



Flamborough and Filey Coast pSPA Seabird Monitoring Programme

2017 Report



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Front cover image: Black-browed Albatross amongst Northern Gannets at Staple Newk, RSPB Bempton Cliffs, East Yorkshire, Wednesday 28 June 2017. © David Aitken

CONTENTS

SUMMARY	4
INTRODUCTION	7
METHODS	10
Productivity monitoring	10
Whole colony counts	12
Study-plot counts	13
Common Guillemot diet study	13
European Shag roost counts and colour ring re-sighting	14
Seabird tracking	14
Recreational disturbance	15
RESULTS	16
Productivity monitoring	16
Whole colony counts	23
Study-plot counts	27
Common Guillemot diet study	28
European Shag roost counts and colour ring re-sighting	29
Seabird tracking	29
Recreational disturbance	32
DISCUSSION	33
REFERENCES	35
ACKNOWLEDGEMENTS	36
Appendix 1: Flamborough and Filey Coast pSPA Maps	38
Appendix 2: Productivity Plot Locations	40
Appendix 3: Study-plot Locations	44

SUMMARY

The Flamborough and Filey Coast seabird monitoring programme is a partnership between the RSPB and Natural England, set up to monitor and report on the condition of this internationally important seabird colony. Established in 2008, the project aims are to establish repeatable baseline census monitoring of the colony, and to pursue a number of key areas of research and surveillance required to inform the population trends. For 2017, the results of seabird monitoring at Flamborough/Bempton and Filey have again been consolidated into a single report covering the Flamborough and Filey Coast proposed Special Protection Area (pSPA).

The results inform the pSPA and underlying Site of Special Scientific Interest (SSSI) condition assessments and provide critical data to inform casework and the establishment of a Marine Protected Area (MPA) network.

In 2017 the seabird monitoring programme was successfully completed by a dedicated team of staff, volunteers, a Seabird Research Assistant and a residential seabird research volunteer.

On balance, 2017 was an average year for most species. A run of poor weather in late June during Black-legged Kittiwake chick provisioning may have affected adult birds' ability to forage and as a result, many nests were observed unattended leaving chicks susceptible to exposure and vulnerable to predation, factors which may account for the poor productivity output. In addition, Common Guillemot recorded the lowest productivity result since monitoring began in 2009 and Razorbill experienced below average productivity. Plot-specific factors such as displacement by prospecting Northern Gannet and Carrion Crow predation may still be affecting auk breeding success. Northern Fulmar productivity remained average while European Herring Gull continue to produce poor breeding results. Northern Gannet productivity dropped below that of the previous two years, though output remains robust.

The productivity results were as follows:

- Northern Fulmar productivity – the addition of two plots at Cunstone Nab in 2017 increased monitoring to seven sites. 128 pairs were monitored from which 64 chicks successfully fledged producing a mean productivity of 0.58 (SE \pm 0.0679) chicks per apparently occupied site (AOS) and an aggregated productivity of 0.50 chicks per AOS.
- Northern Gannet productivity – 273 nests were monitored across five plots, from which 220 chicks fledged producing a mean productivity of 0.81 (SE \pm 0.0347) chicks per apparently occupied nest (AON) and an aggregated productivity of 0.81 chicks per AON.
- Black-legged Kittiwake productivity at Flamborough/Bempton – a remarkable 900 nests were monitored across eighteen plots, from which 527 chicks fledged producing a mean productivity of 0.58 (SE \pm 0.0353) chicks per AON and an aggregated productivity of 0.59 chicks per AON.
- Black-legged Kittiwake productivity at Filey – due to a full colony count in 2017, only 150 nests were monitored across three plots, from which 59 chicks fledged producing a mean productivity of 0.39 (SE \pm 0.0742) chicks per AON and an aggregated productivity of 0.39 chicks per AON.

- European Herring Gull productivity – 88 nests were monitored across five plots, from which 65 chicks fledged producing a mean productivity of 0.73 (SE \pm 0.0475) chicks per AON and an aggregated productivity of 0.74 chicks per AON.
- Common Guillemot productivity – 304 pairs were monitored across six plots, from which 185 chicks fledged producing a mean productivity of 0.59 (SE \pm 0.0896) chicks per AOS and an aggregated productivity of 0.61 chicks per AOS.
- Razorbill productivity – 377 pairs were monitored across eight plots, from which 244 chicks fledged producing a mean productivity of 0.56 (SE \pm 0.0884) chicks per AOS and an aggregated productivity of 0.65 chicks per AOS.

Alongside the seabird monitoring programme, a boat and land-based whole colony count was completed in 2017. This mammoth task – including 214 person/hours of boat based counting – was coordinated by Keith Clarkson, recently retired RSPB Bempton Cliffs Senior Site Manager, and a team of five experienced seabird counters.

The whole colony count results (which are presented here as SPA followed by pSPA) were as follows:

- Northern Fulmar – 846 AOS recorded for the SPA. An additional 411 AOS were recorded at Filey, bringing the pSPA total to 1,257 AOS.
- Northern Gannet – 13,392 AOS recorded for the SPA. In addition, a further 1,169 non-breeding birds were also present in ‘clubs’ which are likely to form future extensions of the colony. There are no breeding Northern Gannets outside the SPA boundary.
- European Shag – 25 AON recorded, typically, at the base of the cliffs within the SPA.
- Great Cormorant – 27 AON recorded. The breeding range of the Great Cormorant is restricted to the high sandstone cliffs north of Filey, which sits outside the SPA boundary but within the pSPA extension, where breeding numbers have remained stable over the past 7 years.
- Black-legged Kittiwake – 45,504 AON recorded for the SPA. An additional 6,031 pairs were recorded at Filey bringing the pSPA total to 51,535 AON.
- European Herring Gull – 351 AON recorded for the SPA. An additional 115 pairs were recorded at Filey bringing the pSPA total to 466 AON.
- Common Guillemot – 84,647 individuals recorded on the cliffs across the SPA. An additional 6,214 individuals recorded at Filey bringing the pSPA total to 90,861 individuals. Using a conversion factor of 0.67 (Birkhead, 1978; Harris 1989) translates to 60,877 pairs or 121,754 breeding individuals within the pSPA.
- Razorbill – 27,967 individuals recorded on the cliffs across the SPA. An additional 2,261 individuals recorded at Filey bringing the pSPA total to 30,228 individuals. Using a conversion

factor of 0.67 (Birkhead, 1978; Harris 1989) translates to 20,253 pairs or 40,506 breeding individuals within the pSPA.

An early season count of Atlantic Puffin was completed in March this year, which included Filey Cliffs to the north, allowing total pSPA coverage for the first time. Approximately 2,879 Atlantic Puffin were counted staging on the sea during the pre-breeding period. This count allows an index of colony size with year-to-year comparisons, but should not be treated as a definitive population count.

