



Cliff nesting seabird surveys at colonies in Northern Ireland

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Published 24 June 2022

Final report to:

afbi AGRI-FOOD
& BIOSCIENCES
INSTITUTE

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Report by:

 **BTO**
Looking out for birds

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Executive Summary

- i. The UK and Ireland hold internationally important populations of seabirds and as such have an obligation to monitor and conserve them. Annual monitoring of sample seabird colonies takes place through the Seabird Monitoring Programme (SMP). Periodic censuses of all seabird populations in the British Isles are undertaken approximately every 20 years, and the abundance and trend information from both the annual SMP and the censuses inform conservation management plans. Seabirds are one of the most globally threatened groups of birds and between 1999 and 2018 the UK seabird indicator declined by 28%. Action is therefore urgently required to halt and reverse declines.
- ii. The Marine Protected Areas Management and Monitoring Programme (MarPAMM) aims to use existing and newly collected seabird abundance data to develop regional seabird models investigating how populations may be affected by human-induced pressures and to inform the management of Marine Protected Areas (MPAs) for seabirds and other marine life.
- iii. Northern Ireland contains significant populations of the UK's seabirds, but due to the complexity, size and location of some of these colonies, large gaps remained in the completion of the latest seabird census (Seabirds Count, 2015 - 2021). The MarPAMM project therefore provided funding to survey Northern Ireland's most important seabird colony, Rathlin Island, and a stretch of the north Co. Antrim coastline unsurveyed due to its high and inaccessible cliff faces.
- iv. Surveys were managed by the British Trust for Ornithology (BTO) and took place in late May and early June in 2021. Twenty-five sectors were individually counted on Rathlin Island and 26 on the north Antrim coast. One site, Sheep Island, was surveyed using an Unmanned Aerial Vehicle (UAV, or 'drone'), while other surveys were carried out by boat and on land, using a combination of these where appropriate. Alongside the survey, the field team on Rathlin Island created a comprehensive count manual to ensure the accuracy and continuity of future surveys.
- v. Thirteen breeding species of seabird were recorded on Rathlin Island, and Guillemots made up 80% of the total count of seabirds for the island. At nearly 150,000 individuals, this made Rathlin Island the UK's largest Guillemot colony during the Seabirds Count census, based on SMP site definitions.
- vi. While the majority of species on Rathlin Island were stable or increasing in number over the long- (1999 - 2021) and short-terms (2011 - 2021), Fulmar, Puffin and Black-headed Gull all experienced declines across both time intervals, with the steepest declines being the near-extinction of Black-headed Gulls as a breeding species on the island (-99% between 1999 and 2021), and a long-term decline in Puffins (-74% between 1999 and 2021). The greatest increases were seen in Herring Gulls, which increased over the long-term by 493% (1999 - 2021) and in Great Skua, which became established as a breeding species following the Seabird 2000 census, albeit in very small numbers.
- vii. Eleven breeding species of seabird were observed along the north Antrim coast between Runkerry and Murlough. The most commonly recorded species were Fulmar

(30% of the total count of seabirds), Guillemot (25%), Kittiwake (21%) and Razorbill (15%).

- viii. Kittiwake and Great Black-backed Gull remained relatively stable in number between the censuses along the north Antrim coast, and four species declined, while four increased. The greatest loss was in Razorbill, which declined by 70% between the censuses, while the greatest increase (excluding a count of two individual Puffins which were not recorded in Seabird 2000), was of Lesser Black-backed Gull (1,200% increase since 2000). The colony of Cormorant for which Sheep Island is designated an SPA declined by 60%.
- ix. While it is encouraging that Red- and Amber-listed species such as Kittiwake and Guillemot have increased in their major colony on Rathlin Island between the last UK-wide censuses, surveys revealed ongoing declines in species such as Puffin on Rathlin Island, and Fulmar on Rathlin and the north Antrim coast. Generally speaking, more species trends were negative on the north Antrim coast than on Rathlin, and this deserves further investigation. Trends on Rathlin and the north Antrim coast generally followed Northern Ireland-level trends over a comparable time period, in particular for large gulls, which are recovering from historical declines.
- x. The completion of the Rathlin Island and north Antrim coast Seabirds Count census provides fundamental baseline data to contribute to MarPAMM's aim to improve the management and monitoring of protected coastal marine environments in Northern Ireland, Ireland and Western Scotland. However, to capitalise on the information provided here, it will be vital to address gaps linking population change to demographic processes, i.e. colony-level breeding success and survival, at-sea distribution and diet, while research into the impacts of specific threats such as development, pollution, invasive species, bycatch, overfishing, disturbance and climate change on Northern Ireland's seabirds should also be a priority for the future.

1. Introduction

1.1. Seabird Monitoring in Northern Ireland

The UK and Ireland support internationally important populations of seabirds and since 1986 these have been monitored through the Seabird Monitoring Programme (SMP), coordinated on behalf of partnership organisations by the Joint Nature Conservation Committee (JNCC). In addition to annual monitoring at selected sites, periodic comprehensive censuses of the UK and Ireland have been undertaken¹, the first of which was in 1969-1970, while the most recent— Seabirds Count — ran between 2015 and 2021. Regular annual monitoring and censuses are essential for determining seabird abundance and trends, assessing the conservation status and to inform marine planning. A 2019 review highlighted the continuing decline of seabird populations globally and the increasing severity of the threats they face on land and at sea (Dias et al., 2019). Good quality, consistent demographic data, including abundance, is fundamental to monitoring the changing fate of seabirds and to informing management plans to mitigate against potential threats. This is especially urgent, since the UK seabird indicator has declined by 28% between 1999 and 2018 (Burns et al., 2020).

In Northern Ireland, the seabird monitoring that feeds into the SMP and censuses is largely carried out by volunteers and NGOs; managed by the British Trust for Ornithology (BTO) Northern Ireland Seabird Coordinator on behalf of Northern Ireland Environment Agency (NIEA) (Booth Jones, 2021). However, there are important seabird colonies in Northern Ireland that are too large, complex and expensive for volunteers to survey, and while many of these are surveyed by the RSPB, National Trust and Ulster Wildlife, notable gaps remain.

Most significantly Northern Ireland's largest seabird colony, Rathlin Island (3,345 ha), remains a monitoring gap outside study plots regularly monitored by the RSPB. The island lies 4.4 km off the north Co. Antrim coast at its closest point and has approximately 30 km of coastline, including basalt and chalk cliffs of up to 100 m tall (DAERA, 1999), making it a challenging and resource-hungry site to survey. Comprehensive counts of Rathlin are also only possible through the inclusion of boat-based surveys which are more difficult compared to land-based approaches. Rathlin holds a number of conservation designations, including an Special Protection Area (SPA) designation for its internationally important breeding populations of Razorbill (*Alca torda*), Common Guillemot (hereafter 'Guillemot', *Uria aalge*) and Black-legged Kittiwake (hereafter 'Kittiwake', *Rissa tridactyla*), and its overall assemblage of over 20,000 breeding seabirds, including Northern Fulmar (hereafter 'Fulmar', *Fulmarus glacialis*), European Shag (hereafter 'Shag', *Gulosus aristotelis*), Common Gull (*Larus canus*), Herring Gull (*L. argentatus*), Lesser Back-backed Gull (*L. fuscus*), Black Guillemot (*Cepphus grylle*) and Atlantic Puffin (hereafter 'Puffin', *Fratercula arctica*) (DAERA, 1999). The island formerly held a population of Manx Shearwaters (*Puffinus puffinus*) until the 1980s (Brooke, 1990), the only Northern Irish colony of these outside the Copeland Islands. This is thought to be extirpated, likely due to the presence of introduced mammalian predators, namely Brown Rats (*Rattus norvegicus*) and Ferrets (*Mustela furo*). As a result of the extensive effort required to make a full survey of the island, Rathlin has only been fully surveyed on four previous occasions, in 1985 for the Seabird Colony Register (SCR, 1985 - 1987), in 1999 for the Seabird 2000 census

¹ Operation Seafarer (1969 – 1970), Seabird Colony Register (SCR) (1985 – 1988), Seabird 2000 (1998 – 2002), Seabirds Count (2015 – 2021).

(1998 – 2002), and two censuses in 2007 and 2011 to meet SPA reporting requirements between the UK-wide coordinated censuses.

A lower concentration of seabirds is found along the opposing coastline to Rathlin in north Co. Antrim. Here the coast consists of a combination of cliffs, rocky shores, sandy beaches and urban areas, restricting seabirds to a few key areas. In particular, Sheep Island SPA is designated for its nationally important breeding population of Cormorants (DAERA, 1998), and the cliffs of the Causeway Coast support breeding Kittiwake, Fulmar, Razorbill and Guillemot. The earliest seabird counts for this stretch of coastline were also made for the SCR (in 1985 for Sheep Island), but not all sites in the region were surveyed during this census. Similarly to Rathlin Island, the steep and inaccessible cliffs in this region prevent safe and comprehensive viewing from the land, prohibiting land-based surveys. Thus, the region between the JNCC SMP sub-sites Runkerry (83507) and Murlough (83416) in north Antrim was also considered to be a monitoring gap for the current seabird census (Booth Jones, 2021).

1.2. MarPAMM

To protect seabird populations, it is fundamental to understand the size and distribution of colonies and how these are changing over time. The Marine Protected Areas Management and Monitoring Programme (MarPAMM)² aims to develop Marine Protected Area (MPA) management plans to conserve marine ecosystems in the INTERREG VA region. To inform management plans and decision-making by regulators there is a requirement to address monitoring gaps for the current seabird census effort, the outputs of which can then feed into regional seabird models, for example investigating how populations may be affected by climate change (J.G. Davies et al., 2021). Due to the large foraging ranges of many seabird species (Woodward et al., 2019), the project is a cross-border effort³, covering the coastlines of Western Scotland, Northern Ireland and the Republic of Ireland, including specifically the North Channel region (including the coastline of Co. Donegal the Republic of Ireland, and Co. Londonderry, Co. Antrim and Co. Down in Northern Ireland, UK). To enable an up-to-date assessment of the status and trends of seabird populations in Northern Ireland, professional survey effort was required to generate abundance data for Rathlin Island and the north Antrim coast in the North Channel region. These up-to-date counts will be used to inform MPA management plans which are a key component of MarPAMM.

² a €6.4 million project supported by the European Union's INTERREG VA Programme, managed by the Special EU Programmes Body (SEUPB). <https://www.seupb.eu/iva-overview>

³ Argyll Scottish Marine Region, Outer Hebrides Scottish Marine Region, Murlough Special Area of Conservation, Carlingford Lough Special Protection Areas (cross-border), Co Down – Co Louth region (cross-border), North Coast Ireland – North Channel region (cross-border)

1.3. Aim

The BTO was contracted to gap-fill difficult-to-access but highly important seabird colonies in Northern Ireland, contributing vital data to the Seabirds Count census and MarPAMM's regional seabird models, and informing monitoring protocols and MPA management plans in Northern Ireland.

2. Methods

2.1. Site Descriptions

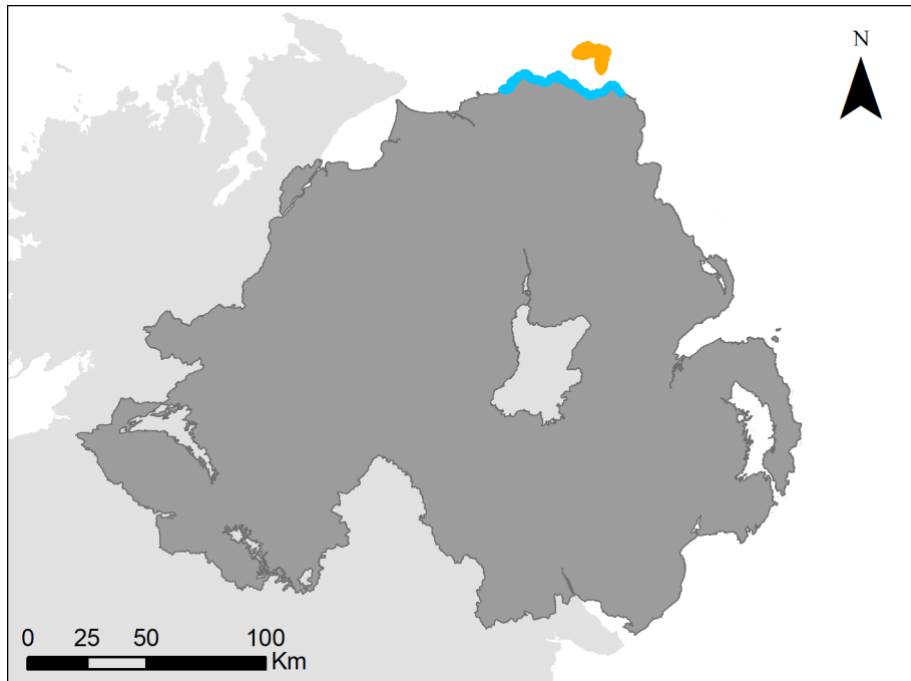


Figure 1: Map of Northern Ireland showing the location of Rathlin Island (orange) and the north Antrim coast (blue) survey areas.

2.1.1. Rathlin Island

Rathlin Island is located off the shore of north Antrim and consists of 25 discrete SMP sub-sites (Figure 2) that correspond to census sector codes used by surveyors in this and previous censuses.



Figure 2: Census sections (RA 1 – 25) and their corresponding Seabird Monitoring Programme sub-sites. Sectors are coloured to aid visualisation.

2.1.2. North Antrim coast

While SMP sites cover the Antrim coastline between ‘Portrush 1C’ (C84263984) and ‘Belfast Channels 1’ (J37107860), in this report the ‘north Antrim coast’ will refer to sites included in the MarPAMM surveys (Figure 3).

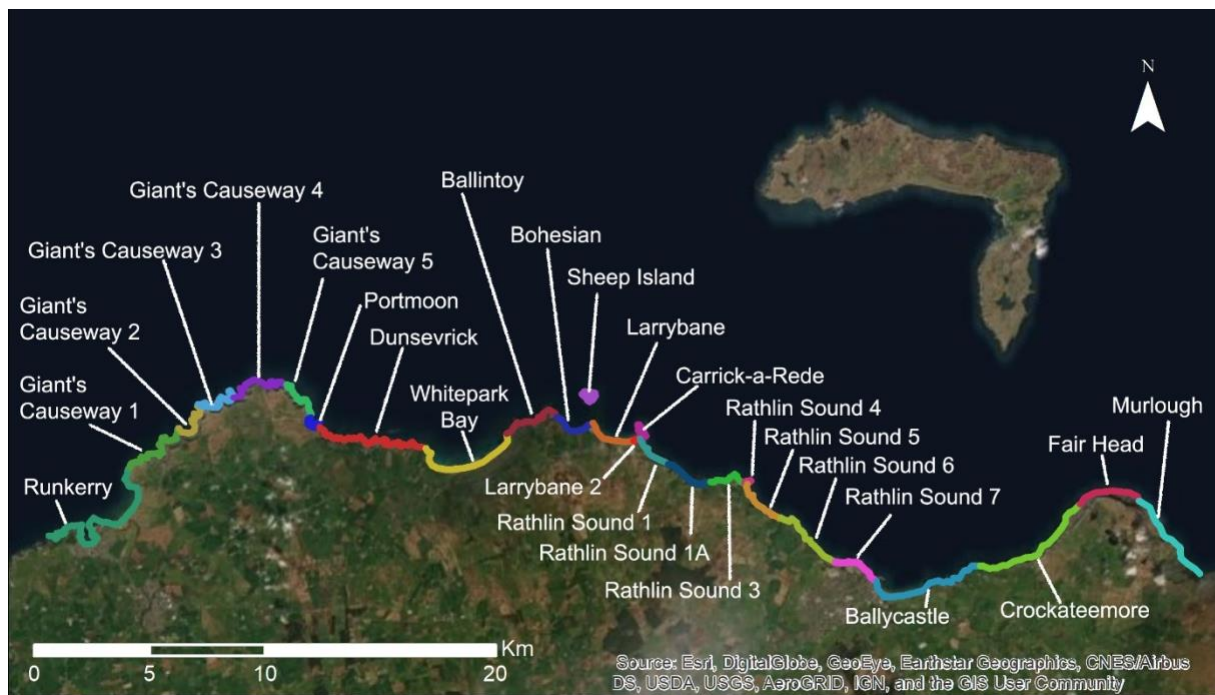


Figure 3: Seabird Monitoring Programme sub-sites in the north Antrim coast survey area. Sub-sites are coloured to aid visualisation.

2.2. Survey Methods

To ensure the consistency of Rathlin Island counts with previous surveys, the advice of a previous survey team member, Eugene Archer, was solicited. This surveyor was a key member of the 1999, 2007 and 2011 teams (Allen et al., 2011; Allen & Mellon, 2007). With Archer's assistance the field team (Kendrew Colhoun, Kerry Leonard, Kevin Mawhinney, Kerry Mackie and Liam McFaul) created an instruction handbook, 'Rathlin Island Seabird Count Manual' (Appendix 1 and Supplementary Material), detailing Rathlin's previously defined census sectors, and these were used in the 2021 census to allow comparisons between years. The manual includes a description of the count methods and sub-sections of each of Rathlin's census sectors and is accompanied by photos showing in-the-field divisions between sectors. In most cases, census sectors were consistent with SMP sub-sites but, for counting purposes, nine of the 25 sectors were split into lettered sub-sectors, which are detailed in the manual. However, for consistency with SMP sub-sites, the abundance counts are considered at the census sector-level here.

