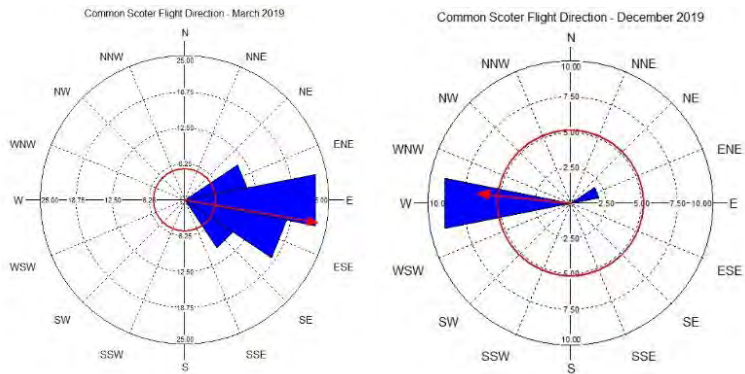
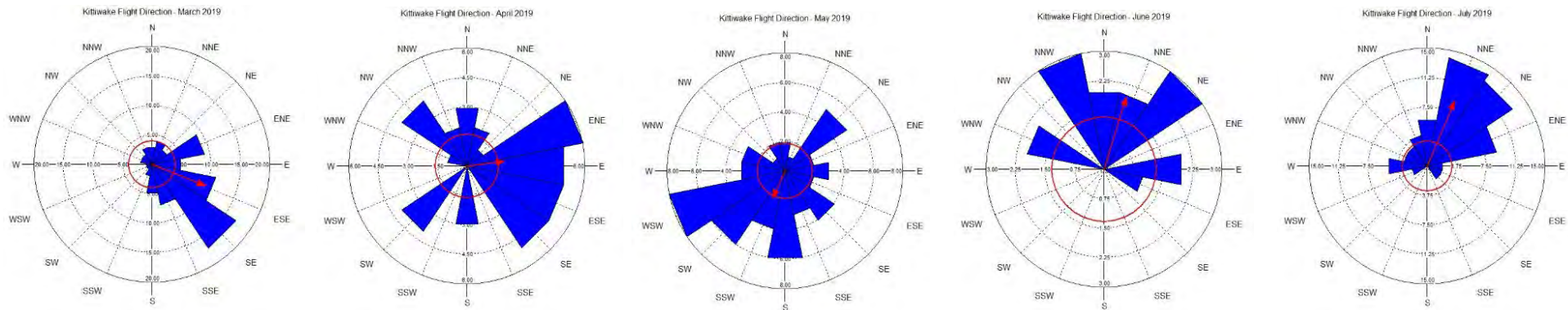
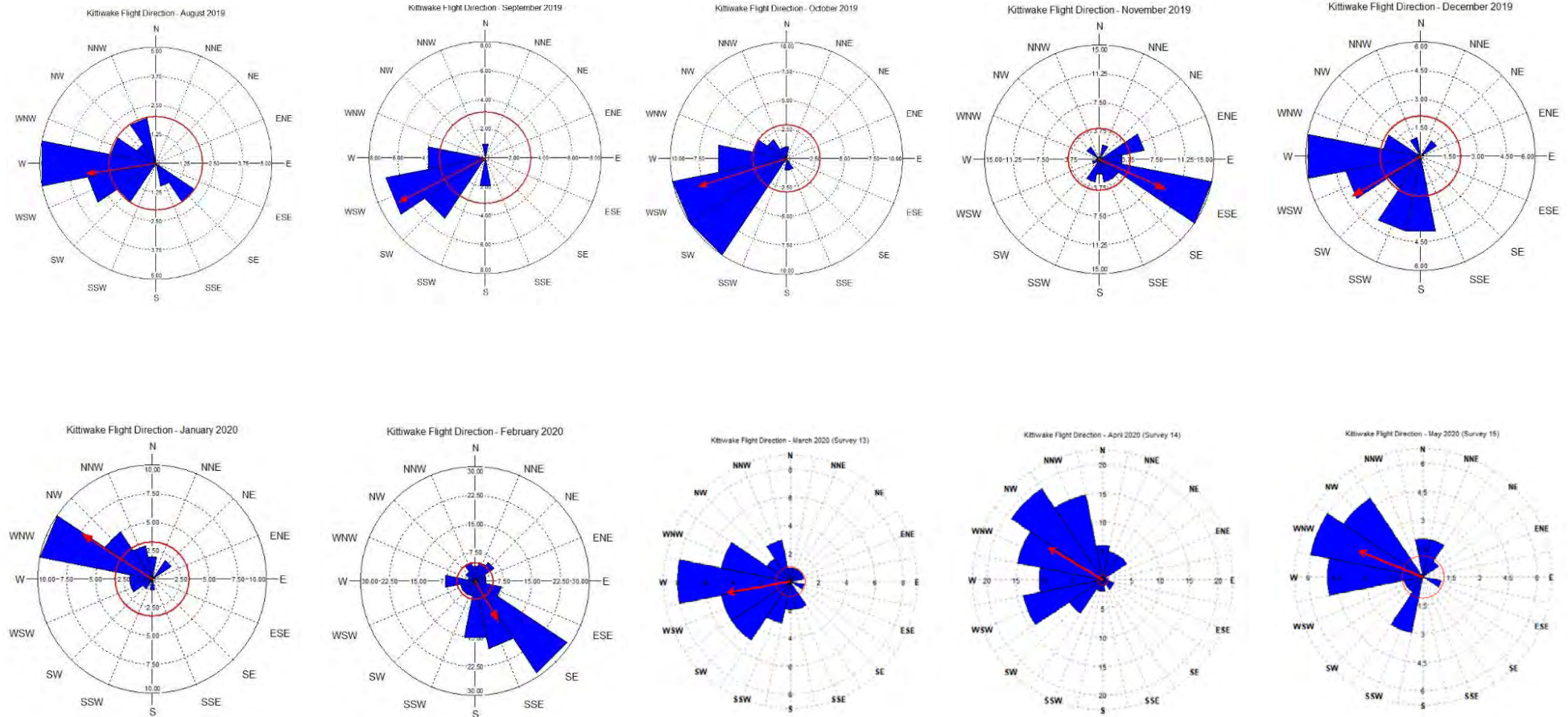


Figure A 1 Summary of flight direction of common scoter during the 24 month survey period.





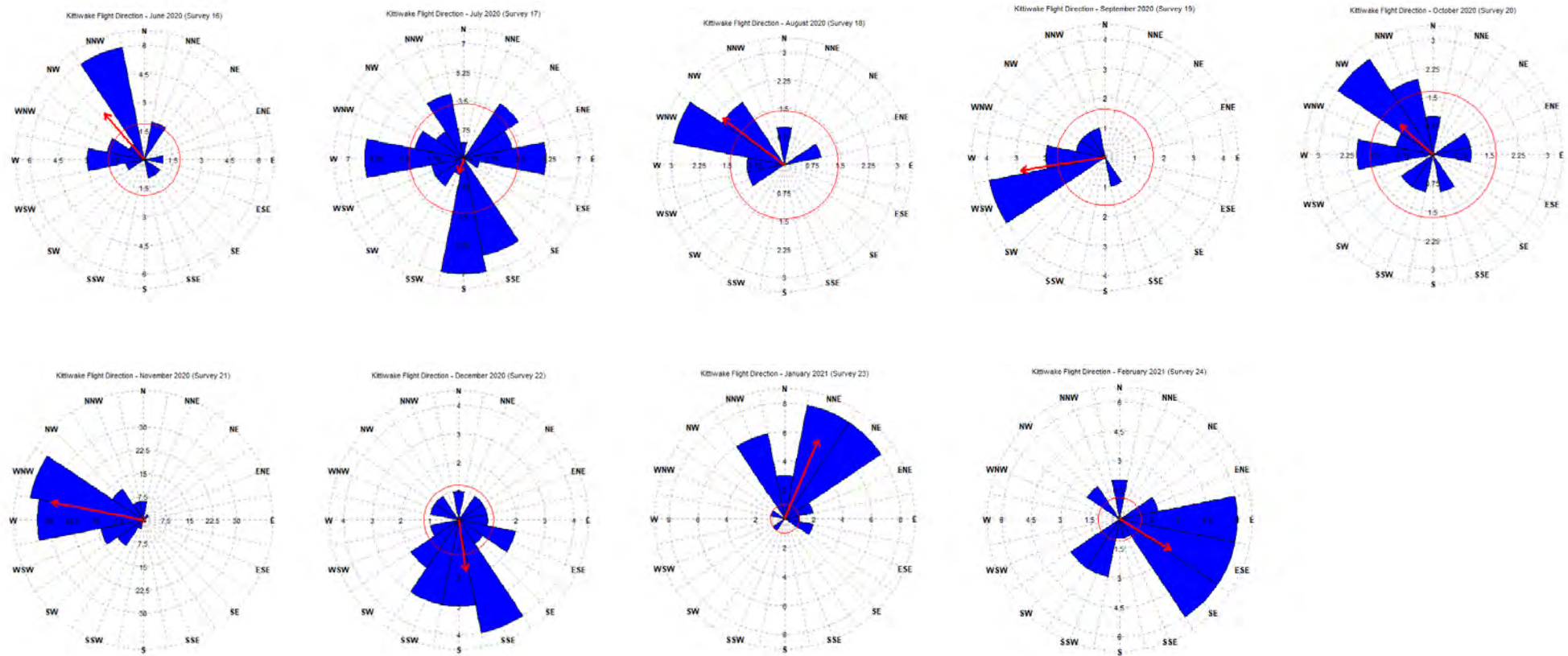


Figure A 2 Summary of flight direction of kittiwake during the 24 month survey period.