The Black-legged Kittiwake study-plot counts produced a mean of 1,943 AON; this is an improvement on 2016 but still on the low side of the median, although Black-legged Kittiwake study-plot means have been more variable than those for Common Guillemot or Razorbill.

The Common Guillemot study-plot counts produced a mean of 1,348 individuals, a slight reduction on the previous two years but in line with an overall upward trend since 2009 (the highest being 1,454 in 2014).

The Razorbill study-plot counts produced a mean count of 676 individuals, a new record high mean and in line with the general upward trend since the first counts in 2009.

A dedicated volunteer was available for three weeks to assist with the Common Guillemot diet composition study. A total of 284 prey items were recorded, of which 69% were clupeids, while 20% were sandeel spp. and 11% were other/unidentified. Although absolute numbers were relatively small, more cephalopods—eight prey items—were recorded than in previous years.

This year, the reserve supported a Black-legged Kittiwake tracking project, led by RSPB's Conservation Science team and funded by Ørsted (formerly DONG Energy). The project informs The Flamborough and Filey Seabird Monitoring Group (RSPB, Flamborough Head European Marine Site, and Natural England), and builds on tracking work previously undertaken at this colony. For the first time, automatic-download tracking devices were fitted to adult birds; employing this technology meant that a bird only needs to be caught once in order to attach the device, after which data is downloaded to a base station whenever the device is in range. The device is designed to fall off after a few weeks. In total, twenty auto-download devices were deployed, eighteen of which successfully collected data.

Recreational disturbance continues to be a threat to the breeding success of the colony. A Personal Watercraft Code of Conduct is now in effect from 1 March to 30 September; users are asked to maintain a no-wake speed within 300m of the cliffs and near rafts of birds. Despite this, the Flamborough Head EMS study of disturbance incidents across the pSPA in 2017 identified numerous disturbance events involving Jet Skis, motorised boats and kayakers. The Flamborough Head EMS Project Officer has also facilitated an agreement with the Chief Pilot of the Humberside Search and Rescue helicopter whereby from 15 March to 15 August crews will not carry out training exercises between North Landing and High Stacks, Flamborough Head. The voluntary Angling Code of Conduct developed with local angling clubs for Bempton and Speeton Cliffs, incorporating a closed season for cliff-top angling from 1 March to 30 September, is largely considered to be a success. Review meetings will continue to ensure the code of conduct remains relevant and effective.

INTRODUCTION

Background

Seabird population data has been collected at Flamborough and Bempton since at least 1969. In 1969, all species but European Shag and Atlantic Puffin were counted as part of the 'Operation Seafarer' national seabird census. In 1987, all species were counted during the 'Seabird Colony Register' census. All species were counted again in 2000 for 'Seabird 2000' and again in 2008. Whole-colony counts of Northern Gannet were completed in 1970-77, 1985-94, 1996-99, 2002, 2004-05, 2008-09, 2012 and again in 2015. In addition, whole colony counts for European Herring Gull were completed in 2010 and 2014 and for European Shag in 2014.

Before the commencement of the Flamborough Head and Bempton Cliffs seabird monitoring programme in 2009, breeding success data for Flamborough/Bempton was collected for Northern Gannet during 1973-79, 1986-94, 1996-98, and 2006. Black-legged Kittiwake breeding success has been monitored continuously since 1986. Common Guillemot productivity was monitored during 1991-98 and 2005-06 and Razorbill productivity was monitored in 2005-06. Northern Fulmar and European Herring Gull breeding success were monitored for the first time in 2009, and is ongoing. Unfortunately, it is not possible to monitor breeding success for Atlantic Puffin at this cliff-nesting colony and only limited monitoring of European Shag is possible depending on nest site use.

At Filey, a whole colony count was carried out in 1986 (Williams 1996). In 2002 the 'Seabird 2000' census team identified a significant seabird colony nesting on the cliffs to the north of Filey Bay (Mitchell et al. 2004). The significance of this colony came to light in 2008 in response to large numbers of Common Guillemot and Razorbill being caught and killed in gillnets set by fishermen in Filey Bay. It was recognised that birds caught in the nets could have originated from either the Flamborough/Bempton or Filey colonies. Unfortunately, at that time there was little current data about the state of the colony at Filey.

The Flamborough and Filey Coast pSPA Seabird Monitoring Programme

Flamborough and Filey Coast pSPA supports the largest mainland seabird colony in England, the only mainland gannetry in England and one of the largest mainland Black-legged Kittiwake colonies in the UK. The landward boundary of the pSPA generally follows the coast at Flamborough Head from South Landing in the south to Speeton in the North with an additional section from the forefront of Filey Brigg headland to Cunstone Nab. The seaward boundary extends approximately 2km parallel to the coast from the landward boundaries before moving seawards and extends approximately 2km into the marine environment (see maps at Appendix 1).

Flamborough Head is a highly protected site both for its wildlife and unique chalk habitats. The site is designated as a European Marine Site, a Special Area of Conservation, a Special Protection Area, a Site of Special Scientific Interest and a Heritage Coast site which includes three Local Nature Reserves, as well as RSPB Bempton Cliffs nature reserve and the Yorkshire Wildlife Trust Flamborough Cliffs nature reserve.

At the north end of the pSPA the Filey Brigg SSSI falls within the pSPA and the Gristhorpe Bay and Red Cliff SSSI is just to the north of the pSPA.

The Flamborough and Filey Coast pSPA qualifies under Article 4.2 of the Birds Directive for the following reasons:

- It supports over 1% of the biogeographical population of four regularly occurring migratory species: Black-legged Kittiwake (*Rissa tridactyla*); Northern Gannet (*Morus bassanus*); Common Guillemot (*Uria aalge*); and Razorbill (*Alca torda*).
- It is used regularly by over 20,000 seabirds in any season: during the breeding season the area regularly supports over 200,000 seabirds.

Due to the importance of the seabird colony and level of site protection, Natural England and the RSPB proposed in 2008 a project to enable a baseline count, population monitoring and further research to collect data on the health of the colony and the Flamborough Head and Bempton Cliffs SPA and underpinning SSSIs. This proposal led to the establishment of the Flamborough Head and Bempton Cliffs seabird monitoring programme, which began with the 2009 seabird breeding season.

There was evidence to suggest that the cliffs north of Bempton supported a sizeable colony that might also meet the EU Birds Directive criteria. So, in 2009, a boat-based whole colony count of the breeding seabird assemblage nesting on the cliffs between Filey and Cayton was carried out by the RSPB. The results suggested that the total number of breeding seabirds in this colony exceeded 20,000 birds, and therefore this colony also met SPA qualifying criteria. In response to this evidence the RSPB, with funding support from Natural England, completed five consecutive years of colony count data to verify these findings. This data supported the proposed extension of the existing SPA to include Filey Cliffs to create the pSPA.