The survey methods followed the requirements of the *Seabird Monitoring Handbook for Britain and Ireland* (Walsh et al., 1995) and the instructions for *Seabirds Count: a census of breeding seabirds of Britain and Ireland* (Joint Nature Conservation Committee, 2018). Surveys were carried out between May and June to suit the majority of seabird species, with the exception of Black Guillemot. This species was not counted during the surveys since the recommended count period for these is in April (Walsh et al. 1995). A summary of the count units used for each seabird species is found in Table 1. The *Seabirds Count* methods have, in places, altered the permitted survey methods from the *Seabird Monitoring Handbook* (e.g. large gull species). Rathlin census sectors were visited by land and by boat, and north Antrim coast SMP sub-sites were visited by boat. Birds were recorded using the forms and codes

listed in pages 14-17 of the *Seabirds Count* manual. The daytime count window for most species is restricted to 08:00 – 16:00, but due to the size and complexity of Rathlin Island and the limited seasonal and weather window in which to gather counts, some allowance was made to count outside the recommended time frame suggested by Walsh et al. (1995), with the latest counts made on Rathlin at 17:40. However, this approach was consistent with previous surveys of Rathlin (Allen et al., 2011; Allen & Mellon, 2007).

The exception to traditional methods employed in 2021 was the survey of Sheep Island. This survey consisted of a boat-based survey with the top of the island surveyed using an unmanned aerial vehicle (UAV, hereafter 'drone') flown from the vessel.

Table 1: Count units for target seabird species found on Rathlin Island and the north Antrim coast, following Walsh et al., 1995.

Species	Count unit (abbreviation)	Definition
Fulmar	Apparently Occupied Sites (AOS)	The count unit is a bird sitting tightly on a reasonably horizontal area judged large enough to hold an egg. Two birds on such a site, apparently paired, count as one site. This definition excludes birds that are sitting on sloping sections of cliff and not on a ledge.
Cormorant	Apparently Occupied Nests (AON)	The count unit includes all substantial or well-constructed nests occupied by at least one bird.
Shag	Apparently Occupied Nests (AON) Individuals (IND)	The count unit includes active nests (bird sitting tight whether or not eggs or young were seen, or an unattended brood of young) and other attended, well-built nests (apparently capable of holding eggs). Nests at a lesser stage of construction should be recorded separately, as they are often abandoned, or destroyed by other pairs stealing nest material. Where evidence of nests is not observed but birds are present in suitable nesting habitat, records of individuals were be made.
Great Skua	Apparently Occupied Territories (AOT)	The count unit includes records of nests, eggs or chicks, incubating or brooding adults, adults displaying or alarming and pairs or individuals in breeding habitat, apparently attached to an area.
Kittiwake	Apparently Occupied Nests (AON)	The count unit is defined as substantial or well-constructed nests capable of holding two or three eggs, occupied by at least one bird standing on or within touching distance of the nest.
Gulls	Apparently Occupied Nests (AON) Apparently Occupied Territories (AOT) Individuals (IND)	The preferred count unit for gulls is AONs, defined as a well-constructed or scrape nest, attended by an adult and capable of holding eggs; or an adult apparently incubating. However, where AONs could not be discerned, AOT were recorded based on the spacing of individuals or pairs from a vantage point. Where evidence of AON or AOT was not observed but birds were present in suitable nesting habitat, records of individuals were made.
Guillemot and Razorbill	Individuals (IND)	The count unit is individuals on land.
Puffin	Individuals (IND)	Individual birds on land, birds flying over sea or land near the colony and birds on sea within 200m of the shore.

2.3. Survey Coverage

2.3.1. Rathlin Island

Rathlin Island census sectors (Table 2, Figure 2) were covered on land and by boat by a team of five surveyors: Kendrew Colhoun, Kerry Leonard, Kevin Mawhinney, Kerry Mackie and Liam McFaul, between the 24th May and 13th June (08:20 – 17:40).

Table 2: Rathlin Island census sectors (matching previously used delineations) and their equivalent Seabird Monitoring Programme sub-sites surveyed as part of 2021 MarPAMM Seabirds Count census. Sectors/sub-sites with the same 'end' grid reference at start grid reference are locations such as sea stacks, where the grid reference represents the location of the discrete sub-site.

Census Sector	SMP Sub-site	Grid Reference	
		Start	End
RA1	Cooraghy	D10205070	D09405080
RA2	West Kebble	D09405080	D09305170
RA3	Doonmore Stack	D09105130	D09105130
RA4	Stacknacally	D09205140	D09205140
RA5	Stackaboy	D09305150	D09305150
RA6	Stackaniska	D09205160	D09205160
RA7	North Kebble	D09305170	D10105240
RA8	Stacknavarlea	D09405190	D09405190
RA9	Stacknaderginan	D09505200	D09505200
RA10	Kinramer North	D10105240	D10605250
RA11	Inanvane	D10605250	D10805280
RA12	Altandivan	D10805280	D11105280
RA13	Greenan	D11505280	D11705310
RA14	Tunny	D11705310	D11905290
RA15	Skerriagh East	D11905290	D12705250
RA16	Altachuile	D12705250	D14105240
RA17	Cantruan	D14105240	D14605240
RA18	Altacorry	D14605240	D15905220
RA19	East Light	D15905220	D16405150
RA20	Rue East	D16405150	D15104720
RA21	Rue West	D15104720	D14805100
RA22	Killeaney	D14805100	D12705130
RA23	Sronlea	D12705130	D10205070
RA24	Brookley	D12305250	D12305260
RA25	Shandragh	D13505150	D13605150

2.3.2. North Antrim coast

Unlike Rathlin Island, which undergoes regular censusing, the north Antrim coastline does not have surveyor-defined census sectors, therefore counts were made at the SMP sub-site level (Table 3, Figure 3). With the exception of Sheep Island SPA, which required a slightly different methodology (see below), all north coast SMP sub-sites were surveyed by a team of two (Dave Allen and Dennis Weir) on the 18th May between 09:30 and 14:45, using the AFBI Fisheries Patrol Vessel, the *Queen of Ulster*.

Sheep Island was surveyed from the Fisheries Patrol Vessel a month later on the 18th June (11:00 – 14:00), with the help of drone operator David Craig (NI Heritage) to view Cormorant AONs not visible from the boat. The drone was flown under licence at a height of approximately 30 m and was not observed to elicit a response from the seabirds. A 3D model of Sheep Island built voluntarily by the drone operator can be viewed [here](#).

Table 3: North Antrim coastal Seabird Monitoring Programme sites surveyed as part of 2021 MarPAMM Seabirds Count census. Sheep Island does have the same 'end' grid reference at start grid reference because the grid reference represents the location of the discrete sub-site.

SMP Sub-site	Grid Reference	
	Start	End
Runkerry	C93484385	C91524212
Giant's Causeway 1	C94704484	C93484385
Giant's Causeway 2	C95204545	C94704484
Giant's Causeway 3	C96044562	C95204545
Giant's Causeway 4	C96044562	C97304600
Giant's Causeway 5	C97304600	C97954520
Portmoon	C97954520	C98174499
Dunsevrick	C98174499	D00814450
Whitepark Bay	D00814450	D02904488
Ballintoy	D02904488	D04004533
Bohesian	D04004533	D04964516
Sheep Island SPA	D04694598	D04694598
Larrybane	D04964516	D06004484
Larrybane 2	D06004484	D06124489
Carrick-a-Rede	D06124490	D06204520
Rathlin Sound 1	D06124489	D06904422
Rathlin Sound 1A	D06904422	D07784388
Rathlin Sound 3	D07784388	D08754381
Rathlin Sound 4	D08754381	D08804379
Rathlin Sound 5	D08804379	D09704300
Rathlin Sound 6	D09704300	D11004195
Rathlin Sound 7	D11004195	D12084150
Ballycastle	D12084150	D14714194
Crockateemore	D14714194	D17074348
Fair Head	D 171 433	D18544365
Murlough	D18544365	D20034187

2.4. Survey Data Storage

Survey data from 2021 were stored in a Microsoft Excel (xlsx) format on Google Drive cloud storage and also uploaded to the SMP database (<https://app.bto.org/seabirds/public/index.jsp>).

2.5. Other Data Sources

Comparative seabird census and monitoring data were obtained through the SMP database (<https://app.bto.org/seabirds/public/index.jsp>), through the Northern Ireland Seabird Report (Booth Jones 2021) and from previous censuses of Rathlin commissioned by NIEA (Allen et al., 2011; Allen & Mellon, 2007).

2.6. Analysis

Census counts from 2021 were compared with Seabird 2000 (1998 – 2002) census counts for both Rathlin and the north Antrim coast, and with the intervening censuses from 2007 (Allen & Mellon, 2007) and 2011 (Allen et al., 2011) for Rathlin Island. Census data collected prior to Seabird 2000 was less complete for the north coast and did not necessarily use methodologies consistent with Rathlin's censuses between 2000 and 2021, therefore were not included here. Where data exist for sub-sites prior to Seabird 2000 on the north coast, sub-site comparisons are made in the species accounts.

3. Results

3.1. Overview

3.1.1. Rathlin Island

The total number of breeding seabird species present on Rathlin in 2021 was 13, of which all were surveyed as part of the MarPAMM work apart from Black Guillemot. Not including Black Guillemots (the volunteer-recorded population estimate for this species is covered in section 4.3.2.), a total of 187,846 seabird count units were recorded on Rathlin Island in 2021. This total combines AON, AOT and IND counts; counts of individual auks were not converted into breeding pairs due to the difficulty in obtaining accurate correction factors as described in Harris et al., (2015). The three most abundant species were (in decreasing order) Guillemots (80%), Razorbills (12%), and Kittiwake (7%), with other gull species only making up a small proportion of the total seabird population of the island (Table 4). While the majority of species were stable or increasing in number over the long- (1999 – 2021) and short-terms (2011 – 2021), Fulmar, Puffin and Black-headed Gull all experienced declines across both time intervals, with the steepest declines being the near-extinction of Black-headed Gulls as a breeding species on the island (-99% between 1999 and 2021), and a long-term decline in Puffins (-74% between 1999 and 2021). The greatest increases were seen in Herring Gulls, which increased over the long-term by 493% (1999-2021) and in Great Skua, which has become established as a breeding species since the Seabird 2000 census, albeit in small numbers (now at least 2 AOT, see section 4.2.4.).

Table 4: Counts of seabird species surveyed in May and June 2021 on Rathlin Island. Species are ordered from top to bottom on their proportional contribution to the total breeding seabird assemblage of Rathlin Island. Percentage changes between Seabird 2000 and Seabirds Count (2021), and the last Rathlin census (2011) and Seabirds Count (2021) are coloured following the Wetland Bird Survey Alerts system (Austin et al., 2019). Red – a decline in numbers of at least 50%; Orange – a decline in numbers of at least 25% but less than 50%; Grey – a decline in numbers of less than 25% or an increase of less than 33%; Pale Blue – an increase in numbers of at least 33% but less than 100%; Dark Blue – an increase in numbers of at least 100%. AON = Apparently Occupied Nests, AOS = Apparently Occupied Sites, AOT = Apparently Occupied Territories, IND = Individuals.

Species (by order of highest abundance)	Count	Percentage of Rathlin total	Direction of abundance change 2000 – Seabirds Count 2021 (%)	Direction of abundance change 2011 census – Seabirds Count 2021 (%)
Guillemot	149,510 IND	80	56	15
Razorbill	22,421 IND	12	7	-2
Kittiwake	13,706 AON	7.3	38	72
Fulmar	1,038 AOS	<1%	-49	-32
Lesser Black-backed Gull	519 AON	<1%	309	72
Puffin	407 IND	<1%	-74	-41
Herring Gull	83 AON	<1%	493	196
Shag	74 AON	<1%	28	57
Common Gull	69 AON	<1%	8	-27
Great Black-backed Gull	12 AON	<1%	300	50
Black-headed Gull	5 AON	<1%	-99	-55
Great Skua	2 AOT	<1%	NA*	300

* Great Skua were not breeding on Rathlin at the time of the Seabird 2000 census.

3.1.2. North Antrim coast

Eleven breeding species of seabird (including Black Guillemots, not surveyed for this report, as discussed above) were observed along the north coast of Antrim within the study area between Runkerry and Murlough. Although no Puffins were recorded in the previous census, two individuals were observed in 2021. If count units are all assumed to represent a breeding pair, 3,849 pairs of seabirds were recorded in the stretch of coastline. The majority of these were Fulmar (30%), Guillemot (25%), Kittiwake (21%) and Razorbill (15%).

Only Kittiwake and Great Black-backed Gull remained relatively stable in number between the censuses while Fulmar declined by 25% and was therefore only just classed as a moderate decline. Three species were classed as being in steep decline (decline of at least 50%) while four increased (Table 5). The greatest loss was in Razorbill, which declined by 70% between the censuses, while the greatest increase (excluding the record of two individual Puffins), was of Lesser Black-backed Gull (1,200% increase since 2000, Table 5).

Table 5: Count of seabird species surveyed in May and June 2021 on the north Antrim coast between Runkerry and Murlough. Species are ordered from top to bottom on their proportional contribution to the total breeding seabird assemblage of the coastline. Percentage changes between Seabird 2000 and Seabirds Count (2021) are coloured following the Wetland Bird Survey Alerts system (Austin et al., 2019). Red – a decline in numbers of at least 50%; Orange – a decline in numbers of at least 25% but less than 50%; Grey – a decline in numbers of less than 25% or an increase of less than 33%; Pale Blue – an increase in numbers of at least 33% but less than 100%; Dark Blue – an increase in numbers of at least 100%. AON = Apparently Occupied Nests, AOS = Apparently Occupied Sites, AOT = Apparently Occupied Territories, IND = Individuals.

Species (by order of highest abundance)	Count	Percentage of north coast total	Direction of abundance change Seabird 2000 – Seabirds Count (%)
Fulmar	1,152 AOS	30	-25
Guillemot	981 IND	25	57
Kittiwake	792 AON	21	-10
Razorbill	582 IND	15	-70
Cormorant	139 AON	4	-60
Lesser Black-backed Gull	91 AON/AOT	2	1200
Herring Gull	82 AON/AOT	2	645
Shag	21 AON	1	-65
Great Black-backed Gull	7 AON/AOT	<1%	17
Puffin	2 IND	<1%	**NA

* Puffins were not observed between Runkerry and Murlough in Seabird 2000.

3.2. Species Accounts

3.2.1. Fulmar

Fulmar are Amber-listed in the Birds of Conservation Concern lists for both the UK and Ireland (Eaton et al., 2015; Gilbert et al., 2021). The recent move from Green to Amber on the Irish list was a consequence of their increased priority status at a European level (BirdLife International, 2017). While relatively stable between 1985-1988 and 1998-2002, Fulmar have been in decline at the UK-level since 1996 (JNCC 2020). Fulmar are widespread around the coast of Northern Ireland, with small numbers being found in most locations where suitable cliff habitat is available. However, the primary colonies for Fulmar are Rathlin Island, Downhill, Binevenagh, The Gobbins and Muck Island (Booth Jones, 2021). In the interval between the previous two censuses (1985-1988 to 1998-2002) Fulmar numbers increased in Northern Ireland by 69% to 5,992 AOS, however subsequent annual monitoring suggests that across the country numbers have declined (Booth Jones, 2021; JNCC, 2021). Rathlin Island has remained a large data gap for assessing Fulmar abundance and trends in Northern Ireland.

Rathlin Island

Abundance 2021

Fulmar AOS were widespread around the island (Appendix 2, Table S2.1). Nests were most abundant in the North Kebble (RA7) sector on the north west coast of the island (239 AOS), with 134 AOS also found in Skerriagh East (RA15) and 105 AOS in Altacorry (RA18). Six coastal sectors did not contain any Fulmar AOS.

Trend

Between the Seabird 2000 (1999) census and the Seabirds Count (2021) census, Fulmar declined on Rathlin Island by 49% (Figure 4). However, between the 2007 and 2011 censuses of the island, Fulmar increased from 1,072 AOS to 1,518 AOS. Thus, the 2021 count of 1,038 AOS represents a return to 2007 numbers, but is 31% lower than the count of 2011.

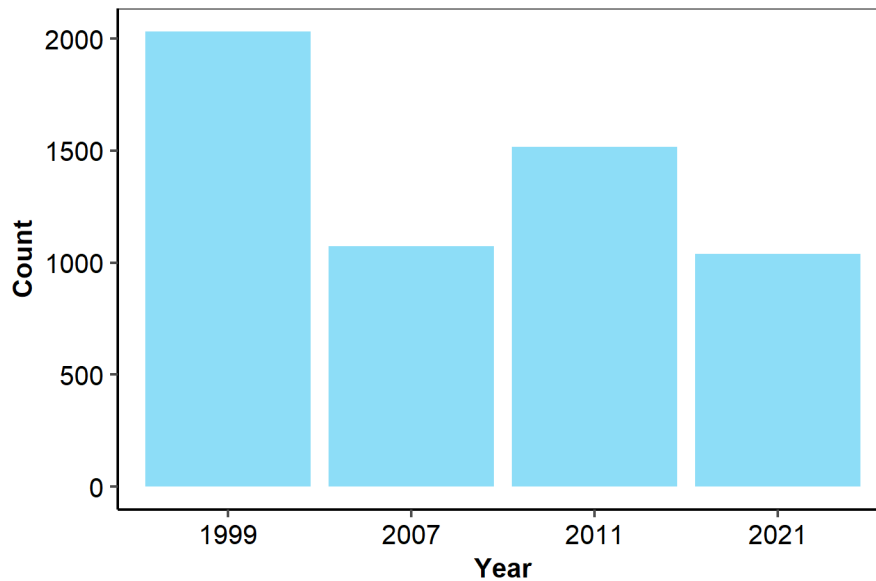


Figure 4: Rathlin Island total Fulmar AOS (Apparently Occupied Sites) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

Giant's Causeway 4 was the sub-site with the highest count of Fulmar AOS, at 191, followed by Rathlin Sound 5 (131 AOS), Giant's Causeway 1 (103 AOS) and Dunseverick (101 AOS).