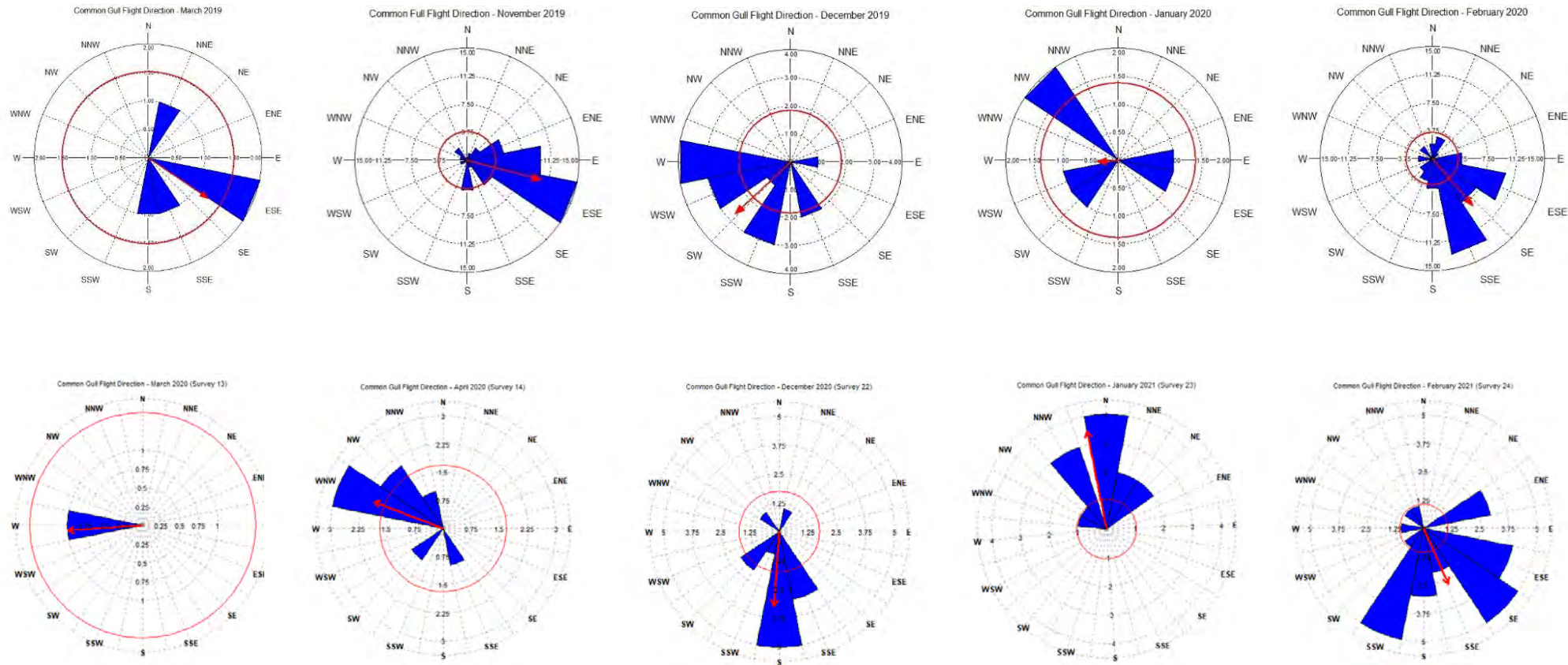
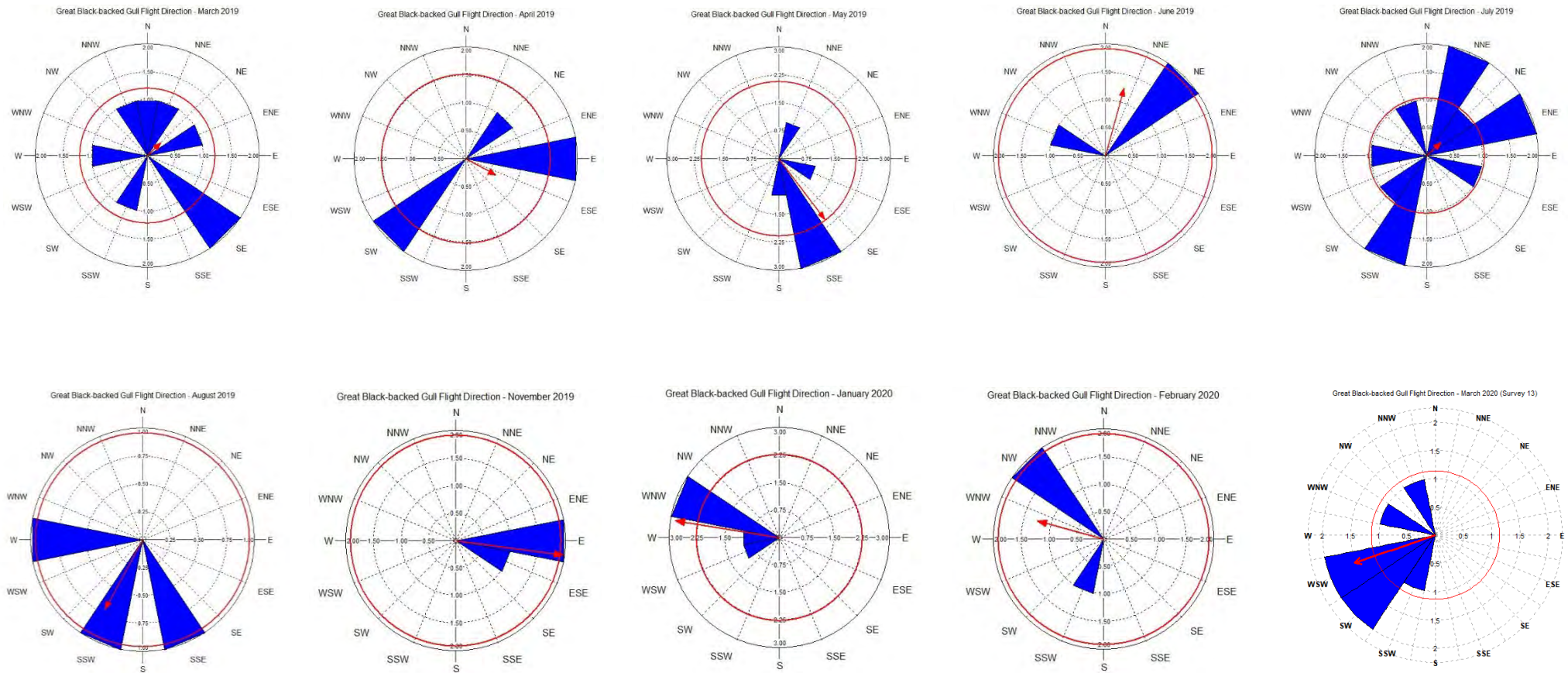


Figure A 3 Summary of flight direction of common gull during the 24 month survey period.