The data collected by this now enlarged Flamborough and Filey Coast seabird monitoring programme will inform the condition and management of the Flamborough and Filey Coast pSPA and underpinning SSSIs. In addition, the results will also inform current and new planning enquiries and environmental assessments e.g. the proposed Hornsea and Dogger Bank offshore wind arrays that may have a detrimental impact on the features of the designated sites. It is also hoped that seabird tracking data collected from the colony will inform potential new offshore MPAs.

Data collected will also be used to inform the Seabird Monitoring Programme (SMP) coordinated by Joint Nature Conservation Committee (JNCC), the RSPB's Annual Reserve Monitoring (ARM) programme, the RSPB Bempton Cliffs reserve management plan and the Yorkshire Wildlife Trust's reserve management.

The key aims of the seabird monitoring programme, and how they are currently implemented, are as follows:

- **Understanding variation and trends in seabird productivity**

Northern Fulmar, Northern Gannet, Black-legged Kittiwake, European Herring Gull, Common Guillemot and Razorbill plots have been monitored for breeding productivity annually since 2009.

- **Understanding population numbers and trends**

Black-legged Kittiwake, Common Guillemot and Razorbill study-plot counts have been carried out annually since 2009. A whole colony census was carried out in 2008 and repeated in 2017. It is intended that a whole colony count be completed every five years within the reserve's management plan cycle.

- **Understanding the relationship between the colony and the larger marine environment**

As the relevant technologies improve we hope to better understand foraging behaviours of birds breeding in the colony and to identify preferred foraging areas and trends in provisioning such as determining key feeding areas for key species, and the factors that influence their location. This includes ongoing seabird tracking, currently focused on Black-legged Kittiwake, and monitoring of Common Guillemot diet composition. In the future this could extend to range finders, remote tracking, and increased use of fish population modeling data and benthic mapping.

- **Understanding how RSPB Bempton Cliffs relates to wider pSPA and potential impacts on disturbance by developing research proposals to address the following management issues**

What are the types of human activities that could disturb the colony and what are their effects? Currently recreational disturbance is monitored and recorded by Bempton Cliffs and others on an ad-hoc basis. For those activities that are of particular concern, we hope to develop specific research proposals which assess level of impact.

The annual programme of monitoring is coordinated by the RSPB Bempton Cliffs seabird team lead by the reserve Warden, the Seabird Research Assistant, and a team of dedicated volunteer seabird researchers including members of Flamborough Bird Observatory (FBO) and Filey Bird Observatory & Group (FBOG).

The results of the 2017 Flamborough and Filey Coast seabird monitoring and research programme are detailed in this report.

Raw Data

Access to the productivity and population monitoring data collected during the seabird monitoring programme is available to researchers and conservation organisations by agreement with RSPB

METHODS

The Flamborough and Filey Coast seabird monitoring programme follows the methods and guidelines set out in the '*Seabird monitoring handbook for Britain and Ireland*' (Walsh et al., 1995) – (“the Handbook” hereafter). The Handbook summarises census and productivity monitoring techniques for seabirds relevant to colonies in Britain and Ireland. The appropriate methods are followed for each species at this colony taking into account the resources available and the physical geography of the colony. Please refer to the Handbook for more details on methodologies for each species and survey undertaken.

N.B. This year, within each section of the report, species are presented in International Ornithological Congress (IOC) taxonomic order which the British Ornithologists' Union (BOU) adopted as of 1 January 2018. In addition, all species are referred to by their IOC international name or vernacular name with the exception Common Murre, which is referred to as Common Guillemot.

Productivity monitoring

Productivity monitoring was completed for the ninth consecutive year for six of the eight breeding seabird species found in the colony: Northern Fulmar, Northern Gannet, Black-legged Kittiwake, European Herring Gull, Common Guillemot and Razorbill. In 2017, a small number of European Shag nests at Flamborough Head were monitored for the third year. Unfortunately, it is not possible to monitor Atlantic Puffin productivity at this cliff-nesting colony.

All productivity monitoring was based on marking apparently occupied sites (AOS) or apparently occupied nests (AON) on a laminated photograph of the relevant plot. For a detailed description of the relevant methodology, please refer to the section of the Handbook for the relevant species.

The productivity monitoring plots were identified when the Flamborough Head and Bempton Cliffs seabird monitoring programme was established in 2009. Plots were selected with a view to providing, where possible, a sample size in the region of 50 AOS or AON per plot and a total sample in excess of 250 AOS/AON for each species, while providing safe vantage points for the observer with little or no disturbance to breeding seabirds. In 2011, five additional monitoring plots for Black-legged Kittiwake were established at Filey Cliffs; in 2014 one of these was dropped and an additional monitoring plot added on Filey Brigg. In 2017, two additional Northern Fulmar plots were added at Cunstone Nab at the North end of Filey Cliffs. Indicative maps of the productivity plot locations are included in Appendix 2.

This year, we present productivity calculated as the mean of the individual plot results for each species as well as presenting species productivity data by aggregating the results of each plot (total chicks fledged / total nests (or sites) monitored).

Northern Fulmar *Fulmarus glacialis*

Seven productivity plots were monitored, including two new plots at Cunstone Nab at the North end of Filey Cliffs. Plots are photographed in early May and AOSs are marked on the laminated photographs over three visits over the late May/early June period. A final visit is made in mid-August and large chicks present at that time are assumed to fledge.

Northern Gannet *Morus bassanus*

Five productivity plots were monitored between late April and October. Plots are photographed in mid to late April and up to 50 or 60 AONs are marked on the laminated photographs. The plots are then visited every 7 – 10 days. Average visit time early in the season is 2 – 3 hours per plot, but reduces once chicks get larger and are more visible. Presence of an egg or chick is recorded (if seen) each visit.

European Shag *Phalacrocorax aristotelis*

In 2017, informal productivity monitoring was carried out on six European Shag nests at Breil Nook, Flamborough alongside the nearby auk productivity monitoring plots. These nests were not selected at random – being the nests it was possible to see from existing seabird monitoring points – and three of them were in recesses in the cliff and not always possible to see clearly. The nest sites were marked on laminated photographs of the cliffs and checked approximately weekly from 30 April until the end of July. No more than 30 minutes per visit was spent. Presence and number of eggs or chicks (to the extent visible) were recorded each visit.

Black-legged Kittiwake *Rissa tridactyla*

Twenty-one productivity plots were monitored across the pSPA between May and August, eighteen plots – 900 AONs – were monitored between Flamborough and Bempton and three plots – 150 AONs – at Filey. Plots are photographed in early to mid-May and up to 50 or 60 AONs are marked on the laminated photographs. Plots are then visited every week, ideally on the same day so visits are 7 days apart. Presence and number of eggs or chicks at each AON is recorded (if seen) each visit. Volunteers are also asked to record chick size using standard codes, but not all do. Average visit time varies according to the volunteer, but 1 to 1.5 hours per visit is probably typical.