Trend

Fulmar declined in the north Antrim coast region by 25% between the Seabird 2000 (1999) census and the Seabirds Count (2021) census (Figure 5). Only 173 Fulmar were counted across five sub-sites for the SCR; in particular records for Giant's Causeway sub-sites, which held many Fulmar in the following two censuses, do not exist and it is unclear whether this is a true absence or a lack of survey effort. However, at Sheep Island 45 AOS were counted, compared to 88 AOS in 2000, and 61 in 2021.

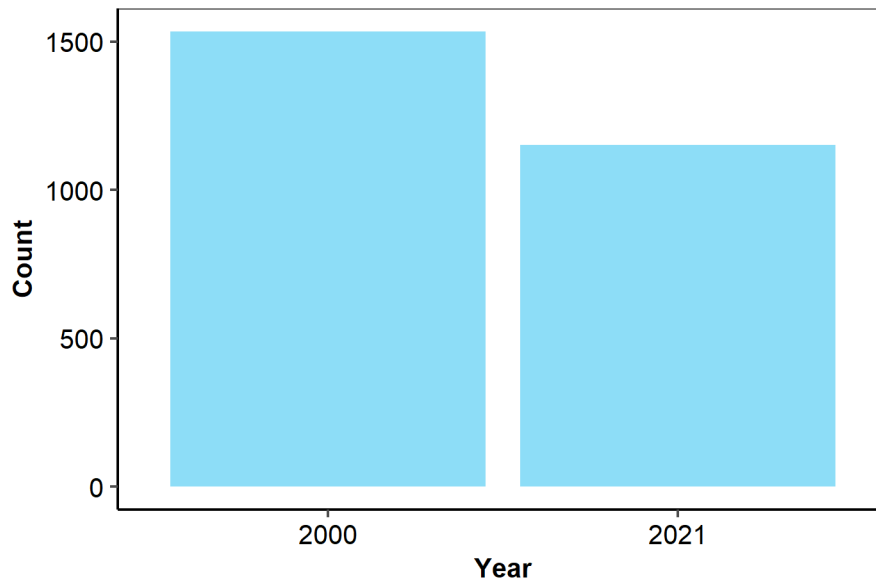


Figure 5: North Antrim coast total Fulmar AOS (Apparently Occupied Sites) counted in the Seabird 2000 (1999) and Seabirds Count (2021) censuses.

3.2.2. Cormorant

While Green-listed in the UK Birds of Conservation Concern list (Eaton et al., 2015), Cormorant are Amber-listed in the Ireland list because 50% of the Irish breeding population is restricted to 10 or fewer sites (Gilbert et al., 2021). At the UK-level, Cormorant numbers increased in the 1990s such that by Seabird 2000 numbers were 10% above those of the previous census (1986-1987), and this may be partly due to increases in inland breeding colonies of the European sub-species (*Phalacrocorax carbo sinensis*), while coastal colonies (of *P. c. carbo*) have mainly remained stable (JNCC, 2021; Mitchell et al., 2004).

There are no inland breeding colonies of Cormorant in Northern Ireland, and in contrast to trends observed between the previous two censuses across the UK, Cormorants declined by 10% between the 1985-1988 and 1998-2002 censuses in Northern Ireland (Booth Jones, 2021). The primary colonies for Cormorant in Northern Ireland are on Bird Island, Strangford Lough, Co. Down and Sheep Island, Co. Antrim (Booth Jones, 2021). Numbers of Cormorants reached a peak on Bird Island in 2005 and have since declined, while long-term monitoring of Sheep Island has recorded a decline followed by stabilisation since 2015 (Booth Jones, 2021). The Sheep Island colony likely exchanges individuals with the nearby satellite population on the Skerries, which acquired a breeding colony of Cormorants around 2010 (when it peaked at 163 AON), and possibly also with a colony in Inishowen in Co. Donegal, Republic of Ireland, although due to the lack of ringing records, this cannot be confirmed (Booth Jones, 2021).

Rathlin Island

Cormorants are currently not a breeding species on Rathlin Island.

North Antrim coast

Abundance 2021

The only breeding location of Cormorants on the north Antrim coastline between Runkerry and Murlough is on Sheep Island (Appendix 3, Table S3.2.). In 2021, Cormorants were counted with the aid of a drone, and 139 AON were observed.

Trend

Boat-based surveys of breeding Cormorants on Sheep Island are conducted on a near-annual basis by NIEA, but views are restricted without access to a vantage point. The last boat-based survey of Sheep Island took place in 2018 and found 88 AON. However, the Seabird 2000 count of Sheep Island, made in 1999, was land-based and found 344 AON (Figure 6). In 1985, there were 380 AON on Sheep Island. While the most recent census total of 139 AON represents a 60% decline on the previous census, it is difficult to estimate the effect of the different count methods on the total number of nests counted. Apparent declines at Sheep Island may also be the result of a redistribution of individuals to the Skerries and further afield (see Discussion).

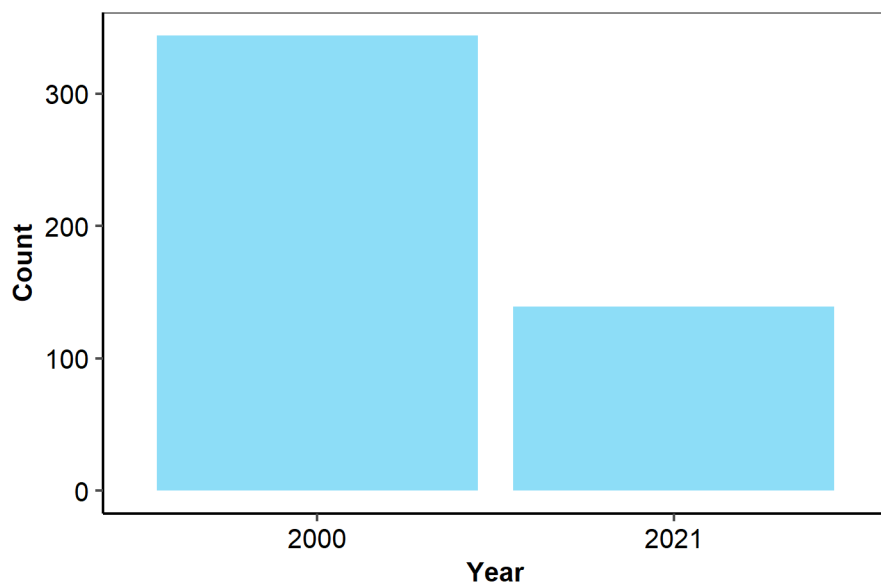


Figure 6: North Antrim coast Cormorant AON (Apparently Occupied Nests) counted in the Seabird 2000 (2000) and Seabirds Count (2021) censuses.

3.2.3. Shag

While serious declines resulted in Shag being Red-listed in the Birds of Conservation Concern list for the UK (Eaton et al., 2015), this species is only Amber-listed in Ireland (Gilbert et al., 2021), where declines have historically been less severe. The 37% drop in the UK breeding abundance observed between 1986 and 2018 is thought to be driven by population declines in Scotland, while trends in England and Wales appear to be more stable (JNCC, 2021).

Shags are predominantly a breeding species of Co. Antrim in Northern Ireland, with concentrations on the Maidens, Muck Island, the Gobbins, Sheep Island and Rathlin Island (Booth Jones, 2021). Between the 1985-1988 and 1998-2002 censuses, Shag declined by 32% (JNCC, 2021). However, in more recent years Shags have increased at various sites around Northern Ireland (particularly at Muck Island, where numbers have increased by 520% to 31 AON since 2000) and have also been recorded at new locations since 2013 (Booth Jones, 2021).

Rathlin Island

Abundance 2021

Only five of the 25 census sectors on Rathlin Island held Shag AON in 2021 (Appendix 2, Table S2.2.), and of these the majority (76%) were found in Rue West (RA21). In total 74 AON were recorded on the island.

Trend

Since Seabird 2000 (58 AON), Shag numbers on Rathlin Island remained fairly stable between the two censuses in 2007 and 2011, if at a slightly lower total (46 and 47 AON, respectively). However, the most recent census in 2021 (74 AON) shows a 57% increase since 2011, and a 28% increase over the Seabird 2000 count (Figure 7). The count in 1985 was 109 AON, therefore while numbers have increased in recent years, they remain below the historical record.

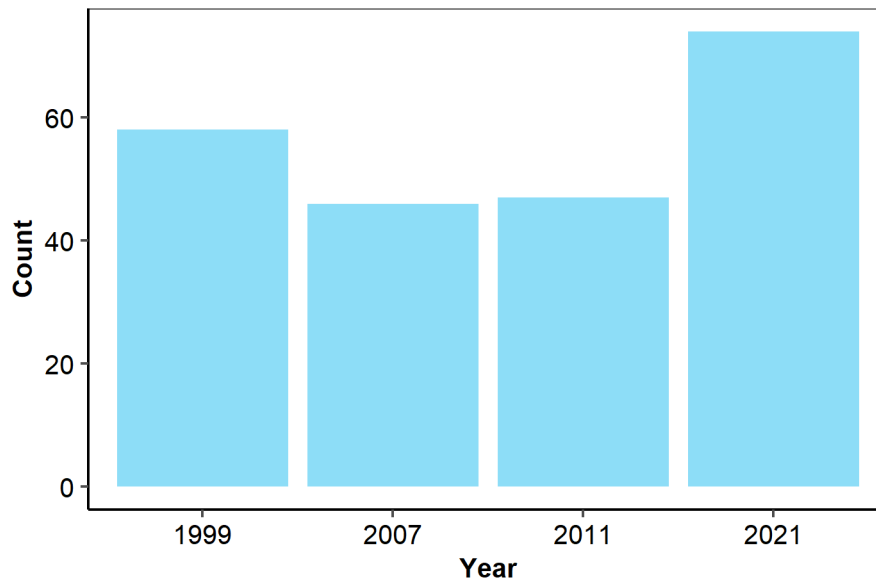


Figure 7: Rathlin Island total Shag AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

Shags were observed at five sub-sites along the north coast in 2021: Rathlin Sound 1, Rathlin Sound 5, Carrick-a-Rede, Larrybane 2 and Sheep Island, and in all of these sub-sites the nests were difficult to observe resulting in counts of individuals being made (5, 5, 1 and 3 IND, respectively). At the primary Shag colony on the north coast, Sheep Island, 21 AON were observed in addition to 22 IND, where birds were present but could not be seen to be associated with a nest.

Trend

Due to the difficulty in observing nests, a comparison of the total numbers in the coastal area is not available. Sixty AON were counted on Sheep Island in 2000, therefore the count of 21 AON in 2021 represents a 65% decline, if the IND observed in 2021 were not associated with nests. Across all sub-sites, the decline was 76% (Appendix 3, Table S3.3.).

3.2.4. Great Skua

Great Skua are Amber-listed in both the UK and Ireland lists (Eaton et al., 2015; Gilbert et al., 2021) and have increased in the UK by 148% between the 1969-1970 and 1985-1988 censuses and by 26% by Seabird 2000 (JNCC, 2021). Great Skua are a rare breeding species in Northern Ireland, with the only known breeding pair occurring annually since 2011 on Rathlin Island.

Rathlin Island

Abundance 2021

Due to the low number of Great Skua on Rathlin Island, surveyors recorded the presence of skuas opportunistically during the survey of other species. Two pairs were observed displaying on the 26th May in North Kebble (RA7), while on the 27th May three individuals were observed between Altachuile and Cantruan (RA16 and 17), and one in Killeaney (RA22). Surveyors therefore estimated that there were at least two AOT on the island, with other individuals potentially present.

Trend

Since 2011 there has been a single AOT recorded on the island, therefore the 2021 estimate of two AOT is an increase on this.

North Antrim coast

No Great Skua were recorded in this area.

3.2.5. Kittiwake

The Kittiwake's recent move from Amber-listed to Red-listed in Ireland was due to the increased global threat status of the species, now classed as Globally Vulnerable (Gilbert et al., 2021), resulting in it now being Red-listed in both the UK and Ireland (Eaton et al., 2015; Gilbert et al., 2021). Around the UK, Kittiwake numbers declined between the last census periods by 25% (Mitchell et al., 2004), while annual monitoring of sample sites suggests that there was a further decline of 50% between 2000 and 2018 (JNCC, 2021). Despite these broader-scale declines, the Northern Irish population of Kittiwake appears to have remained more stable and small colonies are widespread around the coast (Booth Jones, 2021). Between the previous two censuses (1985-1988 to 1998-2002) Kittiwake numbers increased in Northern Ireland by 30% to 13,060 AON (JNCC, 2021). The largest concentration of Kittiwake in Northern Ireland is found on Rathlin Island.

Rathlin Island

Abundance 2021

The total Kittiwake count for 2021 was 13,706 AON. Kittiwake were fairly widespread around the coast of Rathlin (Appendix 2, Table 2.3.), although absent in seven of the 23 coastal census sectors. The largest numbers were recorded in West Kebble (RA2, 2,685 AON), North Kebble (RA7, 2654 AON), Tunny (RA14, 1,717 AON) and Skerriagh East (RA15, 1,975 AON).

Trend

Between the Seabird 2000 (1999) census and the Seabirds Count (2021) census, Kittiwake increased on Rathlin Island by 38% (Figure 8). Kittiwake numbers remained approximately the same in 2007 before dropping slightly in 2011, meaning that the increase in the short-term (2011 – 2021) was larger, at 73%.

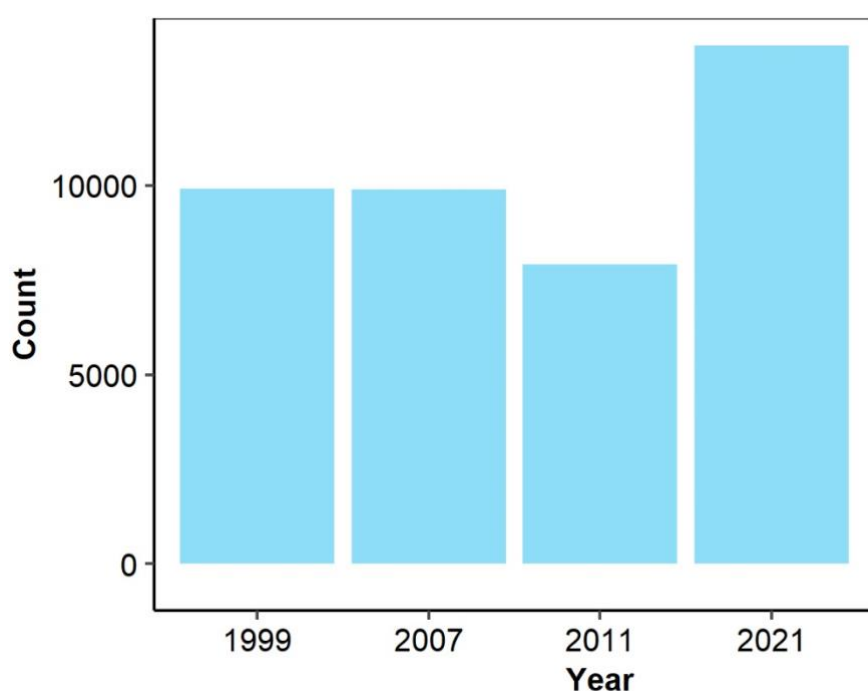


Figure 8: Rathlin Island total Kittiwake AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

Kittiwake colonies were observed in three sub-sites of the north Antrim coast (Appendix 3, Table S3.4): Carrick-a-Rede (277 AON), Larrybane 2 (285 AON) and Sheep Island (230 AON).

Trend

Only two sub-sites (Carrick-a-Rede 568 AON, and Sheep Island 316 AON) contained Kittiwake in the Seabird 2000 census, and none were observed in Larrybane 2. However, in total there was a 10% decline between Seabird 2000 and 2021 (Figure 9). Kittiwake were also recorded at Sheep Island 1985 (although not elsewhere), when the population was 283 AON, therefore at this sub-site there has been very little change in Kittiwake numbers.