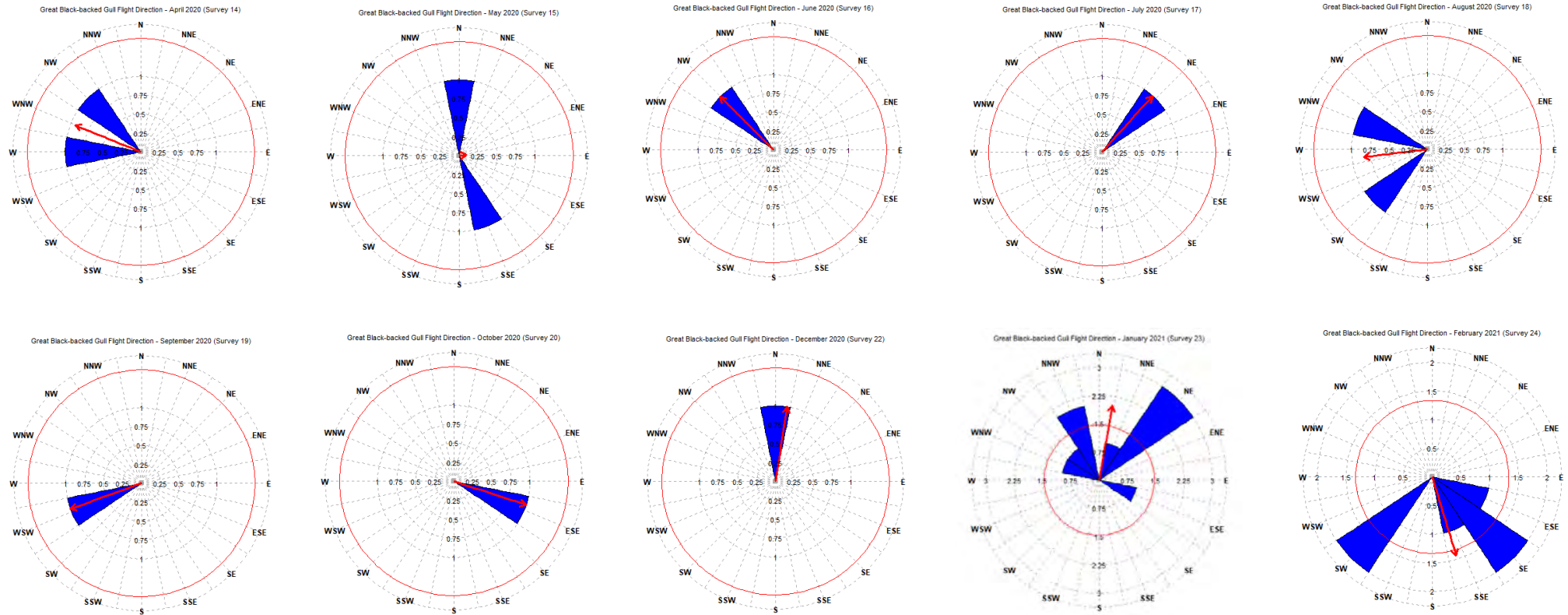
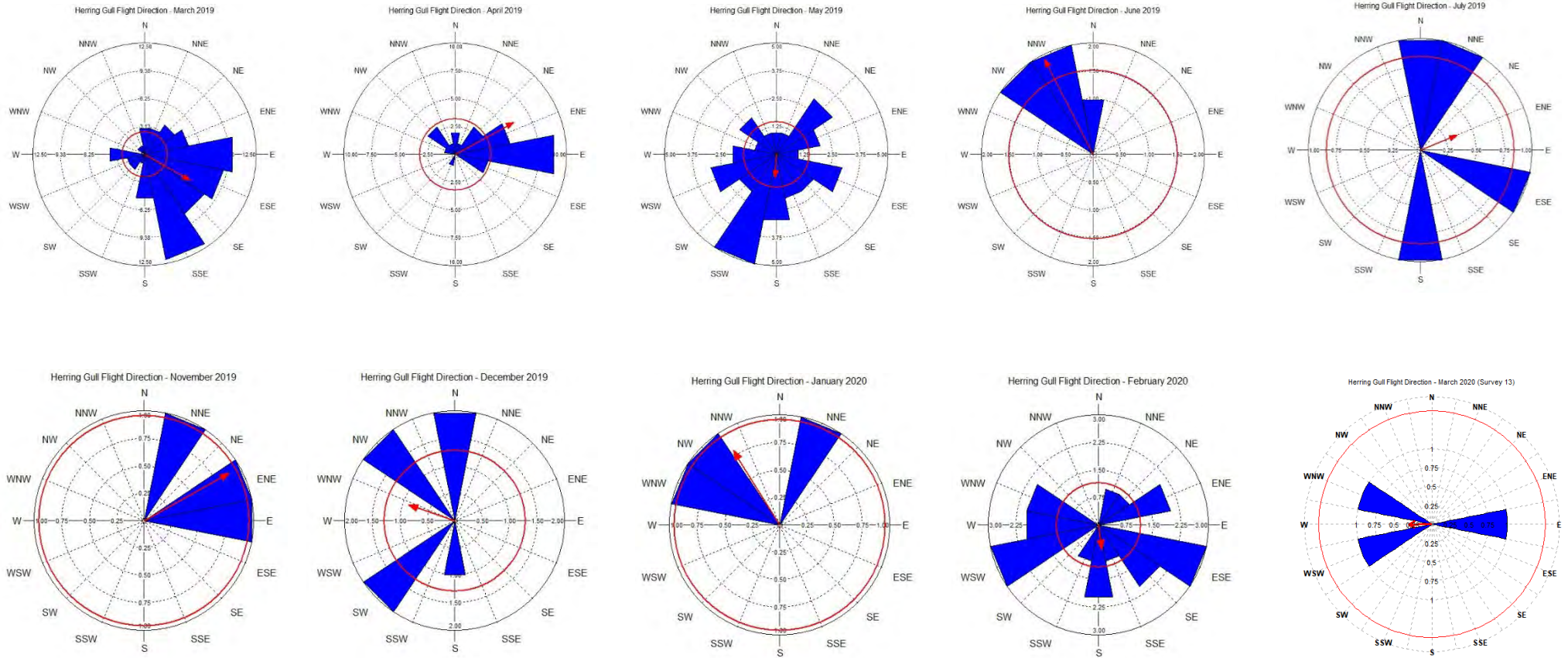


Figure A 4 Summary flight direction of great black-backed gull during the 24 month survey period.



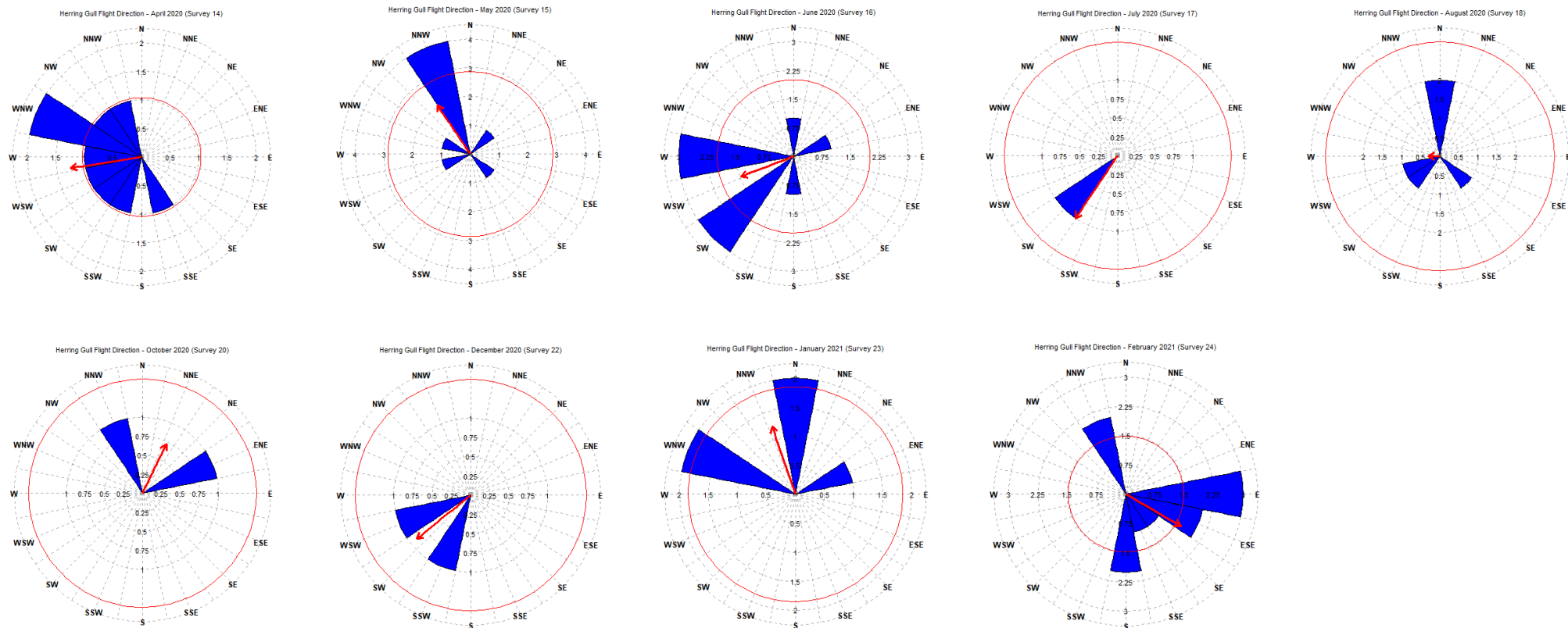


Figure A 5 Summary of flight direction of herring gull during the 24 month survey period.

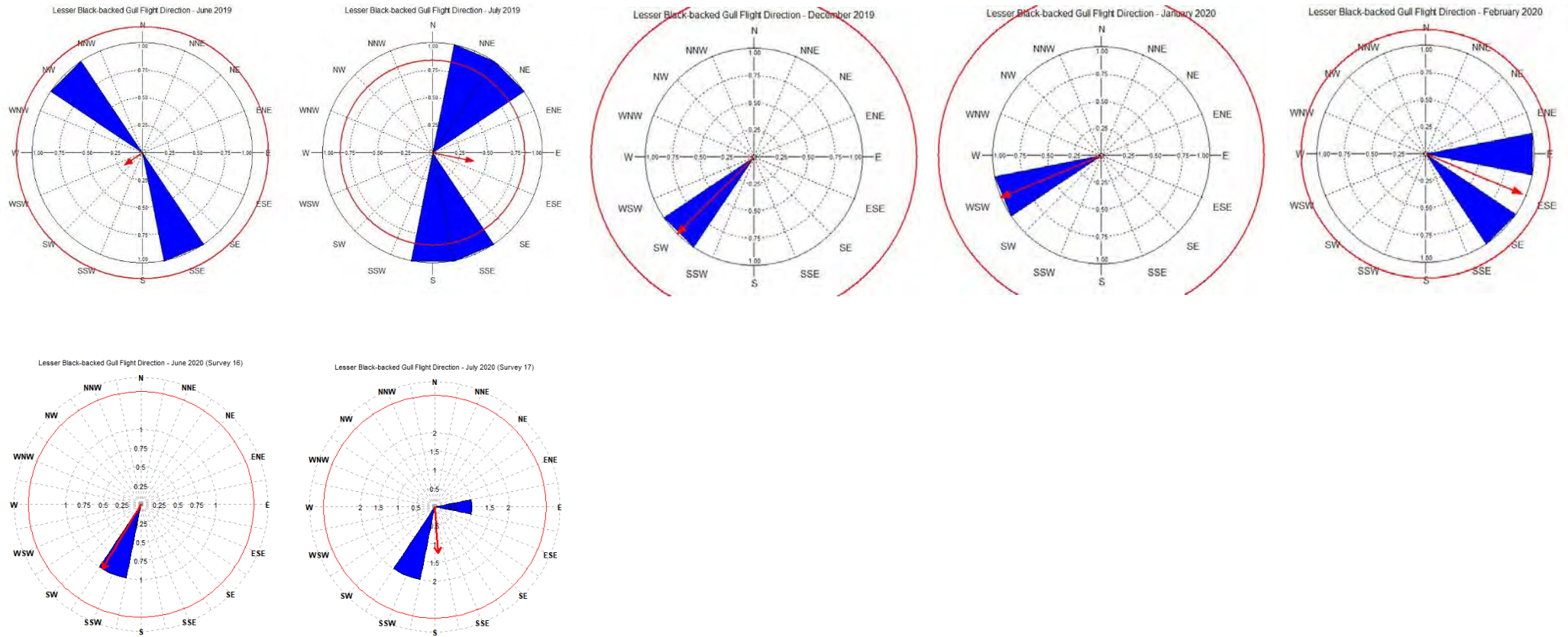


Figure A 6 Summary of flight direction of lesser black-backed gull during the 24 month survey period.