European Herring Gull *Larus argentatus*

Five productivity plots were monitored between May and August. Two of the plots are linear and include all safely observable nests found on a defined stretch of cliff. One linear plot is at Bempton Cliffs and one is at Flamborough Head. Plots are photographed around early/mid-May and AONs are marked on the laminated photographs over two visits. Additional AONs may be added over the course of the season. Plots are then visited every week, ideally on the same day so visits are 7 days apart. Presence and number of eggs or chicks at each AON is recorded (if seen) each visit. Volunteers are also asked to use size codes for chicks. Average visit time varies according to the volunteer, but 1 to 2 hours per visit is probably typical.

Common Guillemot *Uria aalge*

Six productivity plots were monitored between late April and end of July. Plots are photographed in late April/early May and up to 50 to 60 AOSs are marked on the laminated photographs over two visits. Plots are then visited every third day. Additional sites may be added over the course of the season, especially if it has been hard to get 50 AOSs. Presence of an egg or chick is recorded (if seen) each visit. Average visit time early in the season is 2 – 2.5 hours, but reduces once chicks get larger and are more visible.

Razorbill *Alca torda*

Eight productivity plots were monitored between late April and the end of July. Plots are photographed in late April/early May and up to 50 to 70 AOSs are marked on the laminated photographs over two visits. Plots are then visited every third day. Additional sites may be added over the course of the season, especially if it has been hard to get 50 AOSs. Presence of an egg or chick is recorded (if seen) each visit. Average visit time early in the season is 2 – 2.5 hours, but reduces once chicks get larger and are more visible.

Whole colony counts

Colony Count

A whole colony count was completed between 18 May and 14 June 2017 for all breeding seabirds found within the pSPA, except for Atlantic Puffin. Counts were carried out by a team of six experienced observers using a combination of boat and land-based counts. The count took 253 hours or 34 person days to complete and included a total of 214 person hours of boat-based counts and 40 person hours of land based counts. The boat-based surveys were assisted by the Emmerson family of Flamborough and the hire of their fishing coble. Survey methods followed the methodologies and guidelines set out in the Handbook. For the purpose of boat (and land)-based colony counts, the Flamborough to Bempton section of the Flamborough and Filey Coast pSPA is divided into 178 sub-sections, comprising 15km of coastline. These subsections have been marked on a set of laminated photographs which cover the length of the cliffs.

As part of the whole colony count, a count at Filey was completed on Friday 9 June and took approximately 6 hours to complete. It was a boat-based survey and was undertaken by two RSPB staff with assistance from Filey Sailing Club and the use of their RIB. Survey methods followed the methodologies and guidelines set out in the Handbook. The Filey colony is divided into five recording areas, taken from the JNCC Seabird Monitoring Programme (SMP) website; within these recording areas, 24 sub-sections have been established and marked on photographs of the cliffs to assist the counts.

Atlantic Puffin *Fratercula arctica* at Flamborough, Bempton and Filey

Given the impossibility of monitoring the population or productivity of cliff-nesting Atlantic Puffin the species was not included in the Flamborough/Bempton (now Flamborough and Filey Coast) seabird monitoring programme. However, after the species was added to the Red List in 2015 it was decided to attempt to monitor the breeding population to the extent possible. In 2016, advice was sought from Puffin expert Professor Mike Harris, who recommended that we count adults on the sea when large numbers of birds return en masse pre-breeding season (M Harris pers. comm., 2016). Although this cannot be considered to provide an accurate census, it does provide an index with changes from year to year can be compared. Accordingly, for the second consecutive year, in March 2017, RSPB Bempton Cliffs viewpoint volunteers, who are out watching the sea every day, were asked to inform staff as soon as large numbers of Atlantic Puffin appeared staging on the sea. The first reports were in the morning of Friday 24 March. Based on the advice received, a team of two RSPB staff and a volunteer from FBOG, all with extensive bird monitoring experience, walked the distance from High Stacks at Flamborough Head (just south of the lighthouse) to the end of Speeton Cliffs before Hunmanby Gap – approximately 15 kilometers – and Filey Brigg to Cunstone Nab – approximately 4 kilometers. Using visual markers the sea was divided into sections and the number of Atlantic Puffin

on the sea in each section was counted using binoculars and/or telescopes as appropriate. Due to the length of the cliffs to be covered and staff resources available meant that only one count was possible over one day.

Study-plot counts

The size and nature of the Flamborough and Filey Coast colony mean that it is not practicable to conduct annual whole colony population monitoring. Accordingly, study-plots for population monitoring of Black-legged Kittiwake, Common Guillemot and Razorbill were established at Flamborough and Bempton in 2009. Plots were selected to be dispersed through the colony as randomly as possible given the need to provide a safe vantage point and minimise disturbance to breeding birds. Counts have been conducted each year since 2009. In 2011, counts of Common Guillemot and Razorbill were abandoned due to an early breeding season.

For each species the same plots are used each year as required by the Handbook; plot boundaries, based on clear cliff features, are marked on laminated photographs of the relevant area of cliff. Indicative maps of the study-plot locations at Flamborough and Bempton are included in Appendix 3.

The Handbook suggests that study-plot counts are not recommended for general use when counting Black-legged Kittiwake, as population changes may not be detected due to movements within the colony or colony extensions, or losses rather than through changes of density across the colony. However, as Flamborough and Bempton holds one of the largest mainland populations in the UK, it is important that trends are monitored.

Black-legged Kittiwake study-plot counts

Seven study-plots were counted between 0800 and 1600 on at least two occasions during the period from 1 June to 22 June.

Common Guillemot study-plot counts

Seven study-plots were counted between 0800 and 1600 on five occasions during the period from 1 June to 18 June.

Razorbill study-plot counts

Seven study-plots were counted between 0800 and 1600 on five occasions during the period from 1 June to 20 June.

Common Guillemot diet study

In 2017 a dedicated residential volunteer undertook a Common Guillemot diet study at Flamborough/Bempton. The study was carried out from 30 May to 18 June 2017 to cover the peak chick rearing season using methodology adapted from Jeavons (2015). As the observer did not have previous experience it was elected to only monitor Common Guillemot and their productivity plots at Grandstand South and Carter Lane were used for these observations. Observations were made between 0600 and 0800 and 1730 and 2000 on most days during the survey period. The observations were rotated between plots to get a similar number of surveys under morning and evening conditions at both sites. During each session the observer watched the cliff face without binoculars or a

telescope, for birds flying in and landing, focusing predominantly on areas where the nests were located. When birds landed, the observer used binoculars (Viking 10x40 HD) or a telescope (RSPB HD 82mm with 25-50x zoom eyepiece) to identify the species of each prey item, to assign it to a size category (small, medium, large). Identification and sizing was done using an identification guide created for the RSPB STAR project and modified for this study. Size categories were based on the size of the prey in relation to the bill.