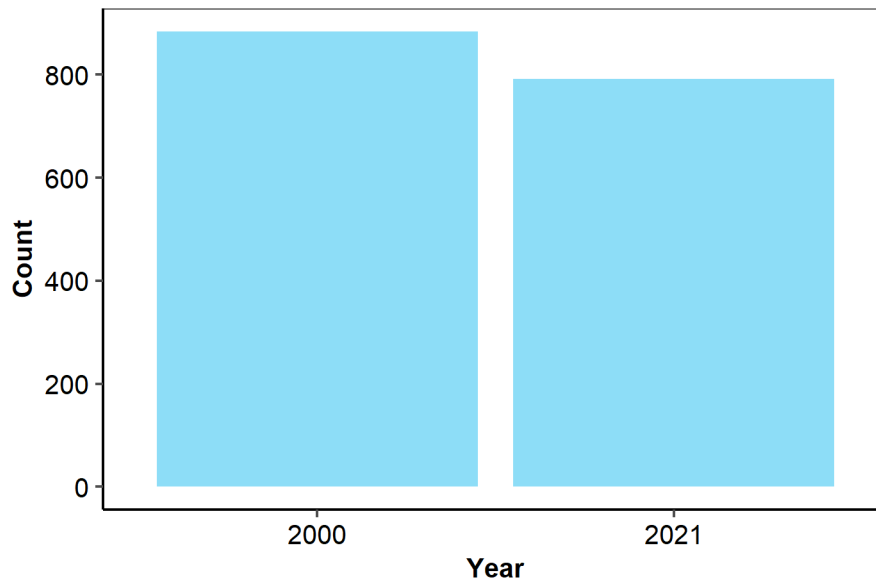


Figure 9: North Antrim coast Kittiwake AON (Apparently Occupied Nests) counted in the Seabird 2000 (2000) and Seabirds Count (2021) censuses.

3.2.6. Black-headed Gull

Black-headed Gulls are Amber-listed in both the UK and Ireland, after a recent downgrade from Red in Ireland due to a slow-down in declines (Eaton et al., 2015; Gilbert et al., 2021). As the species commonly breeds inland, censuses prior to Seabird 2000 provided incomplete coverage of colonies and therefore it is difficult to estimate how populations may have changed in the latter part of the 20th century. However, monitoring since Seabird 2000 suggests that since then there has been a 32% population increase across the UK (JNCC, 2021). While a widespread species in the UK, Black-headed Gulls are more restricted on the island of Ireland, with the largest breeding colonies being found in Northern Ireland, particularly at Strangford Lough, Belfast Lough, Larne Lough, Lough Neagh and Lower Lough Erne. Considering coastal colonies only, for which counts were the most comparable, it is estimated that Black-headed Gulls declined by 12% in Northern Ireland between the previous two censuses (1985-1988 to 1998-2002) (JNCC, 2021).

Rathlin Island

Abundance 2021

While historically Black-headed Gulls have bred in West Keble (RA2), Rue East (RA20), Brockley (RA24) and Shandragh (RA25), only Rue East held any breeding pairs in 2021 (5 AON).

Trend

Formerly, the inland sites of Brockley and Shandragh held colonies of breeding Black-headed Gulls (Appendix 2, Table S2.4.) totalling 383 AON. However, in all subsequent censuses the

numbers have declined (Figure 10), resulting in a long-term decline of 99% and short-term decline of 55%.

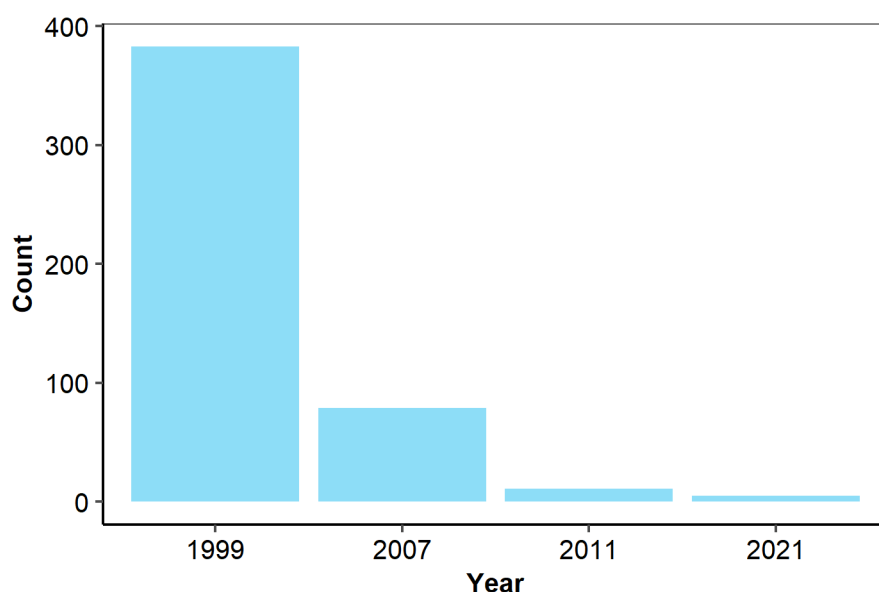


Figure 10: Rathlin Island total Black-headed Gull AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

No Black-headed Gulls were recorded in this area.

3.2.7. Common Gull

Common Gulls are Amber-listed in both the UK and Ireland (Eaton et al., 2015; Gilbert et al., 2021). In the UK, they are primarily a Scottish species and over 50% of the breeding population recorded in Seabird 2000 nested inland (Mitchell *et al.*, 2004). Similarly to Black-headed Gulls, incomplete coverage of inland colonies in historical censuses prohibit a comprehensive estimate of UK population change prior to 2000. Common Gulls are not in fact a common breeding species in Northern Ireland, however between the previous two censuses the total number of coastal nesters increased by 99% to 383 AON (JNCC, 2021). The greatest numbers of Common Gulls are traditionally found on the Copeland Islands, Strangford Lough and inland at Lower Lough Erne (Booth Jones 2021).

Rathlin Island

Abundance 2021

In 2021, 69 AON were recorded in Rue East, which is the usual location of Rathlin Island's Common Gulls, and none were recorded outside this sector (Appendix 2, Table S2.5.).

Trend

Over the long-term, Common Gull numbers have remained very stable (8% increase between Seabird 2000 and Seabirds Count). Prior to Seabird 2000 the census count in 1985 was 64 AON, which was the count observed in 2000 and 2007 also. However, the 2011 census found numbers had risen to 94 AON (Figure 11). Since this record, numbers have declined to previous levels resulting in a short-term decline of 26%.

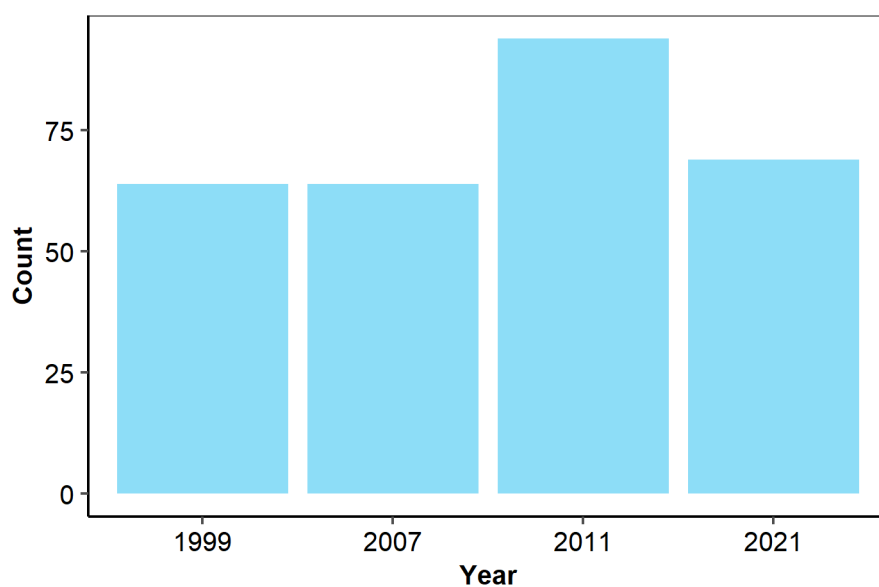


Figure 11: Rathlin Island total Common Gull AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

No counts of Common Gull AON were recorded in this area, however 16 AOT were estimated to be present at Ballintoy and 3 AOT at Murlough.

Trend

No Common Gulls were recorded breeding along the north Antrim coast in Seabird 2000.

3.2.8. Lesser Black-backed Gull

Lesser Black-backed Gulls are Amber-listed in both the UK and Ireland (Eaton et al., 2015; Gilbert et al., 2021). Their adoption of inland urban nesting in the 20th century has made them historically difficult to census, and therefore UK population estimates and estimates of trends are incomplete prior to the Seabird 2000 census (JNCC, 2021). At the UK-level, coastal Lesser Black-backed Gulls increased by 40% between the previous two censuses (1985-1988 to 1998-2002), however breeding abundance appears to have been in steady decline since the late

1990s (JNCC 2021). Lesser Black-backed Gulls are very widespread in Northern Ireland, with the largest colonies being found at Strangford Lough and the Copeland Islands, and inland at Lower Lough Erne and Lough Neagh (Booth Jones 2021). The natural-nesting population of Lesser Black-backed Gulls increased between the previous two censuses by 131% to 1,033 AON in Seabird 2000. Numbers of urban-nesting Lesser Black-backed Gulls have increased in central Belfast since the last census (Booth Jones 2021, Booth Jones et al.), and it is likely that unrecorded concentrations of urban nesting gulls exist elsewhere in the region.

Rathlin Island

Abundance 2021

Lesser Black-backed Gulls nested in six of the 25 census sectors on Rathlin Island (Appendix 2, Table S2.6.), with the highest number (332 AON) being recorded in Inanvane (RA11), representing 64% of the total population of the island.

Trend

Lesser Black-backed Gulls have undergone a large population increase over both the long-term (2000-2021, 309%) and short-term (2011-2021, 263%), despite experiencing a low of 36 AON in the 2007 census (Figure 12). However, they no longer nest inland at Shandragh (RA25) where all the nests were recorded in Seabird 2000 (Appendix 2, Table S2.6.).

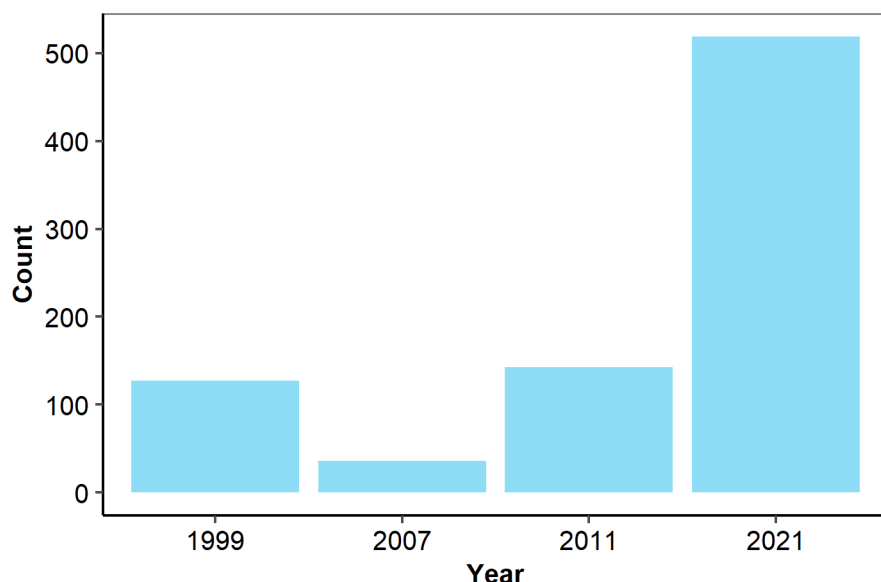


Figure 12: Rathlin Island total Lesser Black-backed Gull AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

Ninety-one AON/AOT (AOT recorded where nests were not directly visible) were recorded along the north Antrim coast, with the majority of these (97%) located on Sheep Island (Appendix 3, Table S3.5.). Lesser Black-backed Gulls were only observed nesting at two other sub-sites (Rathlin Sound 5 and Carrick-a-Rede), although two individuals were also recorded at Murlough.

Trend

Very few (7 AON/AOT) Lesser Black-backed Gulls were recorded in the area at two sub-sites (Sheep Island and Ballintoy) during Seabird 2000 (Figure 13), therefore the count of 91 AON/AOT in 2021 represents a 1200% increase. However, better coverage of Sheep Island using the drone in 2021 may explain some of the increase from low numbers recorded on the island (estimated at 3 AOT) in the survey of 2000.

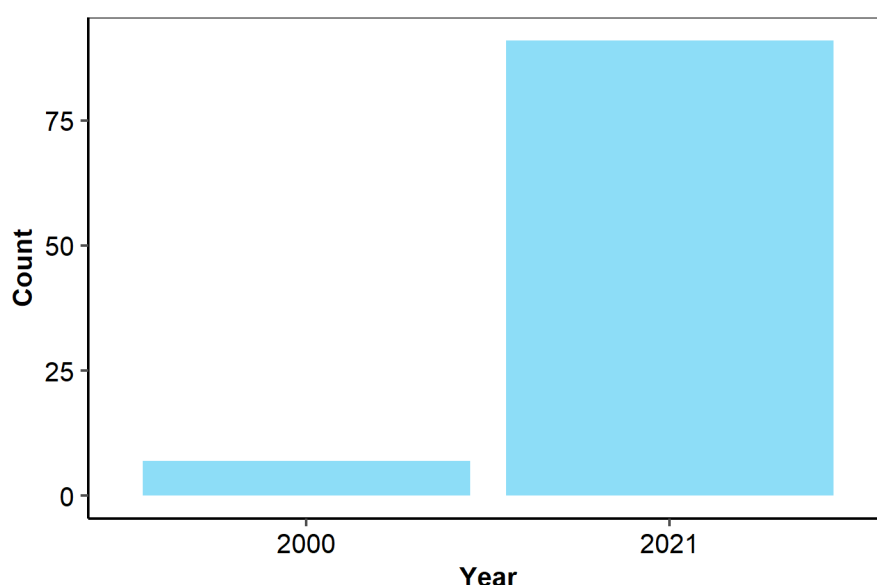


Figure 13: North Antrim coast Lesser Black-backed Gull AON/AOT (Apparently Occupied Nests and Apparently Occupied Territories) counted in the Seabird 2000 (1999) and Seabirds Count (2021) censuses.

3.2.9. Herring Gull

Due to a slow-down in declines in recent years, the Herring Gull has been downgraded from Red-listed to Amber-listed in Ireland (Gilbert et al., 2021), however it currently remains Red-listed in the UK (Eaton et al., 2015). In the UK, Herring Gulls underwent a 13% decline between the previous two censuses (1985-1988 to 1998-2002), and the index of breeding abundance has continued to decline in Great Britain since Seabird 2000, driven by English and Scottish trends (JNCC, 2021). Herring Gulls suffered a far greater decline between the previous two censuses in Northern Ireland, reducing in number by 96% to 709 AON. The main colonies of Herring Gulls in Northern Ireland are on the Copeland Islands and in Strangford Lough, while smaller colonies occur on Rathlin Island, Burial Island, Muck Island and the Skerries (Booth

Jones 2021). Long-term monitoring at Strangford Lough reveals that the population there has steadily recovered since a low point in 2002. Roof-nesting is less common in Herring Gulls than Lesser Black-backed Gulls in Belfast (Booth Jones *et al.*, 2022), however these urban populations have also increased since the last census, and there are likely to be other urban colonies uncounted in the region (Booth Jones 2021).

Rathlin Island

Abundance 2021

Herring Gulls were recorded nesting in seven of the 25 count sectors on Rathlin Island (Appendix 2, Table S2.7.), with the greatest proportion of the 83 AON total being found in Inanvane (RA11, 34%), Altachuile (RA16, 22%) and Altacorry (RA18, 36%).

Trend

Since Seabird 2000, Herring Gulls have increased on Rathlin by 493%, and by 196% between 2011 and 2021 (Figure 14). During Seabird 2000 the entire population was located inland at Shandragh (RA25), however they are no longer found here. Prior to the huge decline that preceded the Seabird 2000 census, the population of Herring Gulls on Rathlin was recorded as 4,037 AOT in 1985. Therefore, while increases over the last 20 years seem large, the population is currently only 2% of the 1985 record.

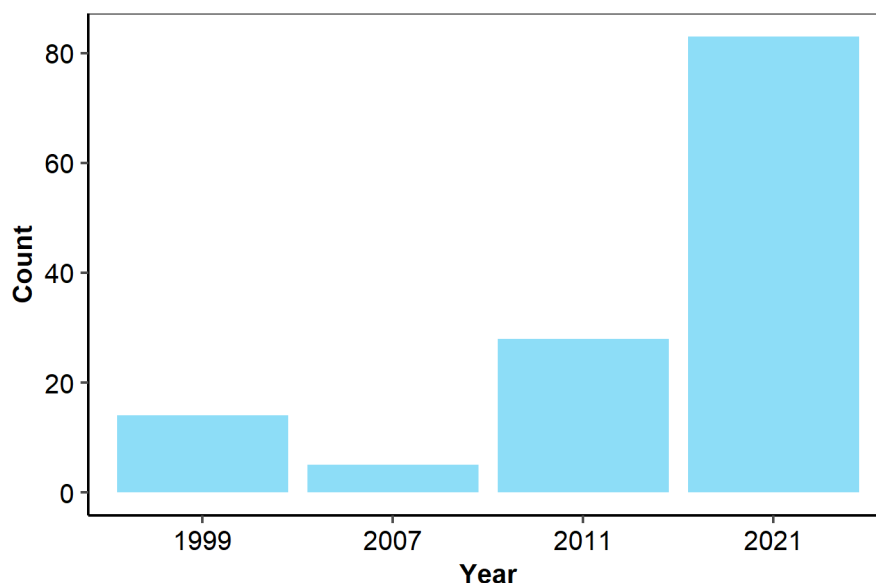


Figure 14: Rathlin Island total Herring Gull AON (Apparently Occupied Nests) counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

A total of 82 AON/AOT were recorded at six of the 26 sub-sites along the north coast (Appendix 3, Table S3.6.). Sheep Island was the largest colony, representing 67% of the 2021 counts in the area.