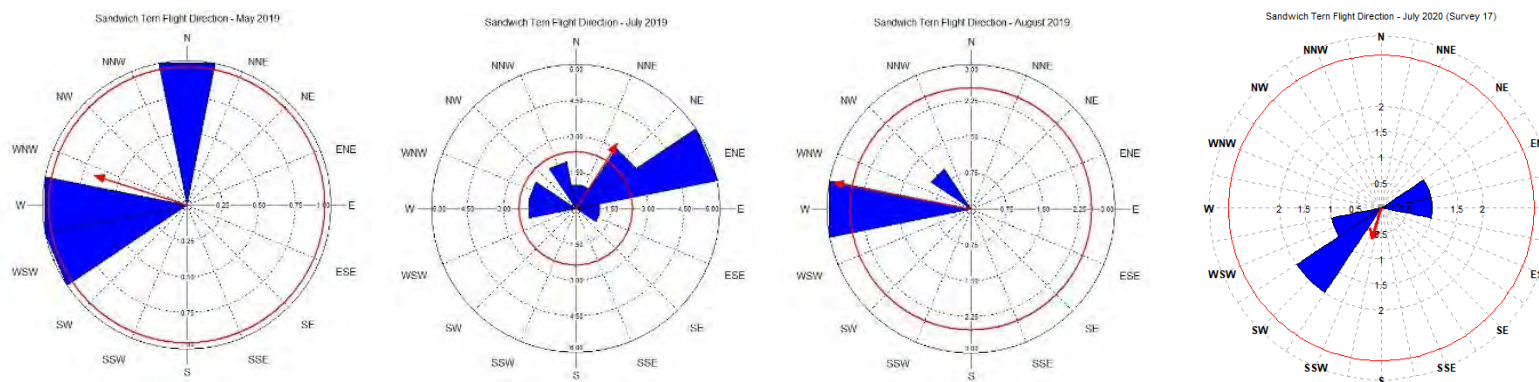
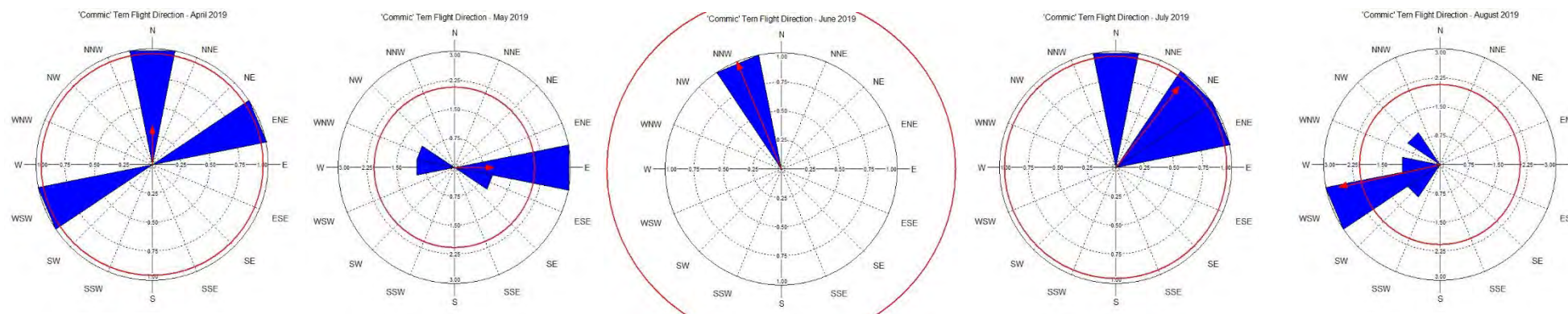


Figure A 7 Summary of flight direction of Sandwich tern during the 24 month survey period.



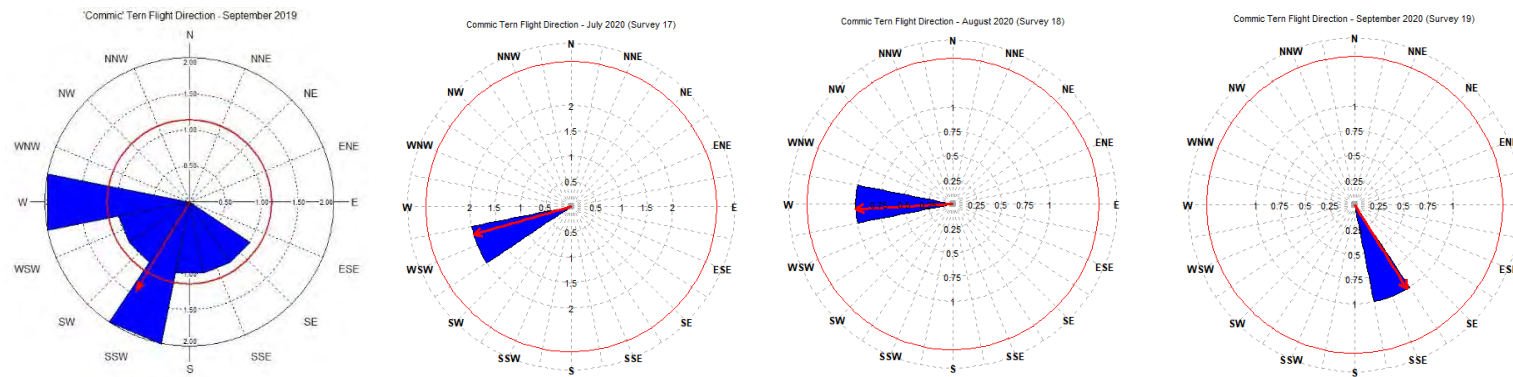
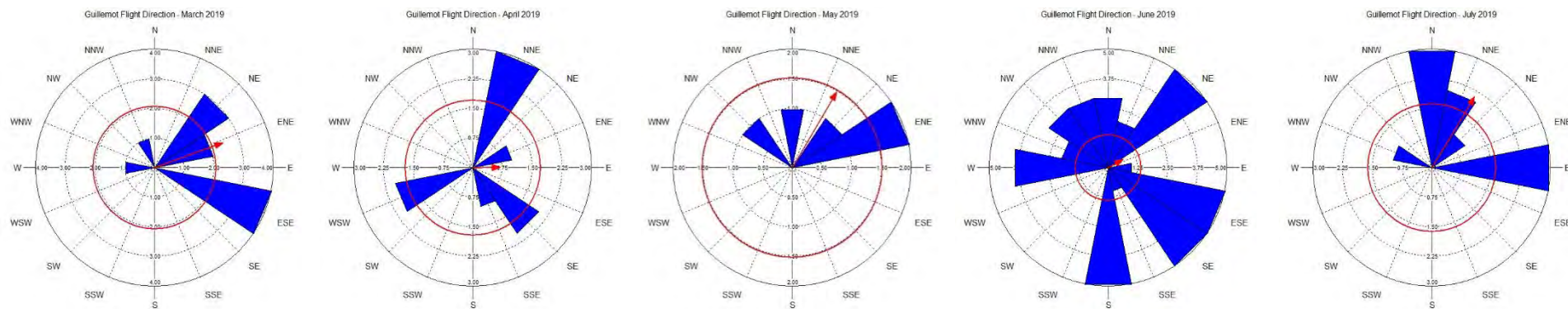


Figure A 8 Summary of flight direction of 'commic' tern during the 24 month survey period.



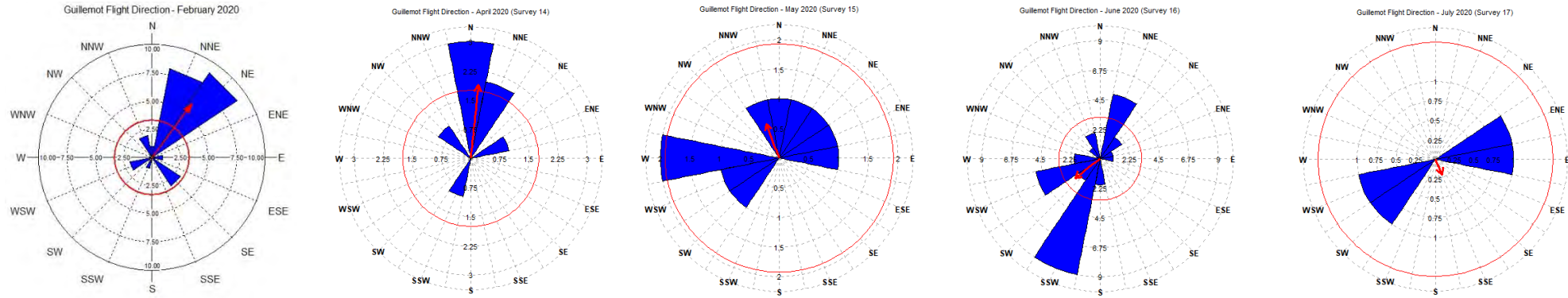


Figure A 9 Summary of flight direction of guillemot during the 24 month survey period.