European Shag roost counts and colour ring re-sighting

Winter roost counts of European Shag, as identified in 2014 at Breil Nook, Flamborough Head, were discontinued this year after several years of counts did not show the numbers anticipated. It remains possible that this is due to the impracticality of seeing some of the areas used to roost from land and with little to no access to boat-based observing in winter.

Throughout the seabird monitoring season, however, colour ring codes are recorded, where practicable; over the winter specific visits are made in appropriate conditions. In each case records are submitted to the Centre for Ecology & Hydrology's (CEH) winter Shag distribution project.

Seabird tracking

Building on the previous GPS tracking work on Black-legged Kittiwakes within the Flamborough and Filey Coast pSPA between 2010 and 2015 (Aitken et al. 2014; Babcock et al. 2015), a further 20 chick rearing birds were tracked in the 2017 breeding season. The aim of the study was to trial a new methodology that will eventually enable the collection of fine-scale distribution data over longer deployment periods, and measurement of behavioral information by determining flight heights and three-dimensional acceleration. Both are crucial factors in understanding the risks of birds colliding with wind turbines and present a major gap in current environmental assessment methods for offshore wind developments, particularly for Kittiwake. Funding for the 2017 tracking work was secured from Ørsted (formerly DONG Energy) as part of a package of strategic monitoring related to the Hornsea Project One offshore windfarm development. Keith Clarkson (former RSPB Bempton Cliffs Senior Site Manager, now 'retired'), Lucy Wright (RSPB Principal Conservation Scientist) and Aly McCluskie (RSPB Senior Conservation Scientist) worked together to secure the funding for this work, with input to the proposals from members of the Flamborough and Filey Coast Seabird Monitoring Group.

Fieldwork was carried out under licenses from the British Trust of Ornithology (BTO) and Natural England (NE) by Saskia Wischniewski, RSPB Conservation Scientist, and Derren Fox, RSPB Senior Research Assistant, with help from Michael Babcock, RSPB Bempton Cliffs Seabird Research Officer, and David Aitken, RSPB Bempton Cliffs Warden. Solar powered University of Amsterdam (UvA) tags with GPS, accelerometer and remote download capabilities, were glue mounted to the mantle of adult chick-rearing birds caught at the nest. Eighteen birds were tracked from the usual sites at either end of the pSPA, Flamborough Head and Filey Brigg. A further two tags were deployed at a new study site at Speeton Cliffs, closer to the centre of the pSPA. Because data from tags were remotely downloaded to a base station via a relay network, birds did not need to be recaptured, meaning that data collection could continue later in the breeding season for as long as the tags stayed glued to the bird and it returned to the colony to download data to the relay network.

The capture and handling of birds followed strict protocols to minimise stress for the birds and disturbance to the colony. Glue mounting compared to the usual taping of tags to the bird increased the duration of attachment from a maximum of four days to 29 days. Tags weighed between 7.4 and 7.7g. Weight increased with attachment material to ~8g, representing ~2% of the body weight of a Kittiwake (~400g) and staying well below the recommended maximum tag burden of 3%. However, since this was the first time this tag attachment and tag was used on Kittiwakes, tagged and control nests were monitored until chicks were fledging age (>30 days) to assess tagging effects. Failure rates were high across control (58% for Filey and 33% for Flamborough) and tagged nests (75%) but tagged nests were also significantly lower on the cliff than control nests by 1.17 ± 0.42 m, and nest height also affected failure rate. Models accounting for nest height did not detect a significant effect of tagging on nest failure at either site.

Recreational disturbance

The Flamborough Head EMS study into recreational activity has identified recreational disturbance as an ongoing issue across the pSPA. Recreational disturbance can include: anglers descending the cliffs to access the foreshore; cliff-top angling during the breeding season; boat, jet ski and kayak use; paragliders, powered hang gliders and low flying aircraft. Wherever possible, disturbance events are recorded and photographed. The information is passed to the EMS project officer, Heather Davison, who is gathering data on recreational disturbance across the pSPA in an attempt to build a better picture of the activities taking place, the frequency that they occur and the possible impact they may have on the pSPA. A future challenge is to determine how to assess the impact of these activities on the breeding seabird assemblage and then manage this impact.

RESULTS

Productivity monitoring

Northern Fulmar *Fulmaris glacialis*

Mean productivity for Northern Fulmar was 0.58 (SE ± 0.0679) chicks per AOS. A total of 128 AOS were monitored across seven plots, from which 64 chicks successfully fledged (Table 1, Figure 1). The mean productivity for Northern Fulmar recorded between 1986-2005 from between thirteen and forty-one colonies annually was 0.41 (SE ± 0.01) chicks per AOS, (Mavor et al., 2008).

Table 1: Northern Fulmar productivity 2017: two new productivity plots at Cunstone Nab at the North end of Filey Cliffs were added to the monitoring programme this year. The new plots are marked *.

Plot	AOS	Fledged chicks	Productivity ch/pr
*Cunstone Nab A	34	17	0.50
*Cunstone Nab B	24	14	0.58
New Roll-up	4	3	0.75
Old Dor	30	7	0.23
Newcombe	11	8	0.73
Breil Nook	10	7	0.70
Swineshaw Hole	15	8	0.53
Aggregate productivity	128	64	0.50
Mean of plot results		0.58	± 0.0679 SE
Original plots total	70	33	0.47
Mean of original plots		0.59	± 0.0967 SE

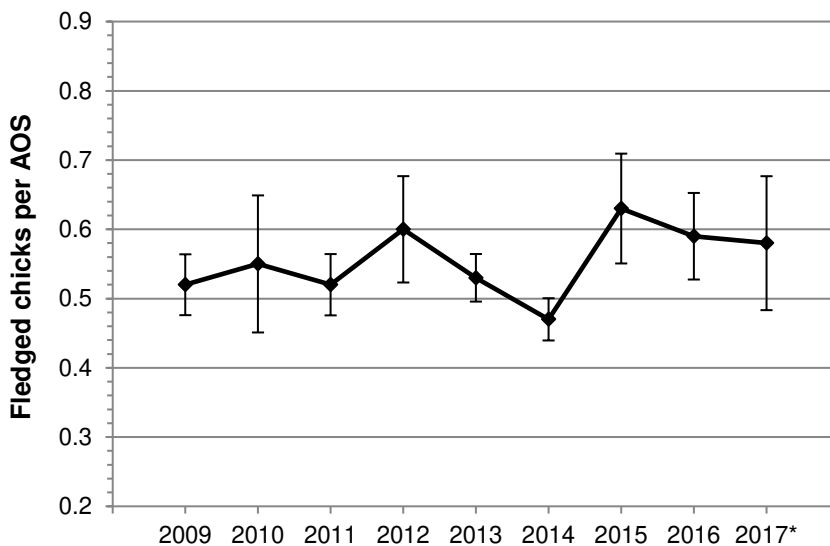


Fig. 1: Northern Fulmar productivity 2009 – 2017, mean of plot productivity results plus/minus SE. *Note: two new plots added in 2017.