Trend

Between Seabird 2000 and Seabirds Count, Herring Gull increased by 645% along the north coast. In particular, the numbers observed on Sheep Island increased from 2 to 55 AOT, which may in part be due to better coverage using the drone in 2021.

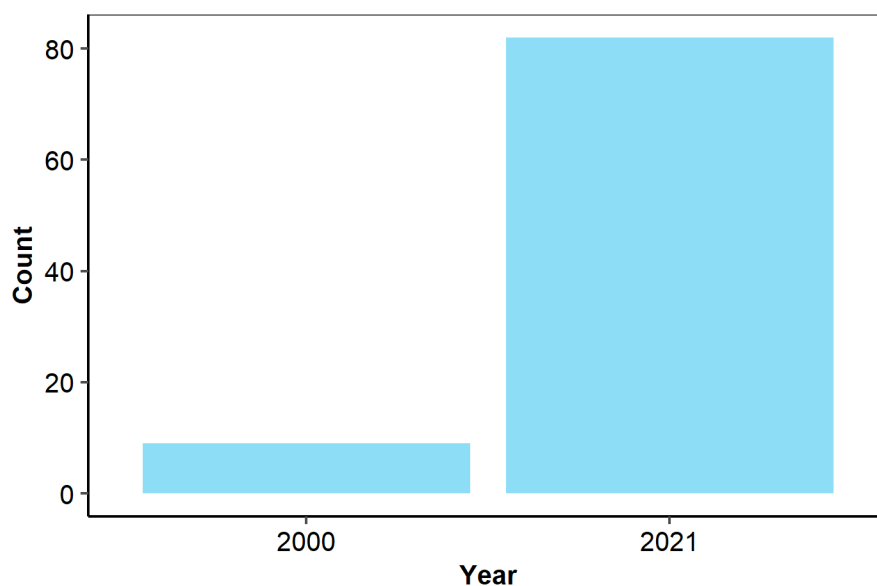


Figure 15: North Antrim coast Herring Gull AON/AOT (Apparently Occupied Nests and Apparently Occupied Territories) counted in the Seabird 2000 (2000) and Seabirds Count (2021) censuses.

3.2.10. Great Black-backed Gull

While the Great Black-backed Gull is currently Amber-listed in the UK (Eaton et al., 2015), the apparent doubling of the Northern Irish population and an increase of 38% in the Republic of Ireland since the last census (1998-2002, JNCC, 2021) has resulted in their conservation status being downgraded to Green on the island of Ireland (Gilbert et al., 2021). While Great Black-backed Gulls were nearly extinct as a breeding species in Great Britain at the end of the 19th century, their range and abundance increased during the 20th century and since 1969-1970 numbers have remained stable across the censuses (Mitchel et al., 2004, JNCC, 2021). The most significant aggregations of Great Black-backed Gulls in Northern Ireland are found in Co. Down at Great Minnis's Island, Strangford Lough and Burial Island, Outer Ards, however they are widespread around the coast.

Rathlin Island

Abundance 2021

Twelve Great Black-backed Gull AON were observed on Rathlin Island in 2021 (Appendix 2, Table S2.8.). These occurred in low densities in six of the census sectors, with a maximum of 3 AON found per sector, at Inanvane (RA11) and Altacorry (RA18).

Trend

Since Seabird 2000 there has been a 300% increase in the number of breeding pairs of Great Black-backed Gulls on the island, and a 50% increase since the 2011 census. The location of nests appears to be quite variable, with only two of the six occupied sectors in 2021 having previously hosted Great Black-backed Gulls in the previous census, and the species no longer breeds inland at Shandragh (RA25) as it did in 1999. The census in 1985 recorded 19 AOT, therefore the current count of 12 AON shows that Great Black-backed Gulls have yet to recover to previous numbers.

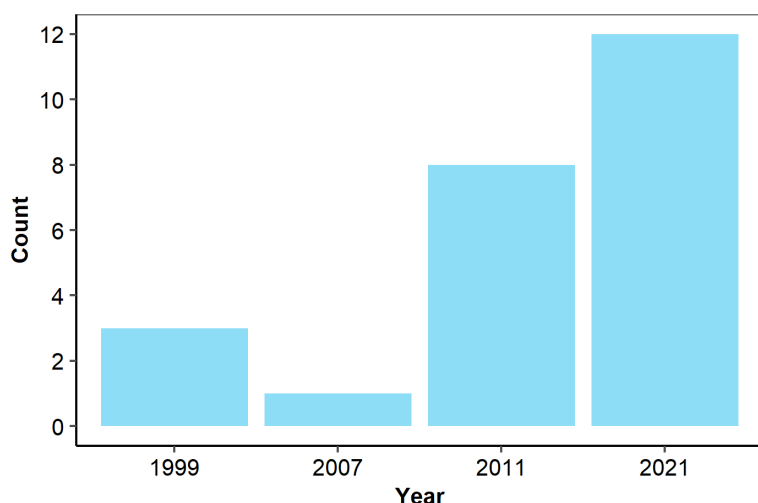


Figure 16: Rathlin Island total Great Black-backed Gull AON (Apparently Occupied Nests and Territories) counted in the Seabird 2000 (1999), 2007, 2011 and 2021 censuses.

North Antrim coast

Abundance 2021

Great Black-backed Gulls were only recorded on Sheep Island along the north Antrim coast in 2021, where 7 AOT were counted.

Trend

Since Seabird 2000, counts of Great Black-backed Gulls along the north Antrim coast have changed little (Figure 17), from 6 AON/AOT to 7 AOT, although the single AON recorded at

Carrick-a-Rede in Seabird 2000 has been lost from this sub-site. In 1985, 55 AOT were recorded on Sheep Island, therefore the count of 7 AOT in 2021 represents an 87% decline since this earlier record.

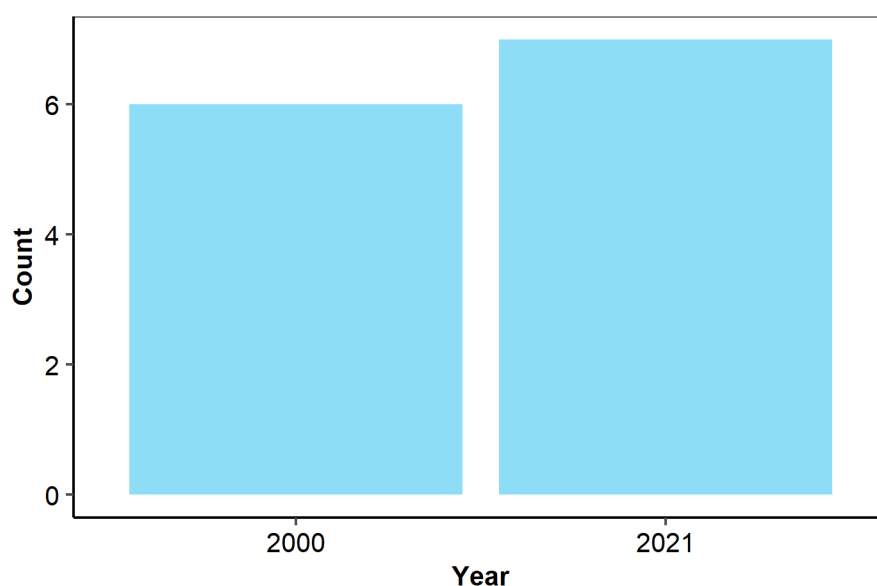


Figure 17: North Antrim coast Great Black-backed Gull AON/AOT (Apparently Occupied Nests and Apparently Occupied Territories) counted in the Seabird 2000 (2000) and Seabirds Count (2021) censuses.

3.2.11. Guillemot

Guillemots are Amber-listed in both the UK and Ireland due to their localised breeding and international importance (Eaton et al., 2015; Gilbert et al., 2021). At the UK-level, Guillemots increased by 31% between the previous two censuses (1985-1988 to 1998-2002), while annual monitoring of sample sites appears to show a continuing positive trend since the last census (JNCC, 2021). Guillemot numbers rose more sharply between the previous two censuses (1985-1988 to 1998-2002) in Northern Ireland than across the UK as a whole, increasing by 119% to 98,546 individuals (JNCC, 2021). The majority of Northern Ireland's Guillemots breed on Rathlin Island, however there are also colonies at The Gobbins, Muck Island and smaller numbers on other suitable cliffs along the north coast (Booth Jones 2021).

Rathlin Island

Abundance 2021

Guillemot were very widespread around the coastline of Rathlin, with only six of 23 coastal census sectors not holding any individuals (Appendix 2, Table S9.2.). The combined total for the island was 149,510 IND, and the sector with the largest count was North Kebble (RA7) which contained 39,334 IND.

Trend

Guillemot have increased over the long- (1999 - 2021, +56%) and short-terms (2011-2021, +15%) on Rathlin Island, and the count of 2021 represents the highest number ever recorded on the island (Figure 18).

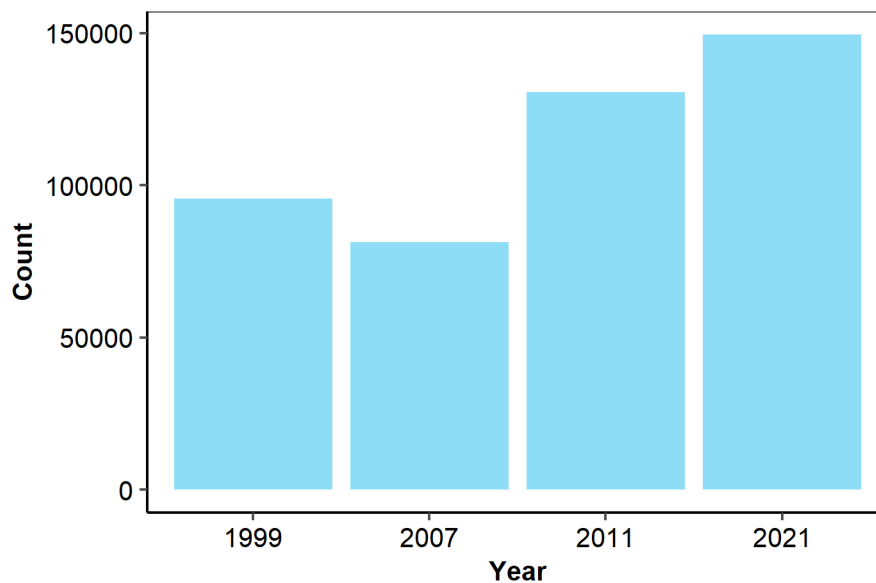


Figure 18: Rathlin Island total Guillemot individuals counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

A total of 981 breeding individuals were recorded at four sub-sites along the north Antrim coast (Appendix 3, Table S3.8): Rathlin Sound 4 (6 IND), Carrick-a-Rede (178 IND), Larrybane 2 (94 IND) and Sheep Island (703 IND).

Trend

Guillemot increased by 57% between Seabird 2000 and Seabirds Count along the north coast (Figure 19). This is a continuation of an increasing trend since 1985, when only 330 IND were recorded, all at the primary colony on Sheep Island.

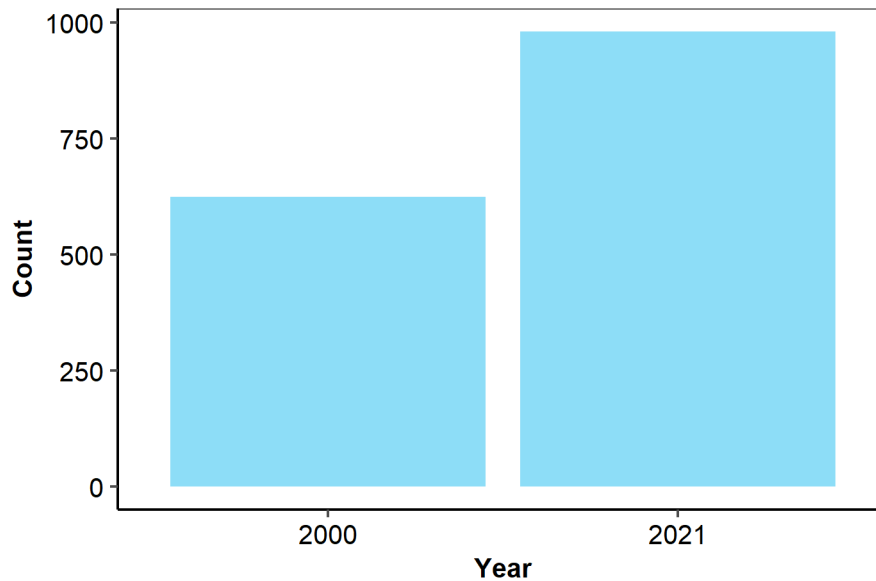


Figure 19: North Antrim coast Guillemot individuals counted in the Seabird 2000 (2000) and Seabirds Count (2021) censuses.

3.2.12. Razorbill

Due to a recent review of their European conservation status, Razorbills were upgraded to Red-listed in Ireland for 2021 (Gilbert et al., 2021) while they currently retain their Amber status at the UK-level (Eaton et al., 2015). The UK population steadily increased across the census periods, most recently increasing by 21% between 1985-1988 and 1998-2002, although abundance index trends from annual monitoring of sample sites in Scotland and Wales have fluctuated since the last census (JNCC, 2021). The Northern Irish population of Razorbill increased by 118% to 24,084 individuals between the 1985-1988 and 1998-2002 censuses (JNCC, 2021). Rathlin Island hosts the majority of Northern Ireland's Razorbills, although they also breed at The Gobbins, Muck Island and in smaller numbers at other suitable cliff sites along the north coast.

Rathlin Island

Abundance 2021

Razorbill were very widespread around Rathlin (Appendix 2, Table S2.10), with only one of the 23 coastal sectors (Rue East, RA20) not containing any individuals. Skerriagh East (RA15) was the sector with the largest count (5,669 IND) and the total count for the island was 22,421 IND.

Trend

Compared to the 1999 and 2011 counts, the number of Razorbill on Rathlin has changed little (increasing by 7% and decreasing by 2%, respectively, Figure 20). However, the 2007 count was approximately half of other recent counts, more comparable to the 1985 count of 8,922 IND.

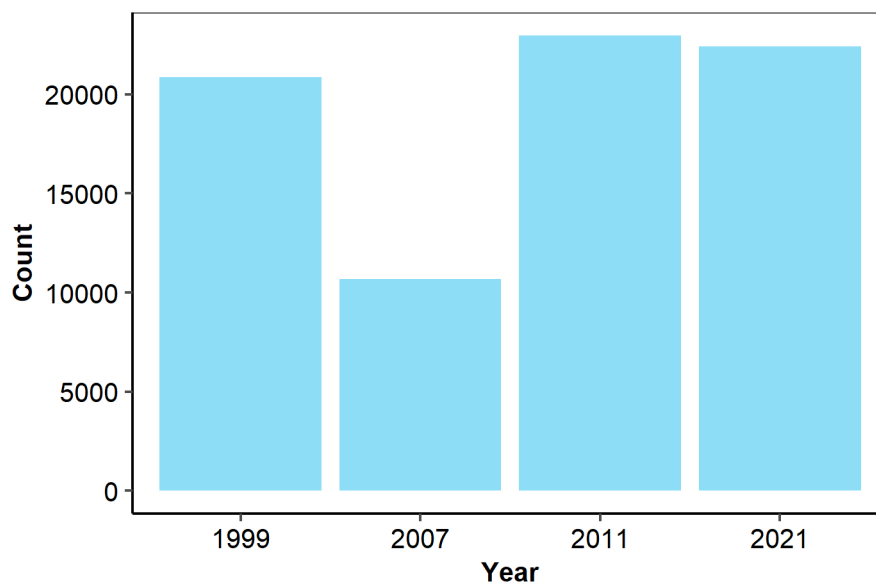


Figure 20: Rathlin Island total Razorbill individuals counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

A total of 582 IND Razorbill were counted at seven sub-sites in 2021, the largest aggregations found in Rathlin Sound 4 (23%) and Sheep Island (38%) (Appendix 3, Table S3.9.).

Trend

Between 2000 and 2021, Razorbill declined along the coastline by 70% (Figure 21). A large proportion of this loss was from Rathlin Sound 4 (-41%) and Sheep Island (-77%), while the colony of 238 IND at Rathlin Sound 6 in 2000 was absent in 2021. Previous to Seabird 2000, Sheep Island held 940 IND in 1985, therefore the 2021 count of 221 IND represents a 76% decline on this record.