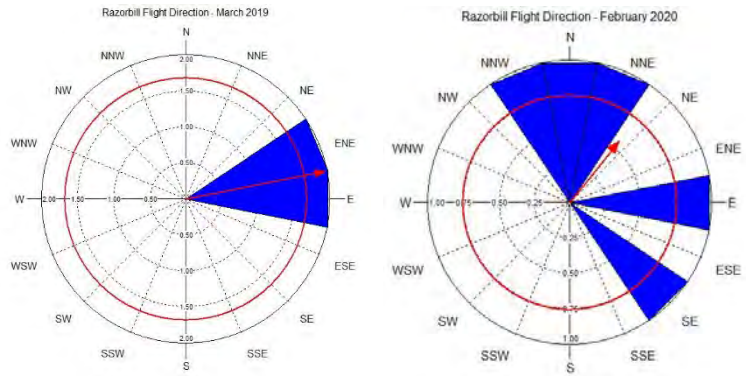
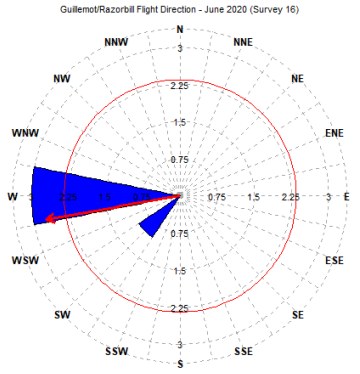
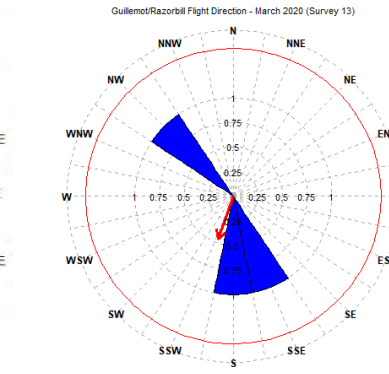
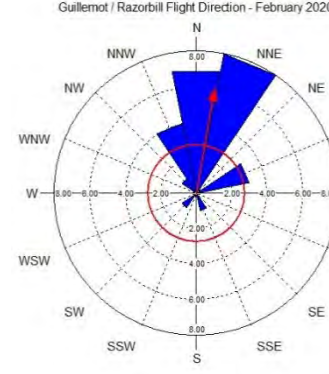
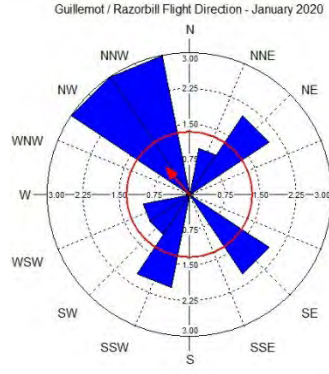
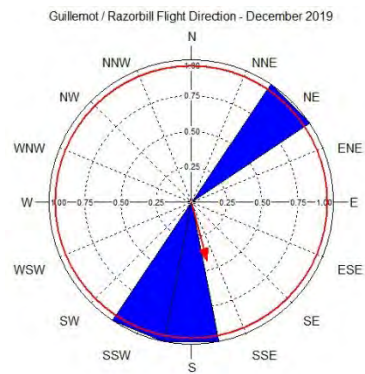
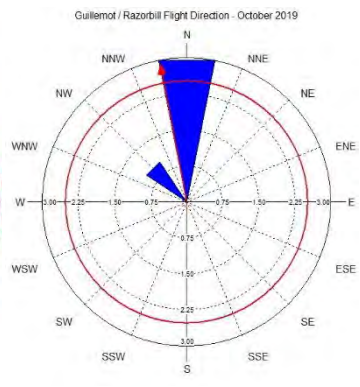
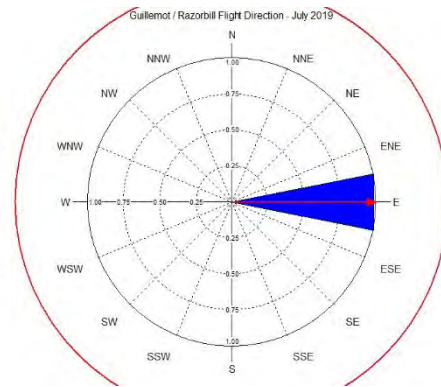
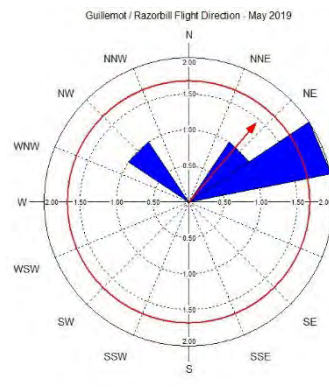
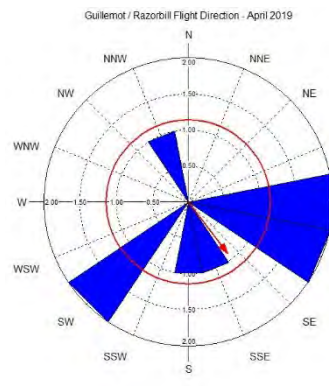
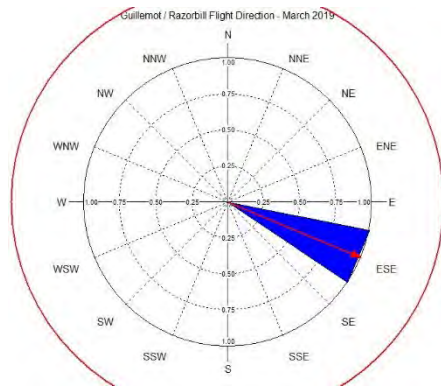


Figure A 10 Summary of flight direction of razorbill during the 24 month survey period.



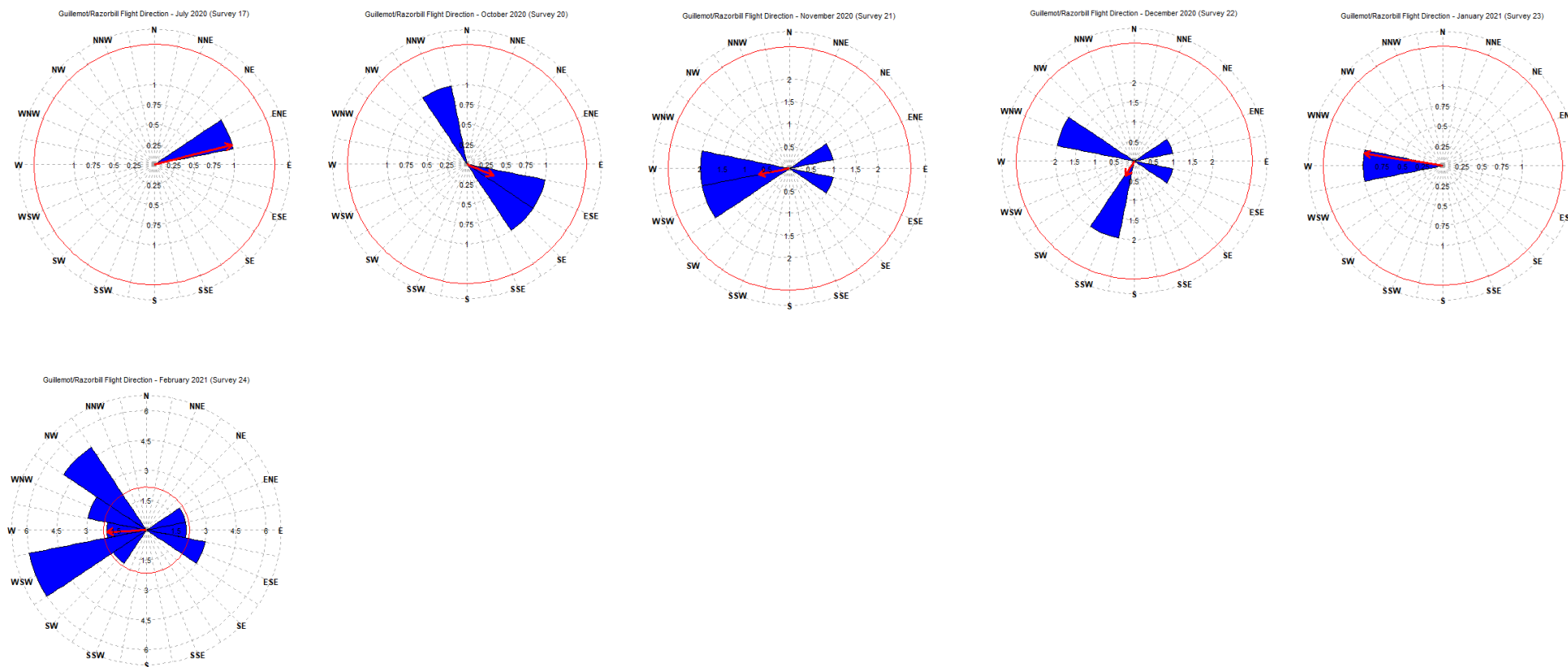


Figure A 11 Summary of flight direction of guillemot/ razorbill during the 24 month survey period.