The productivity on one plot at Old Dor is notably poor and may be as a result of Northern Gannet activity. On the final monitoring visit, Northern Gannets were noted on several ledges that had previously held apparently incubating Northern Fulmar.

Northern Gannet *Morus bassanus*

Mean productivity for Northern Gannet was 0.81 (SE ± 0.0347) chicks per AON. A total of 273 AON were monitored across five plots, from which 220 chicks successfully fledged (Table 2, Figure 2). The mean productivity for Northern Gannet recorded between 1986-2005 from between three and six colonies annually was 0.69 (SE ± 0.01) chicks per AON, (Mavor et al., 2008).

Table 2: Northern Gannet productivity 2017

Plot	AON	Fledged chicks	Productivity ch/pr
Jubilee Corner	53	44	0.83
Nettletrip	57	48	0.84
Staple Newk 1	52	44	0.85
Staple Newk 2	53	45	0.85
Staple Newk 3	58	39	0.81
Aggregate productivity	273	220	0.81
Mean of plot productivity ch/pair		0.81	± 0.0347 SE

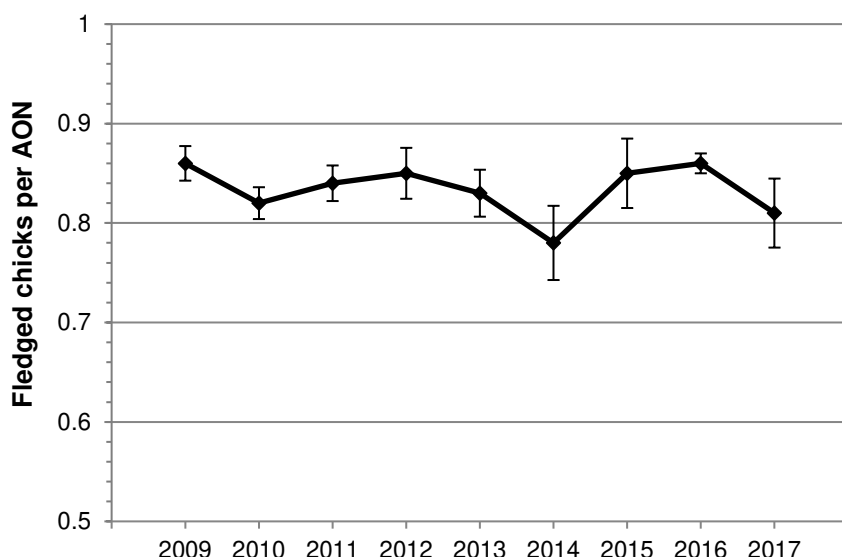


Fig. 2: Northern Gannet productivity 2009 – 2017, mean of plot productivity results plus/minus SE.

European Shag *Phalacrocorax aristotelis*

Five European Shag nests in the area of Breil Nook, Flamborough Head were monitored. Due to line of sight it was not always possible to see the chicks clearly, but it is estimated that at least 12 chicks fledged. Accordingly, productivity for this group of nests was a minimum of 2.4 chicks per pair.

Black-legged Kittiwake *Rissa tridactyla* – Flamborough and Bempton

Mean productivity for Black-legged Kittiwake at Flamborough and Bempton was 0.58 (SE ± 0.0353) chicks per AON. A total of 900 AON were monitored across 18 plots, from which 527 chicks successfully fledged (Table 3, Figure 3). The mean productivity for Black-legged Kittiwake recorded between 1986-2005 from between thirty and sixty-one colonies annually was 0.68 (SE ± 0.03) chicks per AON (Mavor et al., 2008).

Table 3: Flamborough/Bempton Black-legged Kittiwake productivity 2017

Plot	AON	Fledged chicks	Productivity ch/pr
Jubilee Far	50	26	0.52
Bartlett Nab Near	50	34	0.68
Bartlett Nab Far	50	30	0.60
Grandstand North Near	50	29	0.58
Grandstand North Near Edge	50	32	0.64
Grandstand North Mid	50	28	0.56
Grandstand North Far Edge	-	-	-
Grandstand North Low	50	26	0.52
Old Dor	50	31	0.62
Newcombe	47	9	0.19
Back of Newcombe	50	33	0.66
Carter Lane 1	50	25	0.50
Carter Lane 2	-	-	-
Saddle Nook 1	50	35	0.70
Saddle Nook 2	50	33	0.66
Saddle from Breil	50	16	0.32
Breil Nook North	50	42	0.84
Breil Nook South	50	32	0.64
Back of Breil Nook	53	28	0.53
Swineshaw Hole	50	38	0.76
Lighthouse	-	-	-
Aggregate productivity	900	527	0.59
Mean of plot productivity ch/pair		0.58	± 0.0353 SE

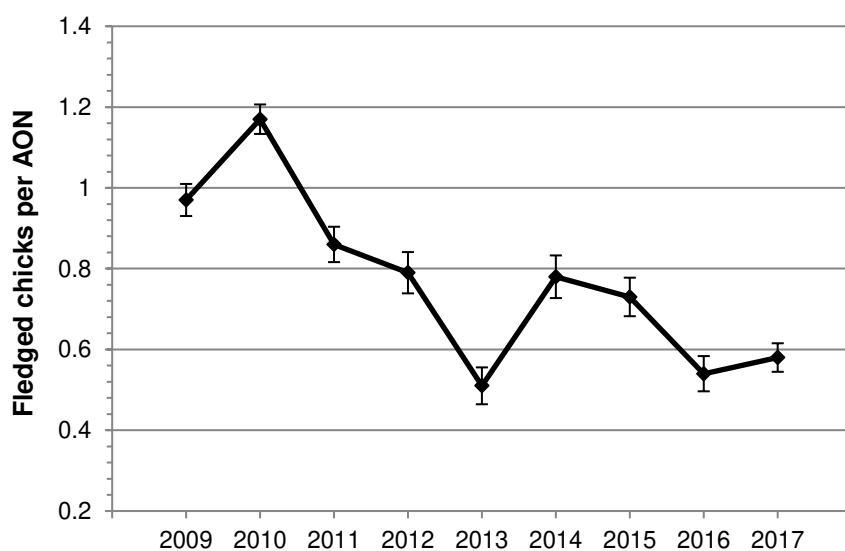


Fig. 3: Flamborough/Bempton Black-legged Kittiwake productivity 2009 – 2017, mean of plot results plus/minus SE.