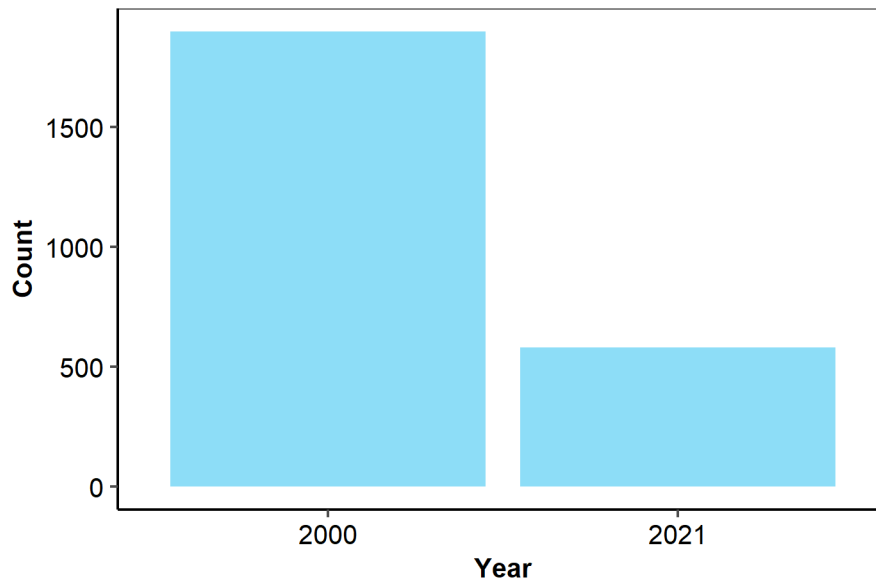


Figure 21: North Antrim coast Razorbill individuals counted in the Seabird 2000 (1999) and Seabirds Count (2021) censuses.

3.2.13. Puffin

Puffins are classified as globally Endangered on the IUCN Red-list (BirdLife International, 2017) and are Red-listed in both the UK and Ireland due to the international importance of the populations and recent range contractions (Eaton et al., 2015; Gilbert et al., 2021). Because Puffins are burrow-nesting, reliable estimates of breeding numbers are hard to obtain, and they are a difficult species to monitor. However, between 1985-1988 and 1998-2002 it is estimated that the number of Puffin AOB increased by 19% in the UK. In Northern Ireland estimates of AOB have not historically been made, and in contrast to increases observed elsewhere the count of individuals between the last two censuses was estimated to have declined by 40% (JNCC, 2021, Booth Jones 2021). Outside of the key colony on Rathlin Island, Puffins also breed at The Gobbins and are present at Muck Island and the Copeland Islands also. The recently established colony at Lighthouse Island in the Copeland archipelago appears to be increasing, although this is not formally monitored.

Rathlin Island

Abundance 2021

A total of 407 IND Puffins were observed in 12 census sectors on Rathlin. The majority (45%) of these were in North Kebble (RA7) (Appendix 2, Table S2.11).

Trend

Puffin have been in a steady decline on Rathlin Island since Seabird 2000 (Figure 22). Due to degree of difficulty in obtaining an estimate of Apparently Occupied Burrows (AOB, the preferred count unit for Puffin), counts have always historically been of individuals, and

therefore counts are associated with caveats (see Discussion). However, survey methodology has remained consistent between counts on Rathlin and therefore while the number of individuals recorded may not closely correspond with the true size of the breeding population of the island, the strongly negative trends for Puffin over the long- (1999-2021, -74%) and short-terms (2011-2021, -41%) are likely to represent true declines for the breeding population. The earliest census in 1985 recorded 2,398 IND, therefore the most recent count of 407 IND represents an 83% decline.

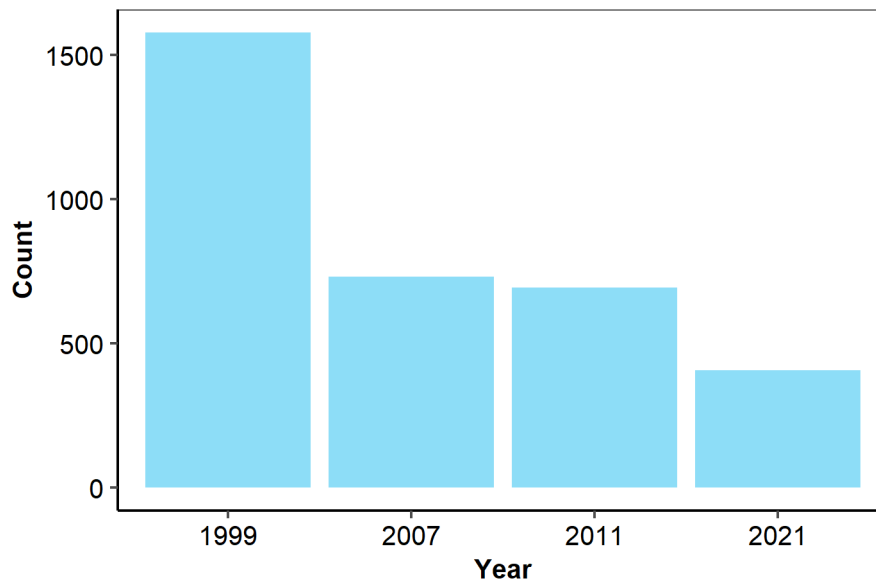


Figure 22: Rathlin Island total Puffin individuals counted in the Seabird 2000 (1999), 2007, 2011 and Seabirds Count (2021) censuses.

North Antrim coast

Abundance 2021

Only two individual Puffins were observed along the north Antrim coast in 2021, and these were both observed at Sheep Island.

Trend

The only Puffin to be observed along the north Antrim coast during the Seabird 2000 census was a record of 3 AOB at Bohesian. These were not observed during the 2021 count. Prior to this, the only record is of 3 AOB on Sheep Island in 1985.

3.3. Non-target seabird species

3.3.1. Arctic Tern

There are no Arctic Tern colonies in the areas surveyed for this report, however two individuals were observed sitting on the shore at Sheep Island.

3.3.2. Black Guillemot

The timing of Black Guillemot surveys was outside the survey period for this report. However annual volunteer monitoring of this species at its main colony on Rathlin Island (Killeaney, RA22) between 2015 and 2020 put the population at an average of 78 IND (95% CI 60-95) (Booth Jones, 2021). This represents a 62% decline on numbers recorded between 1998 and 2002 (204 IND (95% CI 196-213)).

Over the Seabirds Count census period (2015 to 2021) 13 sites were monitored for Black Guillemots between Runkerry and Murlough by volunteers, resulting in a peak count of 96 IND along this stretch of coastline (Booth Jones, 2021, Booth Jones, 2022), a 25% decline on Seabird 2000 counts.

4. Discussion

The cliff-nesting auks and Kittiwakes that make up the majority of the seabird population of Rathlin Island appeared to have thrived between the Seabird 2000 and Seabirds Count. In particular, the large Guillemot colony that made up 80% of the island's seabird population increased on the island by 56%, following an increase since the SCR census (1985) and also from more recent censuses in 2007 and 2011. Razorbills, while not increasing to the degree of Guillemots, made a small gain on the island. Large gull species also increased in between the census periods, although these were yet to return to the numbers seen prior to the Seabird 2000 census. Notable exceptions to the stability and gains observed were found in Puffins, which continued a worrying decline, and the near-extinction of Black-headed Gull as a breeding species on the island.

Trends were more positive on Rathlin (nine of 13 species had positive trends) than on the north Antrim coast (four of 11 species). Of the 13 species surveyed for this report, more species' trend directions between the two national censuses agreed between Rathlin and the north coast (five: Fulmar (-), Lesser Black-backed Gull (+), Herring Gull (+), Great Black-backed Gull (+) and Guillemot (+)), than contrasted (three: Shag (Rathlin +, north coast -), Kittiwake (Rathlin +, north coast -) and Razorbill (Rathlin +, north coast -)). In all three contrasting cases, the negative trends were observed in the north coast populations, and these were not linked to any particular sub-site – i.e. observed declines were not due to any known disruption of a particular colony.

Razorbills appeared to be doing particularly poorly (-70%) on the north coast in comparison to a moderate increase on Rathlin (+7%), which is striking since they also increased at the other primary colonies in Northern Ireland, namely Muck Island (2001 – 2021, +115%, Booth Jones, 2022) and The Gobbins (2000 – 2019, +23%, Booth Jones 2021), in addition to more broadly on the island of Ireland (Republic of Ireland trend: +23% between 2015 and 2018, JNCC, 2021). Therefore, the local declines observed in north Antrim may be due to specific issues along this area of coastline. Alternatively, while surveys of the north Antrim coast were conducted primarily by boat in 2000 using the same methodologies, count differences may be partly attributed to weather, observer and equipment differences. For example, it was noted by surveyors in 2021 that the AFBI fisheries patrol vessel used for surveys provided an exceptionally stable platform from which to count seabirds, and this may have improved the accuracy of counts over those made in previous years. However bad weather and less suitable boats in previous counts would result in undercounting rather than an overestimate, therefore the declines observed in 2021 are likely to be genuine, although the apparent scale may differ from the true extent.

Following a similar pattern to Razorbill, Kittiwake also declined slightly on the north coast (-10%) in comparison with encouraging increases on Rathlin (+38%) and at other colonies in Northern Ireland, namely Muck Island (2001 – 2021, +237%; Booth Jones, 2021, Booth Jones, 2022), The Gobbins (2000 – 2019, +45%; Booth Jones, 2022) and Maggy's Leap (2001 – 2021, +446%; Booth Jones, 2021, Booth Jones, 2022). Increases in Northern Ireland contrast with the most recently available Irish trend, which show that numbers have declined by 32% between Seabird 2000 and the most recent census (2015 – 2018, JNCC, 2021). Declines at the UK-level have largely been studied on the North Sea coast and have been linked to the

influence of climate change-driven changes in the availability of foraging resources on breeding success (reviewed in Johnston et al., 2021). On Rathlin, productivity in RSPB-monitored study plots between 2014 – 2018 was 1.18 chicks/AON, and more broadly in study colonies around the coast of Northern Ireland between 2014 – 2019 productivity was 0.93 chicks/AON (Booth Jones, 2021). This is higher than the UK average over the same time period (JNCC, 2021), although still below the 1.5 chicks/AON required to halt declines (Cook & Robinson, 2010). However, given the proximity of the north coast and Rathlin colonies, the contrasting negative north coast trend may be more explainable by local conditions than by the availability and quality of prey, and requires further study.

Shags also appeared to decline on the north Antrim coast (-76%) in contrast to an increase on Rathlin (+28%), however interpretation of this trend must be viewed with caution, since surveyors recorded counts of individuals along the north coast where nests were not visible. It is therefore likely that the total number of AON was higher than recorded. The observed decline contrasts with increasing trends observed in the smaller colonies at The Gobbins (2000 – 2019, +25%; Booth Jones 2021) and Muck Island (2001 – 2021, +3,250%; Booth Jones, 2021, *pers. comm.* Andry Crory (*Ulster Wildlife*), Booth Jones, 2022), however the major site for Shag in Northern Ireland - the Maidens, off the east Antrim coast - remains uncounted (Booth Jones 2021). Recorded population increases in Northern Ireland reflect those observed in the Republic of Ireland, where Shag numbers have increased by 45% since Seabird 2000 (JNCC, 2021).

While there were contrasts in trend direction between the survey areas as outlined above, trends for Rathlin and the north coast largely concurred and also followed trends from elsewhere in Northern Ireland, in particular for large gulls and for Guillemots, which increased between the censuses at all major colonies, and for Fulmar, which underwent serious declines around the coastline, especially along the north west coast at Downhill and Binevenagh in Co. Londonderry (-87% and -95% respectively, 2000 – 2021; Booth Jones, 2021, *pers. comm.* Richard Donaghey (NIEA), Booth Jones, 2022). Fulmar also declined elsewhere in the INTERREG VA region, in Western Scotland (JNCC, 2021). The steep declines in Northern Ireland and Western Scotland contrast dramatically with the trend observed between Seabird 2000 and the 2015 – 2018 census in numbers recorded in the Republic of Ireland, where Fulmar appeared to remain stable (JNCC, 2021). No specific study has been made of the decline in Fulmar in Northern Ireland, but while a growth in abundance and range expansion of Fulmar populations in the 20th century were supported by fisheries discards (Phillips et al., 1999), changes in fisheries practices and a decline in whitefish fisheries are thought to be the primary driver of decline at the UK-level in the last 15 years (JNCC, 2021), along with changes in foraging resource availability caused by climate change (Lewis et al., 2009; Thompson & Ollason, 2001). Fulmar are also vulnerable to longline bycatch (Fangel et al., 2015; Miles et al., 2020), a threat that remains understudied in the UK.

While trends for Guillemot and Razorbill on Rathlin were positive, Puffins have not shared the success of the cliff-nesting auks. Because they are a burrow-nesting species, Puffin are difficult to accurately survey and historically counts of Puffins in Northern Ireland have been of individuals rather than occupied burrows. Counts of individual Puffins are most representative of the breeding population if made in April, because later in the season immature non-breeders may also be present at the colony (Walsh et al., 1995). Total numbers

present at the colony are also likely to fluctuate depending on sea state, time of day, weather etc. and therefore it is recommended that counts of individuals be repeated (Miles et al., 2015). All surveying for this study took place in late May and early June, and apart from a few census sectors on Rathlin which were surveyed more than once to confirm counts, counts could only be made once within the constraints of the project. Therefore, the count of 407 IND Puffins on Rathlin (only 2 IND were observed along the north Antrim coast) may not be closely representative of the true colony size. Walsh et al. (1995) state that counts of individuals may only indicate the order of magnitude of the population. However, the survey methods used in 2021 were consistent with those previously employed between 1985 and the present (*pers. comm. Eugene Archer and Neil McCulloch 2021*; Allen et al., 2011; Allen & Mellon, 2007), therefore the trend observed since the SCR in 1985 (-83%) is likely to represent a real decline. The only other recorded Puffin colonies in Northern Ireland are at The Gobbins, where they have increased (2000 – 2019, +92% to 54 IND; Booth Jones 2021) and at the nascent colony on Lighthouse Island in the Copeland archipelago (Wolsey & Smyth, 2017). The latter was artificially established in 2012 by attracting in Puffins with calls and decoys, and up to 100 IND have been recorded in April at the colony in recent years (Booth Jones, 2021). Comparison of Northern Irish Puffin trends with other regions is limited since recent Seabirds Count census figures are as yet unpublished and only small, potentially unrepresentative sites are monitored annually (JNCC, 2021).

Puffins are thought to be particularly sensitive to the impacts of climate change (Johnston et al., 2021) and they may also be vulnerable to predation by invasive mammals (Lock, 2006; Zonfrillo, 2002). The presence of Brown Rats and Ferrets on Rathlin Island may impact burrow and crevice nesting species through the predation of eggs, chicks and even adults, and indeed mammalian predation is implicated in the extirpation of one of only two known Manx Shearwater colonies in Northern Ireland (the other being located on the Copeland Islands, which are free of Brown Rats and Ferrets). Black Guillemot, a crevice-nesting species vulnerable to land-based predation (Ewins, 1985; Johnston et al., 2019) have declined on Rathlin by 62% since the last census (Booth Jones 2021) and now appears to nest mainly high up in cliff crevices rather than in the ground-level boulders of Church Bay (*Booth Jones pers. obs. 2021*). Black-headed Gulls are another ground-nesting species that may be affected by predation (JNCC, 2021), and these have suffered near-extinction on Rathlin since Seabird 2000 (-99%), despite mixed fortunes elsewhere in Northern Ireland (Larne Lough: 2000 - 2019, +77%; Strangford Lough: 2001 – 2021 -49%; Booth Jones 2021, *pers. comm. Hugh Thurgate (National Trust), unpublished data for the Northern Ireland Seabird Report 2021*). The removal of non-native mammalian predators is therefore a priority for Rathlin Island, and the planned EU LIFE-funded Rathlin Acting for Tomorrow (LIFE Raft), project managed by RSPB (RSPB, 2021) that aims to eradicate invasive mammals, may be an important step in halting seabird declines on the island.

Sheep Island was the only SMP sub-site on the north Antrim coast to hold a SPA designation for seabirds, specifically for its nationally important breeding population of Cormorants (DAERA, 1998). Despite this protection, Cormorants appeared to decline by 60% between Seabird 2000 and Seabirds Count, while at other key colonies in Northern Ireland Cormorants varied in their trend. The Gobbins held 41 AON in 2000, but between 2015 and 2019 (within the census period) the site held between 0 and 13 AON (Booth Jones 2021), while Strangford Lough's population increased by 40% between 2000 and 2019 (Booth Jones 2021). However, some of the decline in Sheep Island's Cormorant population may be attributable to the

movement of individuals between colonies. For example, the breeding population of Cormorants on the Skerries (a small group of islands approximately 18 km to the west of Sheep Island) is thought to have established in approximately 2010 when the first records were made, and the most recent population estimate for these islands is 82 AON (*pers. comm. Richard Donaghey (NIEA) 2021, Booth Jones, 2022*). It is also thought that individuals may be exchanged with a colony in Inishowen, Co. Donegal in the Republic of Ireland (Booth Jones 2021). However, since no ringing or colour-ringing of Cormorants occurs in Northern Ireland, the movement of individuals is impossible to confirm.

5. Recommendations

The MarPAMM seabird surveys of 2021 cover a significant gap in the knowledge of Northern Ireland's seabird populations, and it will be important to cover these areas again in a consistent manner for future censuses to monitor the health of the region's seabird populations and measure the impact of management. While complete censuses of the seabird populations of Rathlin and the north Antrim coast are vital to feed into the UK- and Ireland-wide population estimates, it will also be valuable to maintain annual monitoring at sample sites to track inter-annual variations in abundance.