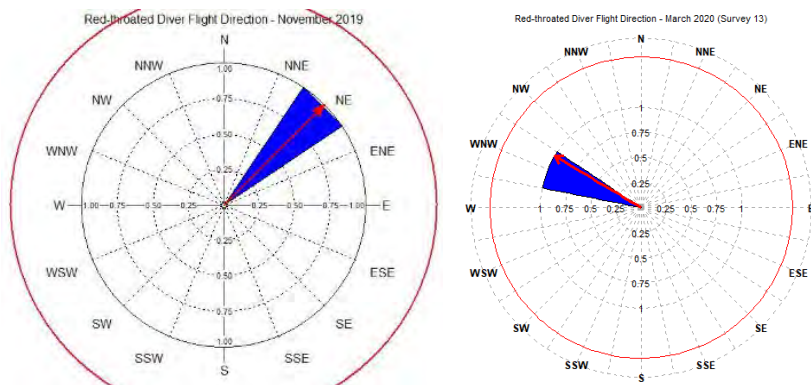
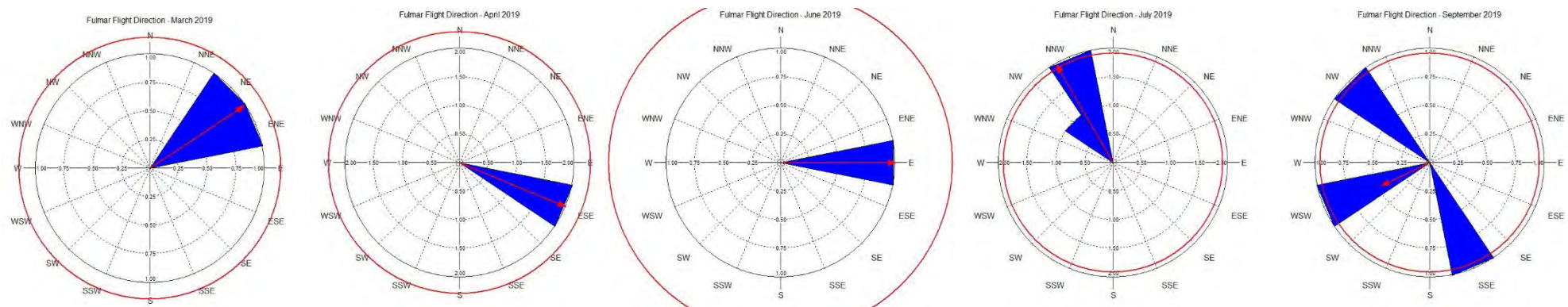


Figure A 12 Summary of flight direction of red-throated diver during the 24 month survey period.



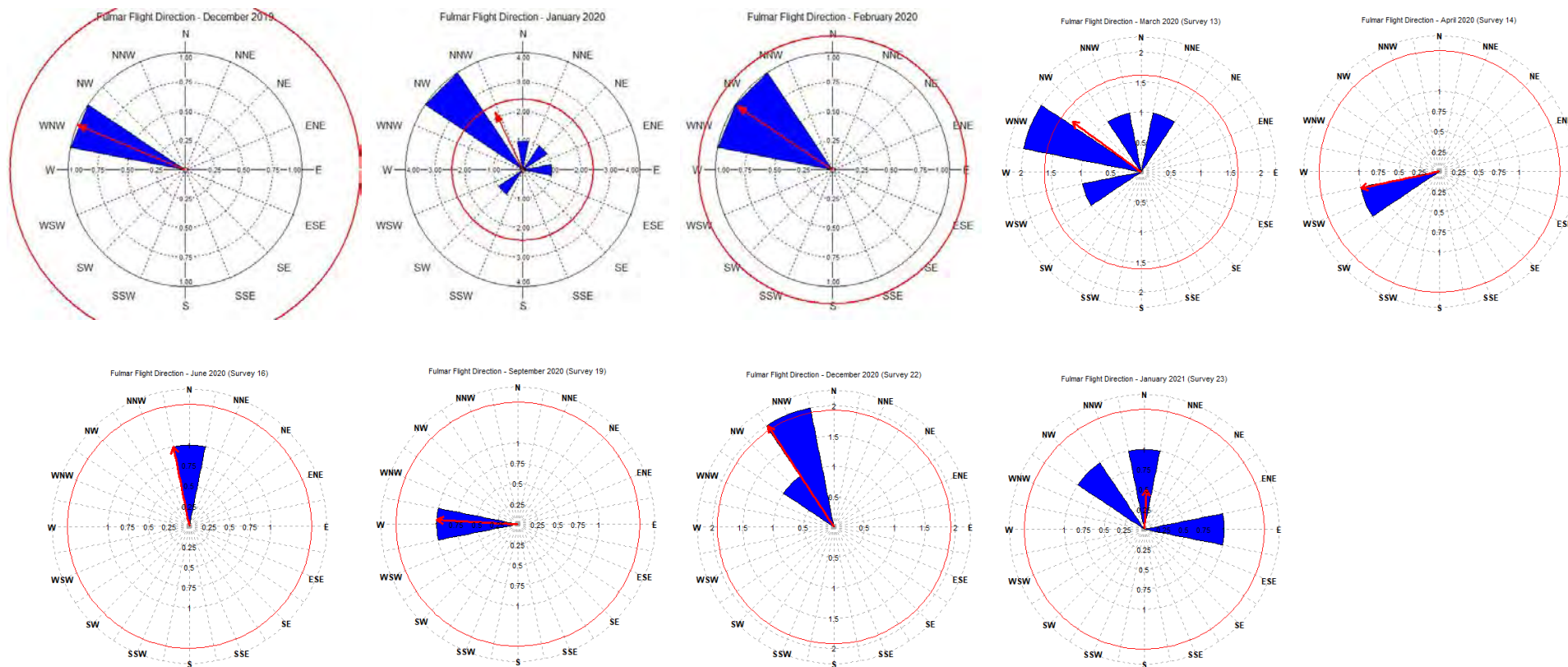


Figure A 13 Summary of flight direction of fulmar during the 24 month survey period.

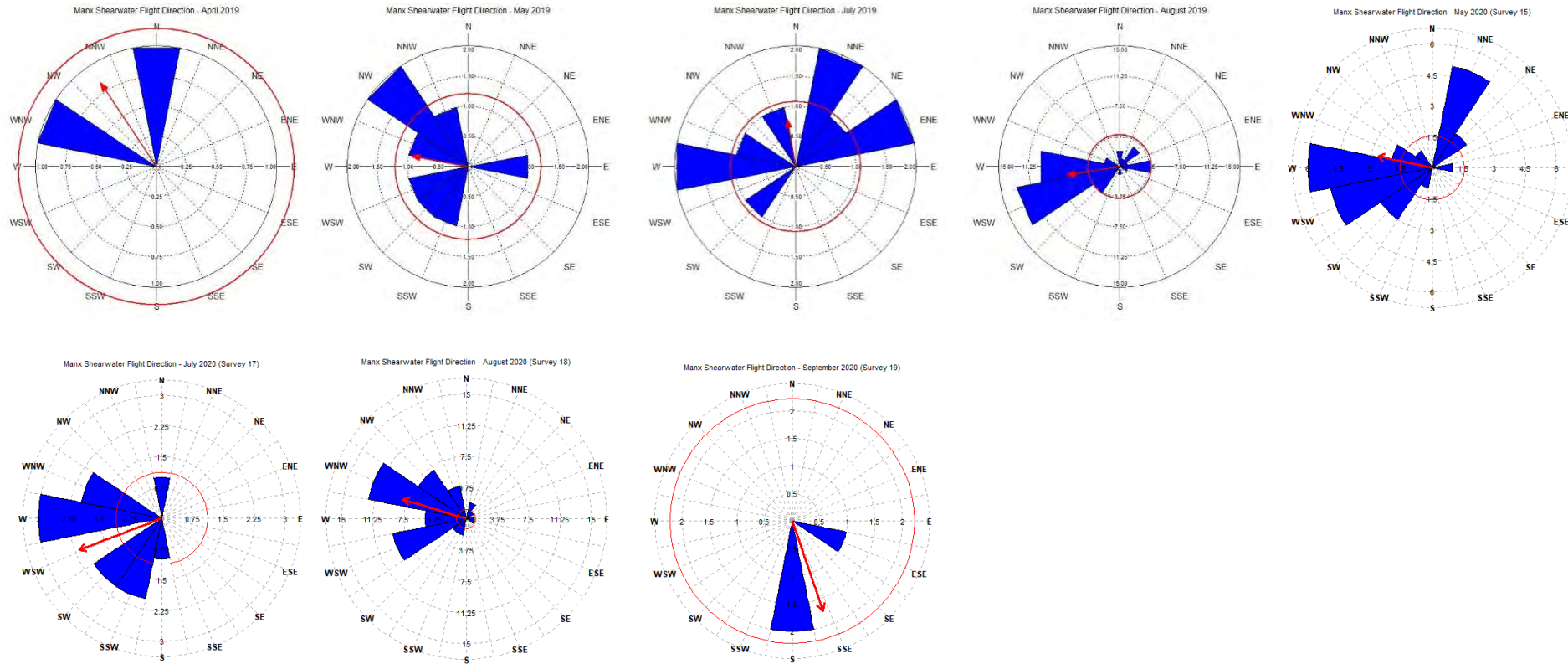
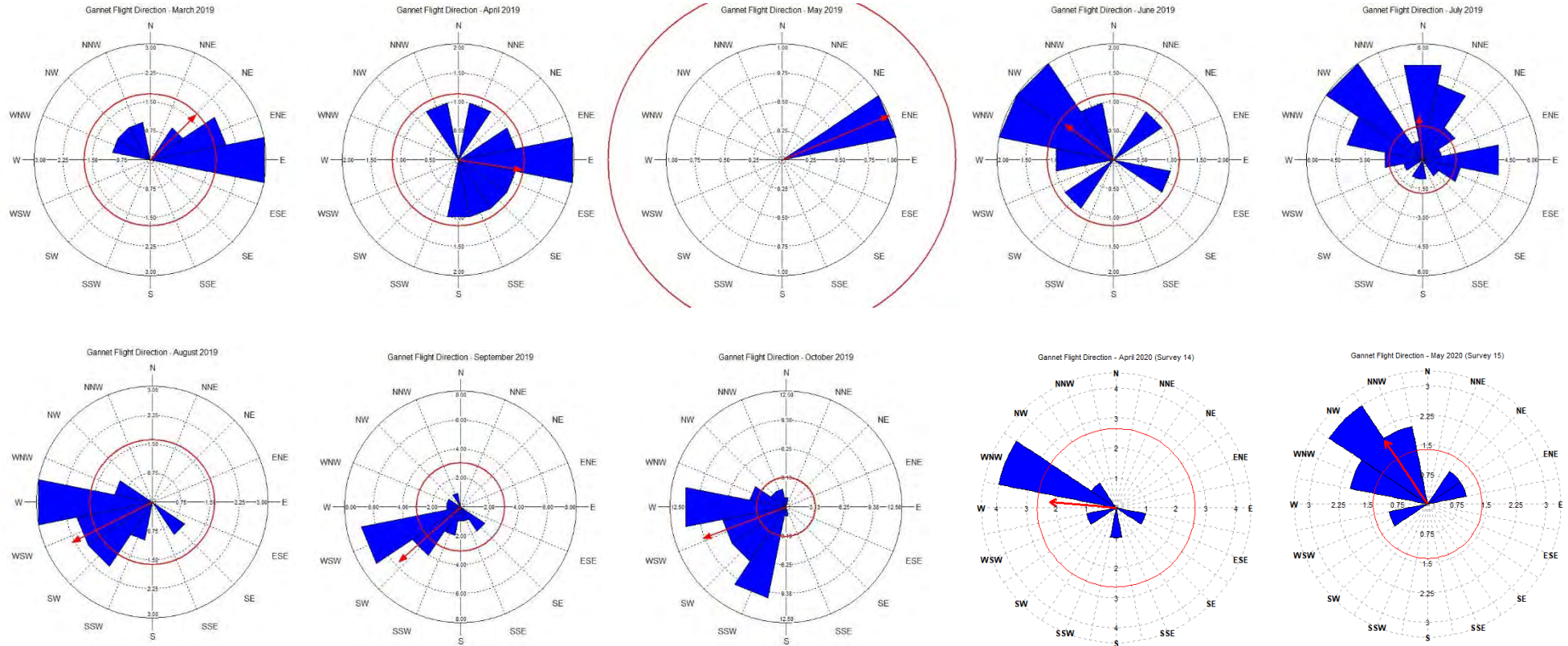