Black-legged Kittiwake *Rissa tridactyla* – Filey Cliffs

Mean productivity for Black-legged Kittiwake at Filey was 0.39 (SE ± 0.0742) chicks per AON. A total of 150 AON were monitored across 3 plots, from which 59 chicks successfully fledged (Table 4, Figure 4). The mean productivity for Black-legged Kittiwake recorded between 1986-2005 from between thirty and sixty-one colonies annually was 0.68 (SE ± 0.03) chicks per AON (Mavor et al., 2008).

Table 4: Filey Black-legged Kittiwake productivity 2017

Plot	AON	Fledged chicks	Productivity ch/pr
Plot 1	50	27	0.54
Plot 7	50	15	0.30
Plot 8	50	17	0.34
Plot 9(a)	-	-	-
Plot 10(a)	-	-	-
Aggregate productivity	150	59	0.39
Mean of plot productivity ch/pair		0.39	± 0.0742 SE

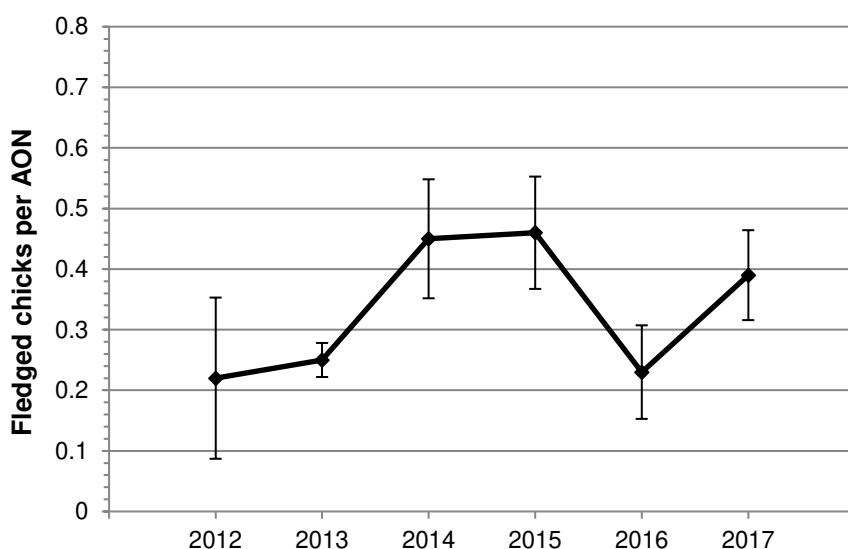


Fig. 4: Filey Black-legged Kittiwake productivity 2012– 2017, mean of plot results plus/minus SE. In 2017 only three plots were monitored with a total sample size of 150 AON. Note that in 2012 productivity on 3 plots was 0.0 due to landslip.

European Herring Gull *Larus argentatus*

Mean productivity for European Herring Gull was 0.73 (SE ± 0.0475) chicks per AON. A total of 88 AON were monitored across five plots, from which 65 chicks successfully fledged (Table 5, Figure 5).

Table 5: European Herring Gull productivity 2017

Plot	AON	Fledged chicks	Productivity ch/pr
Jubilee to Old Dor	25	20	0.80
Newcombe North	6	4	0.67
The Saddle Rock	23	15	0.65

Breil Nook Stack	17	11	0.65
Newcombe to Breil	17	15	0.88
Aggregate productivity	88	65	0.74
Mean of plot productivity ch/pair			0.73 ± 0.0475 SE

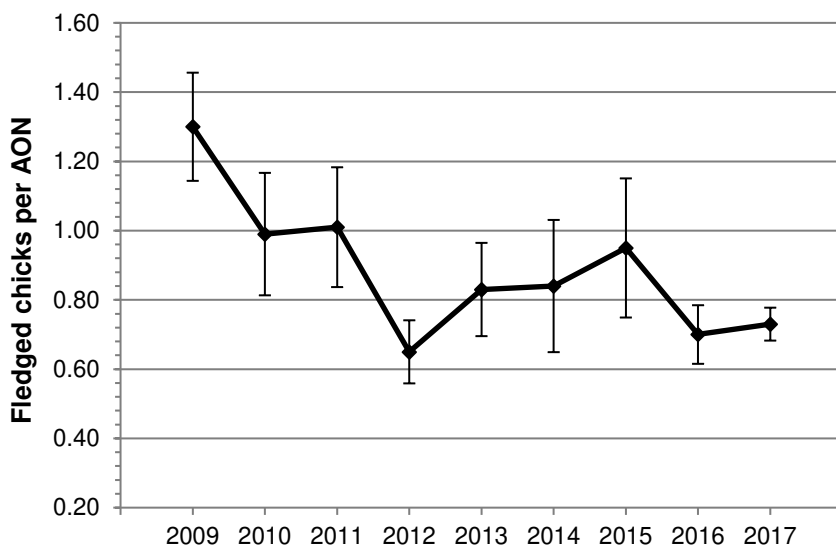


Fig. 5: European Herring Gull productivity 2009 – 2017, mean of plot results plus/minus SE.

Common Guillemot *Uria aalge*

Mean productivity for Common Guillemot was 0.59 (SE ± 0.0896) chicks per AOS. A total of 304 AOS were monitored across six plots, from which 185 chicks successfully fledged (Table 6, Figure 6). The mean productivity for Common Guillemot recorded between 1986-2005 from between three and fifteen colonies annually was 0.69 (SE ± 0.02) chicks per AOS (Mavor et al., 2008).

Table 6: Common Guillemot productivity 2017

Plot	AOS	Fledged chicks	Productivity ch/pr
Nettletrip	47	29	0.62
Grandstand North	44	7	0.16
Grandstand South	55	42	0.76
Carter Lane 1	47	30	0.64
Carter Lane 2	56	40	0.71
Breil Nook	55	37	0.67
Aggregate productivity	304	185	0.61
Mean of plot productivity ch/pair			0.59 ± 0.0896 SE
Mean productivity excluding Grandstand North			0.68 ± 0.0264 SE

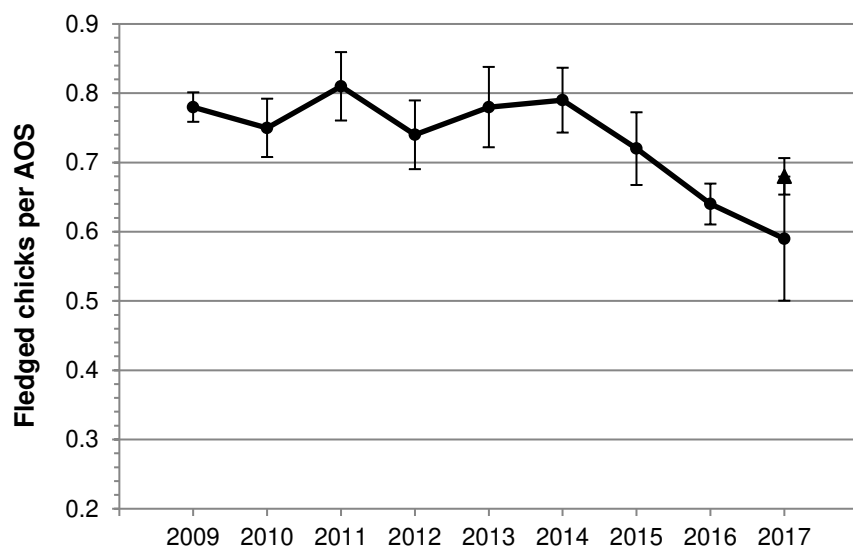


Fig. 6: Common Guillemot productivity 2009 – 2017, mean of plot results plus/minus SE. ▲ = mean of plot results excluding Grandstand North plus/minus SE.