Rathlin Island and the north Antrim coast are both challenging stretches of Northern Ireland's coastline to survey for seabirds because they contain cliff faces unviewable from the shore and therefore require boat-based surveys and the management of logistical elements associated with this (e.g. funding, health and safety, weather considerations, finding experienced surveyors) to achieve good coverage. Rathlin Island poses a particularly intimidating challenge, due to the added difficulty of hosting nearly 200,000 seabirds and being located offshore. Future surveys of these areas will therefore require funding to support the costs associated with employing experienced surveyors, securing boat use, providing accommodation and travel expenses and survey management. Ideally future census managers will consult with previous survey teams to ensure consistency, but due to the long periodicity of the UK-level seabird censuses, much experience and knowledge may be lost over time. The Rathlin Island survey manual will be essential to ensure future censuses are thorough and consistent, and therefore should be stored securely and accessibly. It is planned that in the short-term, the manual and accompanying images will be stored on the Marine Scotland Science online platform, but the potential for the SMP database to hold guidance on survey methods for particular sites and sub-sites should also be considered.

While digital imagery has been used in the study of seabird foraging behaviours in Northern Ireland (Lieber et al., 2021, 2019), the use of photography for surveys is a new approach for monitoring seabirds in the region, in particular the coverage of Sheep Island using a drone. Drone surveys have been trialled elsewhere on a large range of seabird species (reviewed in Edney & Wood, 2021) and have been found to be less hazardous for surveyors, may cause less disturbance to seabirds (Borrelle & Fletcher, 2017) and can be more accurate than more traditional methods (Brisson-Curadeau et al., 2017; Hodgson et al., 2018). However, by switching to new technologies for monitoring, the lack of between-survey consistency can make comparisons of abundance through time challenging without a calculated correction factor. For example, the difference in counts of all species of seabird on Sheep Island between Seabird 2000 and Seabirds Count may be attributable to the use of a drone for the 2021 survey compared to ground- and boat-based counts made in 2000, but the degree to which methods differ in their results will depend on the species and terrain involved. The use of emerging technology should therefore be considered for future monitoring in Northern Ireland, but ideally new methods should be tested alongside traditional methods to measure relative accuracy and impact on the colonies. New technologies may be particularly useful in collecting breeding success and phenology data, since these are rare or non-existent for many species in Northern Ireland. While supporting volunteers to collect this information using traditional means remains a high priority for NIEA via the role of the Northern Ireland Seabird Coordinator (a volunteer-liaison, data-management and reporting post undertaken by the

BTO), there is the potential to trial methods such as static time-lapse cameras for this purpose (e.g. De Pascalis et al., 2018).

While the results of this census highlight winners and losers in terms of abundance change, the drivers of these changes are still poorly understood in Northern Ireland. Expanding demographic monitoring, of productivity as mentioned above, and survival through general metal ringing and colour-ringing studies (such as Retrapping Adults for Survival, RAS: <https://www.bto.org/our-science/projects/ringing/surveys/ras>), as well as knowledge of at-sea distribution and diet (which is strongly linked to climate change response, Johnston et al., 2021) is fundamental to understanding the local drivers of change, particularly in contrast to more well-studied colonies on the North Sea coast. Colour-ringing (already underway for tern colonies in Larne and Strangford Lough, *pers. comm. Roisin Kearney, RSPB and Hugh Thurgate, National Trust*) would also improve knowledge on the dispersal of individuals between colonies, for example in the case of the Sheep Island Cormorants, providing context for apparent population changes.

While at-sea abundance and distribution of marine bird species can be recorded using aerial transects (Buckland et al., 2012), colony-level distributions cannot be derived from these data and therefore the use of tracking technology remains the best way of linking at-sea distribution with breeding populations (Wakefield et al., 2017). Relatively few GPS tracking studies of Northern Irish seabirds have been published to date, although there have been historical studies on Kittiwake (Chivers et al., 2012, 2013), Manx Shearwater (Dean et al., 2013, 2015, amongst others) and Black Guillemot (Shoji et al., 2015) and recently of gulls (Booth Jones et al., 2022). As part of the programme of work for MarPAMM in Northern Ireland, Black Guillemots were also tracked in 2021 providing insight into their breeding season foraging range, habitat use and diving characteristics (unpublished report to MarPAMM⁴). Not only do tracking data help to provide context to abundance changes, details of potentially important local habitats for seabirds both within and beyond the breeding season, and relative exposure to potential areas of threat (Bolton et al., 2019; Pollock et al., 2021) but they can also be included in multispecies meta-analyses to contribute to the designation of MPAs (T. E. Davies et al., 2021).

The completion of the Rathlin Island and north Antrim coast Seabirds Count census provides fundamental baseline data to contribute to MarPAMM's aim to improve the management and monitoring of protected coastal marine environments in Northern Ireland, Ireland and Western Scotland. However, to capitalise on the information provided here, it will be vital to address gaps linking population change to demographic processes, i.e. colony-level breeding success and survival, at-sea distribution and diet, while research into the impacts of specific threats such as development, pollution, invasive species, bycatch, overfishing, disturbance and climate change (Dias et al., 2019) on Northern Ireland's seabirds should also be a priority for the future.

Acknowledgements

Eugene Archer provided invaluable experience and advice on Rathlin surveys from lockdown in France; without his expertise, now thankfully assimilated into the count manual in Appendix 1, the Rathlin surveys would have been hugely more difficult and less consistent. Thanks to AFBI and David Eccles, the skipper of the AFBI's fisheries patrol vessel the *Queen of Ulster* for providing last-minute survey support for the north coast counts.

We are also indebted to Naomi Wilson (AFBI) and Heidi Mellan (BTO) for managing the financial aspects of the project and to Sam Massimino (BTO) for providing detailed H&S support during a pandemic.

The Project Steering Group, consisting of Katherine Booth Jones (BTO), Niall Burton (BTO), Liz Humphreys (BTO), James Pearce-Higgins (BTO), Naomi Wilson (AFBI), Tom Evans (MSS), Richard Howells (MSS), Anne Saunders (MSS), Chelsea Ward (MSS), Neil McCulloch (NIEA), Gillian Gilbert (RSPB), Kendrew Colhoun (AFBI) and Dave Allen (Allen & Mellon), provided planning support and advice to the project throughout. In particular, I would like to thank Dave Allen, Neil McCulloch, Niall Burton, Liz Humphreys, Tom Evans, Rich Howells and Chelsea Ward for providing helpful comments on the draft report.

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Appendix 1: Rathlin Island Seabird Count Manual



Rathlin Island Seabird Count Manual

1 Introduction

This manual utilises the experience of all those who have counted the Rathlin Island seabird colony in 1999, 2007, 2011 and 2021. It builds on, refines and amends the notes produced in 2011.

The authorship is as follows:

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2 Overview

This guidance document has been prepared on completion of the 2021 survey, as a compilation of information, ideas, photos and experiences from previous surveys, to help guide future surveyors.

- Best efforts have been made to provide maps and photos of all boundaries, as accurately as possible.
- Maps in this document have used Spatial NI and Big Maps, not under licence.
- This is a private document for internal use only. It is not to be published in the public domain in any way.
- The information is provided in Table 1 and the attached Appendices.
- The original count sections are those tagged 'RA', e.g. RA1, RA2. The lettered subsections were added in 2011 as a single boat observer was carrying out all counting and recording, dividing some sites into subsections made this task easier. Going forward it is recommended that these subsections are still used, but it is the total count for each 'RA' section which can be used for comparative purposes.
- Previous "RA" section count data gives future counters a good vision as to what to expect in each section.
- Experience at Rathlin and other sites strongly suggests that, unless a land-based survey site is 'straight-on' at 90 degrees to the cliff, birds will be missed, and a boat survey is preferred wherever possible.
- In general gulls other than Kittiwake are always counted from the land.
- The count will never be complete as some birds on difficult to see ledges will never be counted accurately. Counters should always err on the side of caution and take care not to over-estimate numbers.
- Following the count it is important that all counters share and discuss the data, especially areas of possible overlap. If necessary, a recount of queried sections should be undertaken.

3 Methods

The recommended method for each section and sub-section is listed in Table 1 below. Table 1 should be used in conjunction with the 90 Appendices, which show count sections as viewed from the land and sea, and as top-down maps.

This manual should be used for any future modifications to methods. The RA site boundaries must not be changed as this will affect year on year comparisons.

With reference to the maps in the Supplementary Material – Rathlin Count Manual Appendices, red indicates sections to be counted from the sea by boat; green sections should be counted from the land.

Table S1: Section & sub-section recommended count methods and notes.

Site Code	Site Name	Sub-site	Main site - Start Grid	Main site - End Grid	Surveyed from	Usual species	Notes
RA1	Corraghy		D102507	D094508	Boat only		
RA2	West Kebble		D094508	D093517	Boat and Land	ALL	Almost all from the boat.
	West Kebble	A			Boat		
	West Kebble	B1			Boat		
	West Kebble	B2			Land		
	West Kebble	C			Boat		
	West Kebble	D			Boat		
	West Kebble	E			Boat		
	West Kebble	F			Boat		
	West Kebble	G			Land		Lake.
	West Kebble	H			Boat		Added post-2021 survey. There have not been any birds recorded in this area but added for completeness.
	West Kebble	I			Boat		Added post-2021 survey. There have not been any birds recorded in this area but added for completeness.
RA3	Doonmore Stack		D091513	D091513	Boat and Land	ALL	Top of stack done from both land and sea, difficult to count.

	Doonmore Stack	A			Boat		Western portion, from the sea.
	Doonmore Stack	B			Land		Examine the photo from the sea. Birds at the top breaking the skyline are visible from the land, all other birds on the seaward are hidden and are counted in 3A.
	Doonmore Stack	C			Land		The northward face of the stack.
	Doonmore Stack	D			Land		Eastern area visible from land
RA4	Stacknacally		D092514	D092514	Boat and Land	ALL	Fairly straightforward line down the middle for land/sea.
	Stacknacally	A			Boat		
	Stacknacally	B			Land		
RA5	Stackaboy		D093515	D093515	Boat only	ALL	Small stack on the raised beach at the bottom of the cliff.
RA6	Stackaniska		D092516	D092516	Boat and Land	ALL	View from several land VPs.
	Stackaniska	A			Boat		
	Stackaniska	B			Land		
RA7	North Kebble		D093517	D101524	Boat and Land	ALL	Nearly all boat, a few areas visible from land.
	North Kebble	A1			Boat		
	North Kebble	A2			Boat		
	North Kebble	B			Boat		
	North Kebble	C			Boat		
	North Kebble	D			Boat		

	North Kebble	E			Boat		Counted from the land previously but there is no reason it cannot be counted from the sea going forward. There is no straight on view from the land so birds will be missed.
	North Kebble	F			Boat		
	North Kebble	G			Boat		
	North Kebble	H			Boat		
	North Kebble	I			Land		<p>Caused confusion in 2021 and eventually counted from the sea. It is difficult from the sea though as it is a high platform. The previous mapping was inadequate. Should be counted from land again in future.</p> <p>This area is ONLY the large flat area which is visible, there are other sloping areas visible to the east but these are counted from the boat.</p>
	North Kebble	J			Land		Upper part of this cliff.
	North Kebble	K			Land		This is the bottom part of the cliff beside the lighthouse. The bank of grass acts as a dividing line between it and section J. Any birds in the grass go into K, though there are very few.
	North Kebble	L			Land		Upper cliff for Fulmars, lower for other species at the point.
	North Kebble	M			Boat and land		The western part of this is tucked into the cliff wall and must be done from the boat.
	North Kebble	N			Land		Viewable from land, from far point by scope is best.
	North Kebble	O			Land		New section added in 2021. Formerly ignored but has some Razorbills now, section added for completeness.

RA8	Stacknavarlea		D094519	D094519	Boat and Land	ALL	All from land apart from a few gullies and a face which need to be done from the boat. A large % can be done from a few land vantage points.
RA9	Stacknaderginan		D095520	D095520	Boat and Land	ALL	All from land apart from a deep cleft at the north side. A large % can be done from a few land vantage points.
RA10	Kinramer		D101524	D106525	Boat and land	ALL	There was some confusion at this site in 2021 as it was marked land and boat, but thought it could all be done from land. It was also counted from the sea in 2021 which resulted in a better count. Going forward only any gulls present should be done from the land, cliff nesters from the sea.
RA11	Inanavane		D106525	D108528	Boat and Land	ALL	All cliff nesting birds from the boat, gulls only from the land.
RA12	Altandivan		D108528	D111528	Boat	ALL	This has previously been counted from the land but it is likely birds will be missed. Count from boat next time. Or count from both and have co-ordination to work out the best approach.
RA13	Gireenan		D115528	D117531	Boat only	ALL	All species from the boat.
RA14	Tunny		D117531	D119529	Boat only	ALL	All species from the boat.

		A			Boat		
		B			Boat		
		C			Boat		
		D			Boat		
		E			Boat		
RA15	Skerriagh East		D119529	D127525	Boat and Land	ALL	Most from the boat except one large flat area of auks which is dangerous to view.
		A			Boat		
		B			Boat		
		C			Boat		
		D			Boat and land		There is a large flat area and cave which cannot be completely seen from the sea. The eastern end is difficult to see. The central and western part can mostly be seen from the boat. The eastern shelf may be visible from the land but is dangerous and was not counted in 2021. The best way forward is probably to do it all from the boat and just estimate what is hidden.
		E			Boat		
RA16	Altachuille		D127525	D141524	Boat and Land	All	All cliff nesting birds from the boat, gulls only from the land
RA17	Cantruan		D141524	D146524	Boat only	ALL	

RA18	Altacorry		D146524	D159522	Boat and Land	ALL	All cliff nesting birds from the boat. Gulls only from the land. Some potential access issues, check with Liam etc.
RA19	East Light		D159522	D164515	Boat only	ALL	The area is covered mostly by subsections A and D, with two faces of concentrated birds below the lighthouse at B and C, around the cave.
		A			Boat		
		B			Boat		Small area below lighthouse.
		C			Boat		Small area below lighthouse.
		D			Boat		
RA20	Rue East		D164515	D151472	Land Only	GULLS only	Low grassy coastline, mostly Common Gulls and a few larger gull species.
	Rue East	A			Land		
	Rue East	B			Land		
	Rue East	C			Land		
	Rue East	D			Land		
	Rue East	E			Land		Some potential access issues E-F, check with Liam etc.
	Rue East	F			Land		Some potential access issues E-F, check with Liam etc.
	Rue East	G			Land		Ushet
RA21	Rue West		D151472	D148510	Boat and Land	ALL	All cliff nesting birds from the boat, gulls only from the land. Main Shag colony.

RA22	Killeaney		D148510	D127513	Boat only	ALL	Main south side of the island. Fulmar, Razorbill, gulls in very small numbers.
RA23	Stroanlea		D127513	D102507	Boat only	None	Main south side of the island. Fulmar, Razorbill, gulls in very small numbers.
RA24	Brockley		D123525	D123526	Land Only	GULLS only	Small lake, had no birds in 2021.
RA25	Shandragh		D135515	D136515	Land Only	GULLS only	Small lake, had no birds in 2021.