Figure A 14 Summary of flight direction of Manx shearwater during the 24 month survey period.



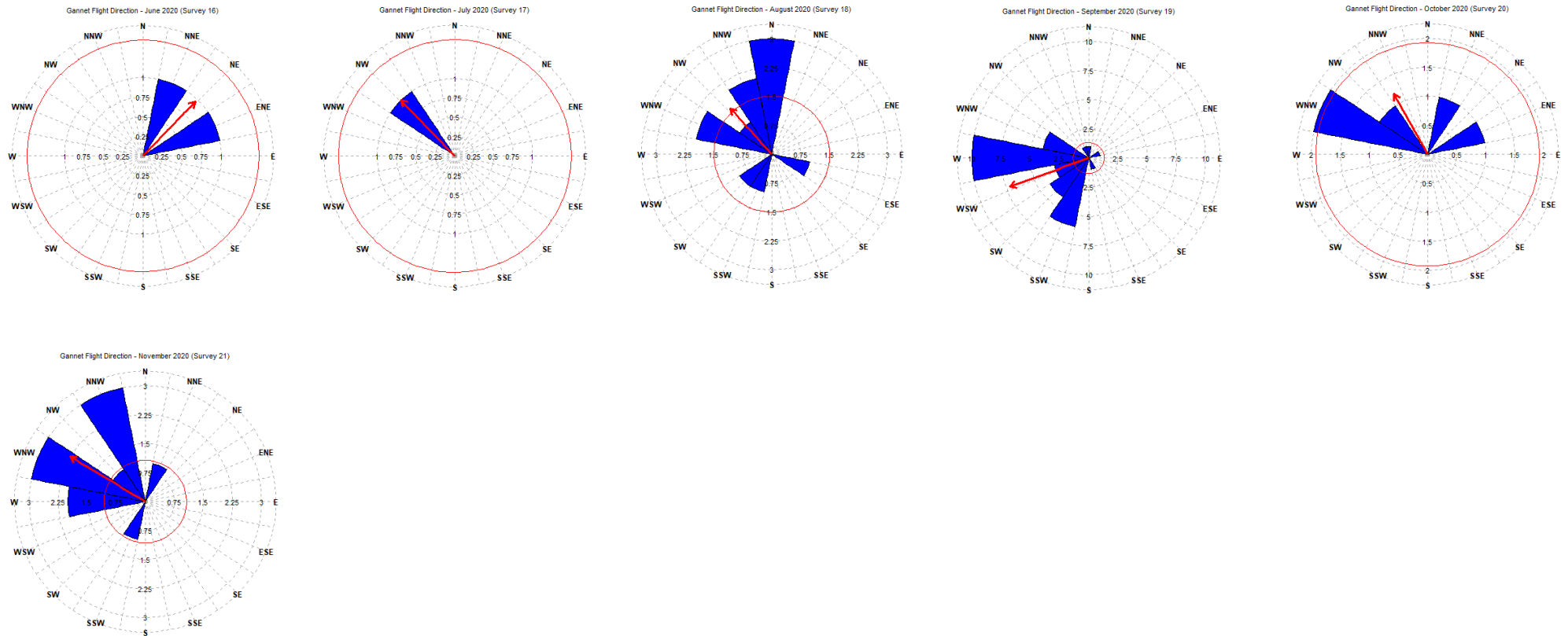


Figure A 15 Summary of flight direction of gannet during the 24 month survey period.

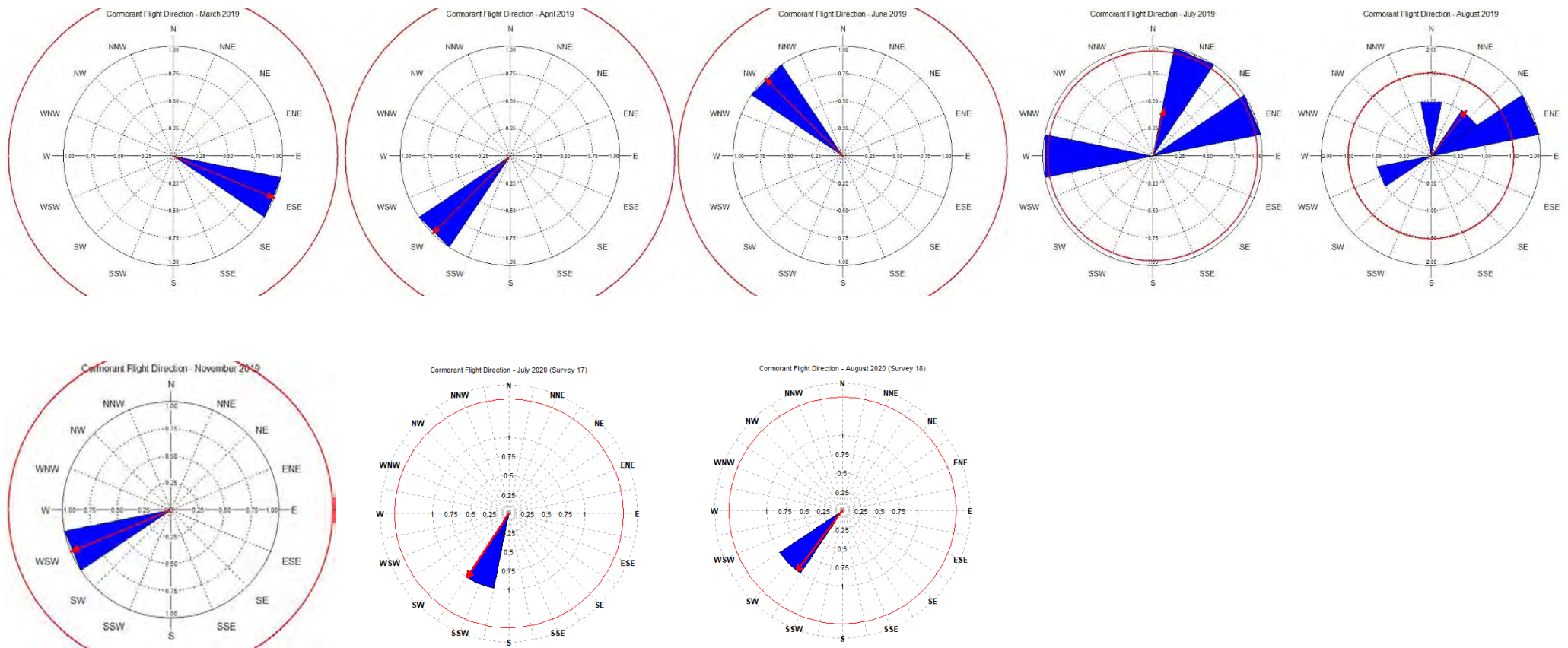


Figure A 16 Summary of flight direction of cormorant during the 24 month survey period.

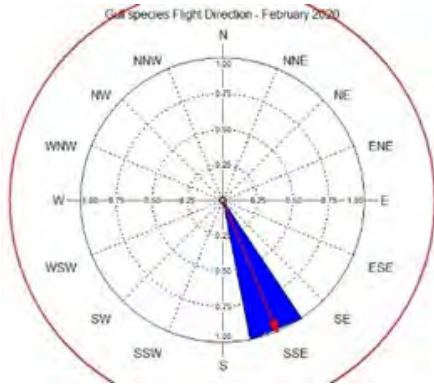


Figure A 19 Summary of flight direction of gull species during the 24 month survey period.

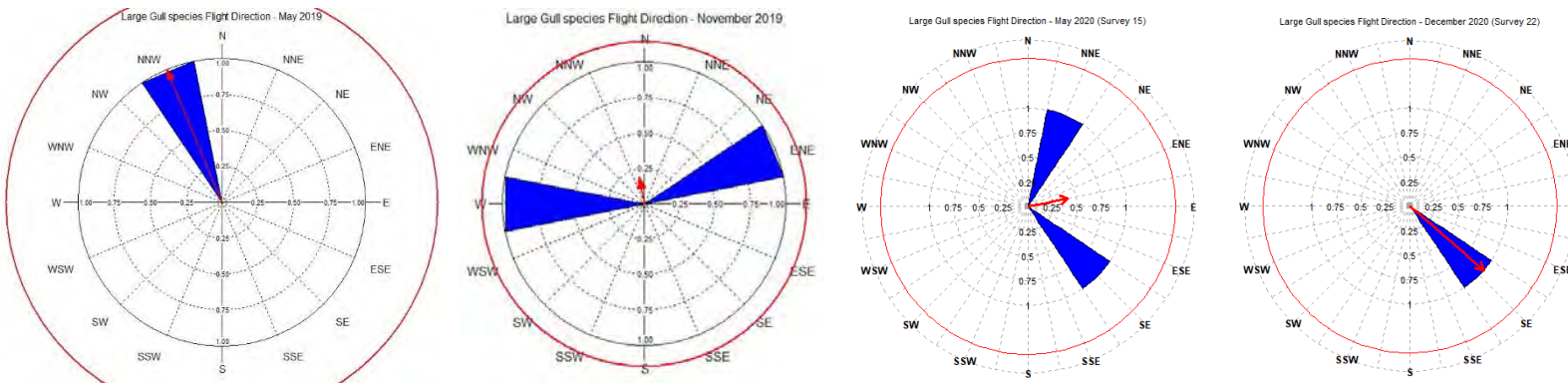


Figure A 20 Summary of flight direction of large gull species during the 24 month survey period.

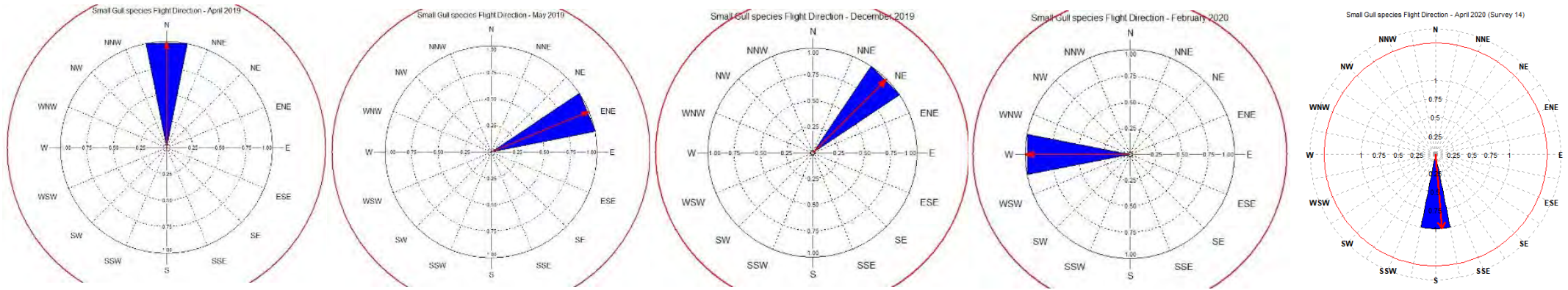


Figure A 21 Summary of flight direction of small gull species during the 24 month survey period.

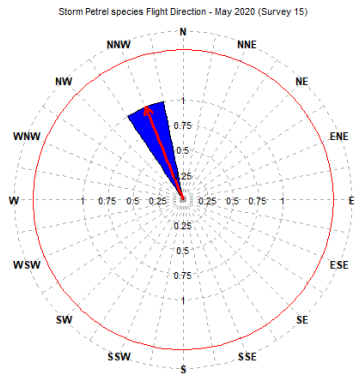


Figure A 22 Summary of flight direction of storm petrel species during the 24 month survey period.

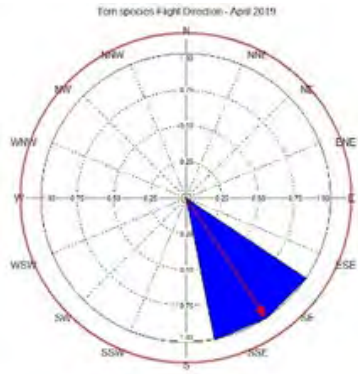


Figure A 23 Summary of flight direction of tern species during the 18 month survey period.

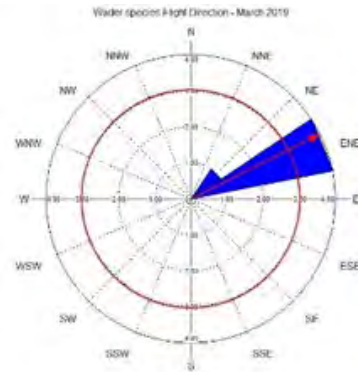


Figure A 24 Summary of flight direction of wader species during the 24 month survey period.

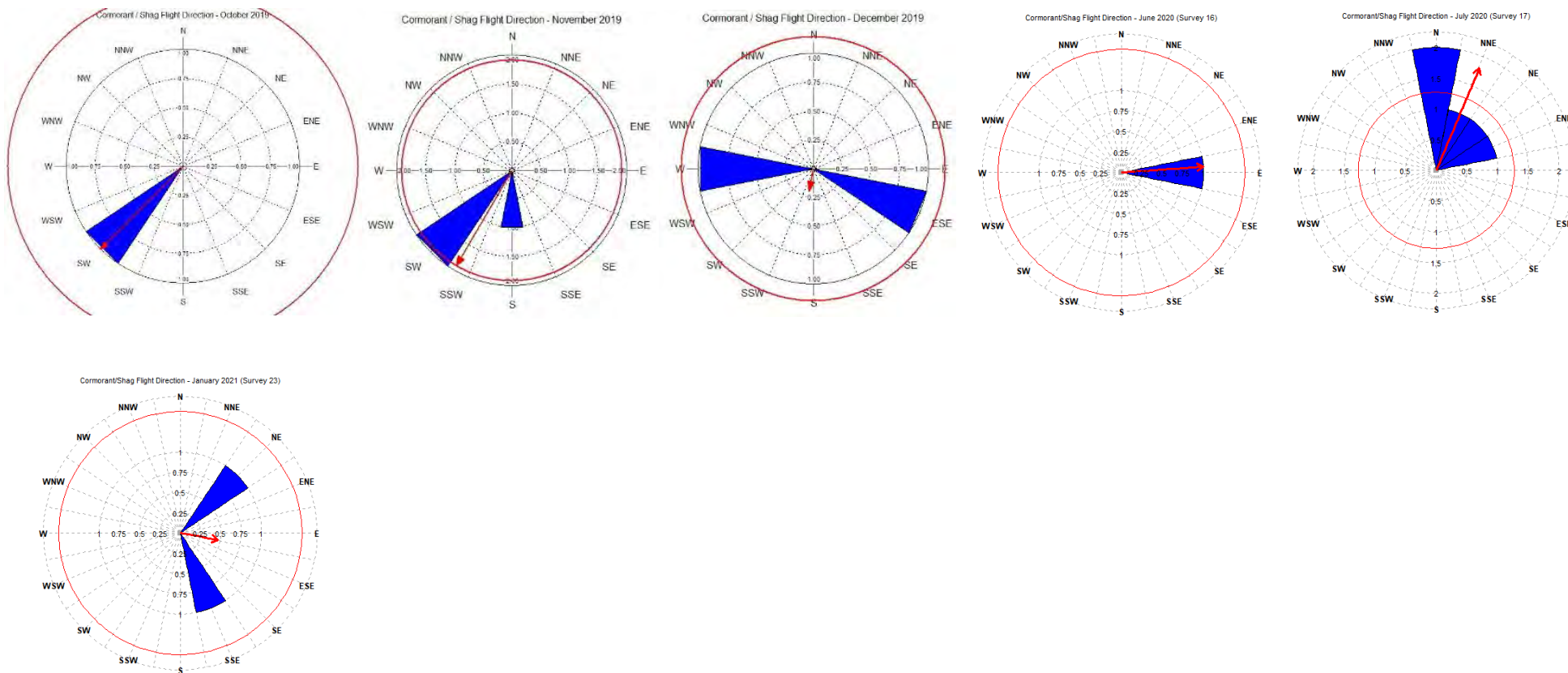


Figure A 25 Summary of flight direction of cormorant/ shag during the 24 month survey period.



RWE Renewables UK
Swindon Limited

Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire SN5 6PB
T +44 (0)8456 720 090
www.rwe.com

Registered office:
RWE Renewables UK
Swindon Limited
Windmill Hill Business Park
Whitehill Way
Swindon