Appendix 2: Rathlin Island – Species Tables

Table S2.1: Fulmar Apparently Occupied Sites on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		7	14	12	4	-43	-67
2	West Kebble		275	130	124	41	-85	-67
3	Doonmore Stack		18	2	0	6	-67	NA
4	Stacknacally		1	0	0	0	-100	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		4	1	0	0	-100	NA
7	North Kebble		248	118	413	239	-4	-42
8	Stacknavarlea		0	0	1	0	NA	-100
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		41	12	27	23	-44	-15
11	Inanvane		1	10	4	6	500	50
12	Altandivan		56	18	57	56	0	-2
13	Greenan		46	2	38	5	-89	-87
14	Tunny		51	24	67	71	39	6
15	Skerriagh East		476	255	313	134	-72	-57
16	Altachuile		263	143	144	62	-76	-57
17	Cantruan		247	131	81	91	-63	12
18	Altacorry		98	50	104	105	7	1
19	East Light		65	44	22	79	22	259
20	Rue East		0	0	0	0	NA	NA
21	Rue West		14	26	31	30	114	-3
22	Killeaney		94	77	62	57	-39	-8
23	Sronlea		27	15	18	29	7	61
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		1,482	2,032	1,072	1,518	1,038	-49	-32

Table S2.2: Shag Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		8	0	0	0	-100	NA
2	West Kebble		0	0	1	0	NA	-100
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	0	0	NA	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	0	0	NA	NA
7	North Kebble		7	11	3	1	-86	-67
8	Stacknavarlea		0	0	0	0	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	0	0	NA	NA
11	Inanvane		0	0	0	0	NA	NA
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		6	4	0	0	-100	NA
15	Skerriagh East		1	0	0	0	-100	NA
16	Altachuile		0	0	0	0	NA	NA
17	Cantruan		9	5	4	5	-44	25
18	Altacorry		0	0	6	3	NA	-50
19	East Light		0	0	1	0	NA	-100
20	Rue East		0	0	0	0	NA	NA
21	Rue West		20	25	32	56	180	75
22	Killeaney		7	1	0	9	29	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		109	58	46	47	74	28	57

Table S2.3: Kittiwake Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		1344	1108	432	83	-94	-81
2	West Kebble		1365	1840	1539	2685	97	74
3	Doonmore Stack		278	330	202	266	-4	32
4	Stacknacally		163	316	195	284	74	46
5	Stackaboy		71	63	14	0	-100	-100
6	Stackaniska		183	316	134	158	-14	18
7	North Kebble		2337	2029	1563	2654	14	70
8	Stacknavarlea		439	550	356	515	17	45
9	Stacknaderginan		465	601	296	442	-5	49
10	Kinramer North		325	166	141	342	5	143
11	Inanvane		2	144	41	542	27,000	1,222
12	Altandivan		210	0	205	229	9	12
13	Greenan		861	280	194	463	-46	139
14	Tunny		606	943	1022	1717	183	68
15	Skerriagh East		668	587	1091	1975	196	81
16	Altachuile		0	0	0	0	NA	NA
17	Cantruan		404	409	406	1159	187	185
18	Altacorry		0	0	0	0	NA	NA
19	East Light		196	214	91	192	-2	111
20	Rue East		0	0	0	0	NA	NA
21	Rue West		0	0	0	0	NA	NA
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		6,822	9,917	9,896	7,962	13,706	38	73

Table S2.4: Black-headed Gull Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		0	0	0	0	NA	NA
2	West Kebble		0	79	10	0	NA	-100
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	0	0	NA	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	0	0	NA	NA
7	North Kebble		0	0	0	0	NA	NA
8	Stacknavarlea		0	0	0	0	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	0	0	NA	NA
11	Inanvane		0	0	0	0	NA	NA
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		0	0	0	0	NA	NA
15	Skerriagh East		0	0	0	0	NA	NA
16	Altachuile		0	0	0	0	NA	NA
17	Cantruan		0	0	0	0	NA	NA
18	Altacorry		0	0	0	0	NA	NA
19	East Light		0	0	0	0	NA	NA
20	Rue East		0	0	1	5	NA	400
21	Rue West		0	0	0	0	NA	NA
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		300	0	0	0	-100	NA
25	Shandragh		83	0	0	0	-100	NA
Total		No record	383	79	11	5	-99	-55

Table S2.5: Common Gull Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		0	0	0	0	NA	NA
2	West Kebble		0	4	2	0	NA	-100
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	0	0	NA	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	0	0	NA	NA
7	North Kebble		0	0	0	0	NA	NA
8	Stacknavarlea		0	0	0	0	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	0	0	NA	NA
11	Inanvane		0	0	0	0	NA	NA
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		0	0	0	0	NA	NA
15	Skerriagh East		0	0	0	0	NA	NA
16	Altachuile		0	0	9	0	NA	-100
17	Cantruan		0	0	0	0	NA	NA
18	Altacorry		0	0	0	0	NA	NA
19	East Light		0	0	0	0	NA	NA
20	Rue East		64	60	83	69	8	-17
21	Rue West		0	0	0	0	NA	NA
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		64	64	64	94	69	8	-27

Table S2.6: Lesser Black-backed Gull Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		0	0	0	0	NA	NA
2	West Kebble		0	1	0	0	NA	NA
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	0	0	NA	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	0	0	NA	NA
7	North Kebble		0	0	0	0	NA	NA
8	Stacknavarlea		0	0	0	0	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	13	57	NA	338
11	Inanvane		0	23	99	332	NA	235
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		0	0	0	0	NA	NA
15	Skerriagh East		0	0	0	0	NA	NA
16	Altachuile		0	0	6	22	NA	267
17	Cantruan		0	0	0	0	NA	NA
18	Altacorry		0	0	0	98	NA	NA
19	East Light		0	0	0	0	NA	NA
20	Rue East		0	0	0	1	NA	NA
21	Rue West		0	12	25	9	NA	-64
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		127	0	0	0	-100	NA
Total		155	127	36	143	519	309	263

Table S2.7: Herring Gull Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		0	0	0	0	NA	NA
2	West Kebble		0	0	3	0	NA	-100
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	1	0	NA	-100
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	1	0	NA	-100
7	North Kebble		0	0	0	1	NA	NA
8	Stacknavarlea		0	0	0	0	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	2	4	NA	100
11	Inanvane		0	3	7	28	NA	300
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		0	0	3	0	NA	-100
15	Skerriagh East		0	0	2	0	NA	-100
16	Altachuile		0	0	2	18	NA	800
17	Cantruan		0	0	2	0	NA	-100
18	Altacorry		0	0	0	30	NA	NA
19	East Light		0	0	0	0	NA	NA
20	Rue East		0	1	0	1	NA	NA
21	Rue West		0	1	5	1	NA	-80
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		14	0	0	0	-100	NA
Total		4,037	14	5	28	83	493	196

Table S2.8: Great Black-backed Gull Apparently Occupied Nests on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census and count recorded in Apparently Occupied Territories.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		0	0	0	0	NA	NA
2	West Kebble		0	0	0	1	NA	NA
3	Doonmore Stack		0	0	0	0	NA	NA
4	Stacknacally		0	0	1	0	NA	-100
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		0	0	0	0	NA	NA
7	North Kebble		0	0	0	0	NA	NA
8	Stacknavarlea		0	0	0	1	NA	NA
9	Stacknaderginan		0	0	0	0	NA	NA
10	Kinramer North		0	0	1	2	NA	100
11	Inanvane		0	0	0	3	NA	NA
12	Altandivan		0	0	0	0	NA	NA
13	Greenan		0	0	0	0	NA	NA
14	Tunny		0	1	2	0	NA	-100
15	Skerriagh East		0	0	0	0	NA	NA
16	Altachuile		0	0	2	2	NA	0
17	Cantruan		0	0	0	0	NA	NA
18	Altacorry		0	0	0	3	NA	NA
19	East Light		0	0	0	0	NA	NA
20	Rue East		0	0	0	0	NA	NA
21	Rue West		0	0	1	0	NA	-100
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	1	0	NA	-100
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		3	0	0	0	-100	NA
Total		19	3	1	8	12	300	50

Table S2.9: Guillemot individuals on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021).
 *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		2,421	1,330	1,210	1,590	-34	31
2	West Kebble		4,991	5,985	4,955	7,243	45	46
3	Doonmore Stack		6,718	6,092	5,668	7,177	7	27
4	Stacknacally		1,142	1,348	1,060	2,099	84	98
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		3,062	3,085	3,360	3,930	28	17
7	North Kebble		24,903	24,046	41,835	39,334	58	-6
8	Stacknavarlea		10,741	15,884	18,426	26,951	151	46
9	Stacknaderginan		7,770	5,823	9,355	7,423	-4	-21
10	Kinramer North		260	38	0	143	-45	NA
11	Inanvane		0	299	710	675	NA	-5
12	Altandivan		1,133	666	836	970	-14	16
13	Greenan		1,284	867	2,212	3,500	173	58
14	Tunny		10,420	4,084	18,242	20,925	101	15
15	Skerriagh East		12,907	8,240	12,908	17,270	34	34
16	Altachuile		0	4	39	0	NA	-100
17	Cantruan		7,160	2,971	7,972	8,790	23	10
18	Altacorry		0	0	0	0	NA	NA
19	East Light		648	524	1,599	1,320	104	-17
20	Rue East		0	0	0	0	NA	NA
21	Rue West		7	17	58	170	2,329	193
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		0	0	0	0	NA	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		41,887	95,567	81,303	130,445	149,510	56	15

Table S2.10: Razorbill individuals on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021).
 *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		359	243	259	341	-5	32
2	West Kebble		1,402	1,239	2,362	1,444	3	-39
3	Doonmore Stack		385	493	616	553	44	-10
4	Stacknacally		302	223	448	312	3	-30
5	Stackaboy		24	9	8	14	-42	75
6	Stackaniska		484	259	397	195	-60	-51
7	North Kebble		4,442	2,046	4,705	5,042	14	7
8	Stacknavarlea		360	845	718	747	107	4
9	Stacknaderginan		485	234	493	412	-15	-16
10	Kinramer North		180	10	344	692	284	101
11	Inanvane		113	420	116	256	127	121
12	Altandivan		693	282	448	636	-8	42
13	Greenan		1,024	87	868	1,184	16	36
14	Tunny		1,826	960	2,363	2,213	21	-6
15	Skerriagh East		6,237	2,350	6,062	5,669	-9	-6
16	Altachuile		430	108	360	144	-67	-60
17	Cantruan		1,633	601	1,863	1,891	16	2
18	Altacorry		7	5	10	12	71	20
19	East Light		234	162	317	292	25	-8
20	Rue East		0	0	0	0	NA	NA
21	Rue West		100	106	196	276	176	41
22	Killeaney		20	1	1	28	40	2,700
23	Sronlea		120	1	21	68	-43	224
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		8,922	20,860	10,684	22,975	22,421	7	-2

Table S2.11: Puffin individuals on Rathlin Island at each census period (1985, 1999, 2007, 2011 and 2021). *SMP sub-sites not recorded for 1985 census.

Census Sector	SMP Sub-site	Count 1985*	Count 1999	Count 2007	Count 2011	Count 2021	% Change 1999-2021	% Change 2011-2021
1	Cooraghy		12	3	14	0	-100	-100
2	West Kebble		18	32	7	11	-39	57
3	Doonmore Stack		8	8	5	8	0	60
4	Stacknacally		0	0	0	0	NA	NA
5	Stackaboy		0	0	0	0	NA	NA
6	Stackaniska		5	0	0	0	-100	NA
7	North Kebble		474	374	349	182	-62	-48
8	Stacknavarlea		18	33	66	4	-78	-94
9	Stacknaderginan		0	0	2	0	NA	-100
10	Kinramer North		3	0	0	1	-67	NA
11	Inanvane		0	17	34	15	NA	-56
12	Altandivan		149	3	11	31	-79	182
13	Greenan		194	9	94	45	-77	-52
14	Tunny		38	14	71	96	153	35
15	Skerriagh East		112	134	23	2	-98	-91
16	Altachuile		200	0	0	0	-100	NA
17	Cantruan		281	87	15	10	-96	-33
18	Altacorry		0	0	0	0	NA	NA
19	East Light		50	17	4	2	-96	-50
20	Rue East		0	0	0	0	NA	NA
21	Rue West		0	0	0	0	NA	NA
22	Killeaney		0	0	0	0	NA	NA
23	Sronlea		17	0	0	0	-100	NA
24	Brookley		0	0	0	0	NA	NA
25	Shandragh		0	0	0	0	NA	NA
Total		2,398	1,579	731	695	407	-74	-41

Appendix 3: North Antrim coast – Species Tables

NB: All tables in Appendix 3 contain zero counts where no records exist for sub-sites for the SCR and Seabird 2000 censuses. Complete coverage is assumed for Seabird 2000 and hence absences are treated as true zeros. However, some sub-sites may not have been covered in the SCR, therefore change is not calculated between the 2021 census and SCR.

Table S3.1: Fulmar Apparently Occupied Sites along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	8	6	-25
Giant's Causeway 1	0	167	103	-38
Giant's Causeway 2	0	66	61	-8
Giant's Causeway 3	0	184	39	-79
Giant's Causeway 4	0	65	191	194
Giant's Causeway 5	0	22	0	NA
Portmoon	0	254	0	NA
Dunseverick	0	0	101	NA
Whitepark Bay	43	28	19	-32
Ballintoy	24	17	7	-59
Bohesian	0	57	0	NA
Sheep Island	45	88	61	-31
Larrybane	0	99	87	-12
Larrybane 2	0	0	84	NA
Carrick-a-Rede	0	71	48	-32
Rathlin Sound 1	0	131	57	-56
Rathlin Sound 1A	0	0	28	NA
Rathlin Sound 3	0	1	11	1,000
Rathlin Sound 4	10	10	22	120
Rathlin Sound 5	51	41	131	220
Rathlin Sound 6	0	165	61	-63
Rathlin Sound 7	0	60	33	-45
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	2	NA
Total	173	1,534	1,152	-25

Table S3.2: Cormorant Apparently Occupied Nests along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	380	344	139	-60
Larrybane	0	0	0	NA
Larrybane 2	0	0	0	NA
Carrick-a-Rede	0	0	0	NA
Rathlin Sound 1	0	0	0	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	0	0	NA
Rathlin Sound 6	0	0	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	380	344	139	-60

Table S3.3: Shag Apparently Occupied Nests along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021). * Individuals recorded where nests were not apparent.

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	18	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	80	60	21 AON + 22 IND*	-65
Larrybane	0	0	0	NA
Larrybane 2	0	0	3 IND*	NA
Carrick-a-Rede	0	0	1 IND*	NA
Rathlin Sound 1	0	0	5 IND*	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	2	5 IND*	NA
Rathlin Sound 6	0	8	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	80	88	21	-76

Table S3.4: Kittiwake Apparently Occupied Nests along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021). * Individuals recorded where nests were not apparent.

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	238	316	230 + 75 IND*	-27
Larrybane	0	0	0	NA
Larrybane 2	0	0	285 +310 IND*	NA
Carrick-a-Rede	0	568	277 +325 IND*	-51
Rathlin Sound 1	0	0	0	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	0	0	NA
Rathlin Sound 6	0	0	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	238	884	792	-10

Table S3.5: Lesser Black-backed Gull Apparently Occupied Nests or Territories along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021). * Individuals recorded where nests were not apparent.

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	4	0	NA
Bohesian	0	0	0	NA
Sheep Island	0	3	88	2,833
Larrybane	0	0	0	NA
Larrybane 2	0	0	0	NA
Carrick-a-Rede	0	0	2	NA
Rathlin Sound 1	0	0	1	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	0	1	NA
Rathlin Sound 6	0	0	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	2 IND*	NA
Total	0	7	91	1,200

Table S3.6: Herring Gull Apparently Occupied Nests or Territories along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	2	0	-100
Whitepark Bay	0	0	0	NA
Ballintoy	75	5	0	-100
Bohesian	0	0	0	NA
Sheep Island	75	2	55	2,650
Larrybane	0	0	6	NA
Larrybane 2	0	0	0	NA
Carrick-a-Rede	0	0	10 + 28 IND*	NA
Rathlin Sound 1	0	0	2	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	0	1	NA
Rathlin Sound 6	0	2	0	-100
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	8 + 36 IND*	NA
Total	150	11	82	645

Table S3.7: Great Black-backed Gull Apparently Occupied Nests or Territories along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	55	5	7	40
Larrybane	0	0	0	NA
Larrybane 2	0	0	0	NA
Carrick-a-Rede	0	1	0	-100
Rathlin Sound 1	0	0	0	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	0	NA
Rathlin Sound 5	0	0	0	NA
Rathlin Sound 6	0	0	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	55	6	7	17

Table S3.8: Guillemot individuals along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	330	439	703	60
Larrybane	0	0	0	NA
Larrybane 2	0	0	94	NA
Carrick-a-Rede	0	185	178	-4
Rathlin Sound 1	0	0	0	NA
Rathlin Sound 1A	0	0	0	NA
Rathlin Sound 3	0	0	0	NA
Rathlin Sound 4	0	0	6	NA
Rathlin Sound 5	0	0	0	NA
Rathlin Sound 6	0	0	0	NA
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	330	624	981	57

Table S3.9: Razorbill individuals along the north Antrim coast between Runkerry and Murlough at each census period (SCR: 1985 – 1988, Seabird 2000 (S2000):1998 – 2002, Seabirds Count: 2021).

SMP Sub-site	SCR Count 1985 – 1988	S2000 Count 1998 - 2002	Count 2021	% Change S2000 (1998-2002) - 2021
Runkerry	0	0	0	NA
Giant's Causeway 1	0	0	0	NA
Giant's Causeway 2	0	0	0	NA
Giant's Causeway 3	0	0	0	NA
Giant's Causeway 4	0	0	0	NA
Giant's Causeway 5	0	0	0	NA
Portmoon	0	0	0	NA
Dunseverick	0	0	0	NA
Whitepark Bay	0	0	0	NA
Ballintoy	0	0	0	NA
Bohesian	0	0	0	NA
Sheep Island	940	963	221	-77
Larrybane	0	0	0	NA
Larrybane 2	0	0	44	NA
Carrick-a-Rede	0	281	98	-65
Rathlin Sound 1	0	36	11	-69
Rathlin Sound 1A	0	11	0	-100
Rathlin Sound 3	0	121	5	-96
Rathlin Sound 4	0	230	136	-41
Rathlin Sound 5	0	31	67	116
Rathlin Sound 6	0	238	0	-100
Rathlin Sound 7	0	0	0	NA
Ballycastle	0	0	0	NA
Crockateemore	0	0	0	NA
Fair Head	0	0	0	NA
Murlough	0	0	0	NA
Total	940	1,911	582	-70

Project partners



Citation

Booth Jones, K.A., Allen, D., Archer, E., Colhoun, K., Leonard, K., Mackie, K., Mawhinney, K., McFaul, L., Weir, D., Humphreys, E.M. and Burton, N.H.K. (2022) Cliff Nesting Seabird Surveys at Colonies in Northern Ireland. Report to Agri-Food and Biosciences Institute and Marine Scotland Science as part of the Marine Protected Area Management and Monitoring (MarPAMM) project

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This work was produced as part of the Marine Protected Area Management and Monitoring (MarPAMM) project. MarPAMM has been supported by the European Union's INTERREG VA Programme, managed by the Special EU Programmes Body.

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