This year, productivity on Grandstand North was notably low. Carrion Crow predation on eggs and displacement by prospecting Northern Gannet seemed to be responsible. These factors mean that this plot is likely not representative of the colony as a whole and this hypothesis is supported by the results of the full colony count. Exclusion of this plot improves the mean productivity from 0.59 to 0.68. However, the Nettletrip plot, which is also affected by Northern Gannet activity (new nests and prospecting birds noted again this year) showed an upturn in productivity in 2017.

Razorbill *Alca torda*

Mean productivity for Razorbill was 0.56 (SE \pm 0.0884) chicks per AOS. A total of 377 AOS were monitored across eight plots, from which 244 chicks successfully fledged (Table 7, Figure 7). The mean productivity for Razorbill recorded between 1986-2005, from between one and seven colonies annually, was 0.65 (SE \pm 0.02) chicks per AOS (Mavor et al., 2008).

Table 7: Razorbill productivity 2017

Plot	AOS	Fledged chicks	Productivity ch/pr
Grandstand Gully	13	2	0.15
Grandstand North	46	17	0.37
Grandstand South	22	7	0.32
Newcombe	80	67	0.84
Back of Newcombe	49	29	0.59
Saddle Nook	53	37	0.70
Breil Nook	56	46	0.82
Swineshaw Hole	58	39	0.67
Aggregate productivity	377	244	0.65
Mean of plot productivity ch/pair		0.56	\pm 0.0884 SE
Mean of plot productivity on RSPB Reserve		0.28	

Mean of plot productivity
at Flamborough Head

0.72

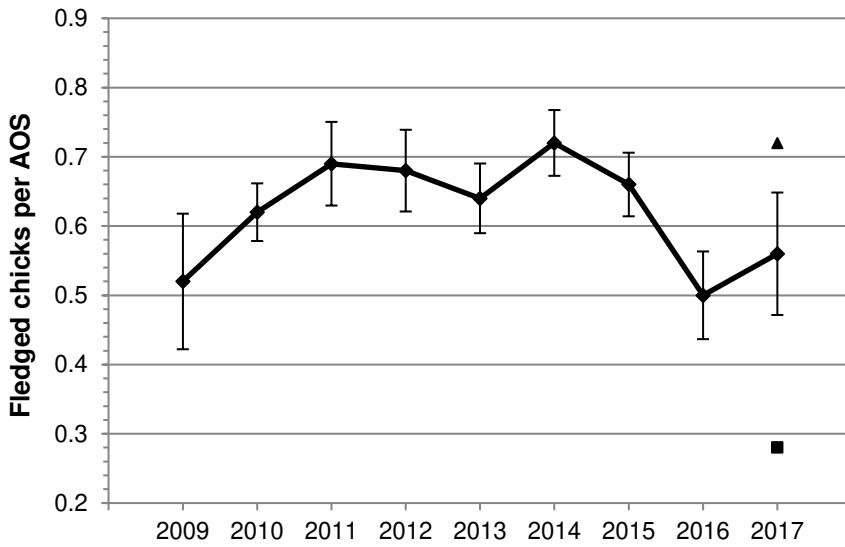


Fig. 7: Razorbill productivity 2009 – 2017, mean of plot results plus/minus SE. ■ = mean of Grandstand plot results; ▲ = mean of Flamborough plot results.

Once again, Carrion Crow activity may have had an impact on these results, particularly for the three Grandstand plots at the RSPB Bempton Cliffs reserve. There were near daily observations of predated eggs or actual Carrion Crow predation of Razorbill eggs in the vicinity of the Grandstand viewpoint. It is therefore likely that productivity on these plots is not typical of the larger colony. For this reason Figure 7 shows separate means for the three Grandstand plots on the RSPB Reserve and for the plots at Flamborough Head as well as the overall mean of plot results.

Whole colony counts

N.B. Complete whole colony count data for the Flamborough and Filey Coast pSPA exists for 2017 only. For this reason, the following population graphs presented here are for the original Flamborough Head and Bempton Cliffs SPA.

Northern Fulmar *Fulmaris glacialis*

846 AOS were recorded across the SPA (Figure 8). An additional 411 AOS were recorded at Filey, bringing the pSPA total to 1,257 AOS or 2,514 breeding individuals.

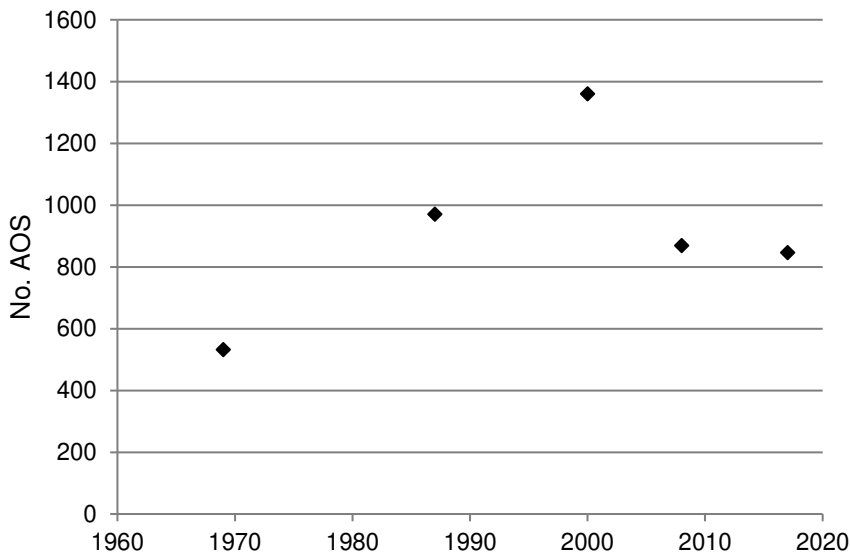


Fig. 8: Trend in Northern Fulmar *Fulmaris glacialis* breeding population within the Flamborough Head and Bempton Cliffs SPA (1969-2017).

Northern Gannet *Morus bassanus*

13,392 AOS were counted (Figure 9). In addition to the apparently occupied sites, a further 1,169 non-breeding birds were also present in 'clubs' which are likely to form future extensions of the colony.

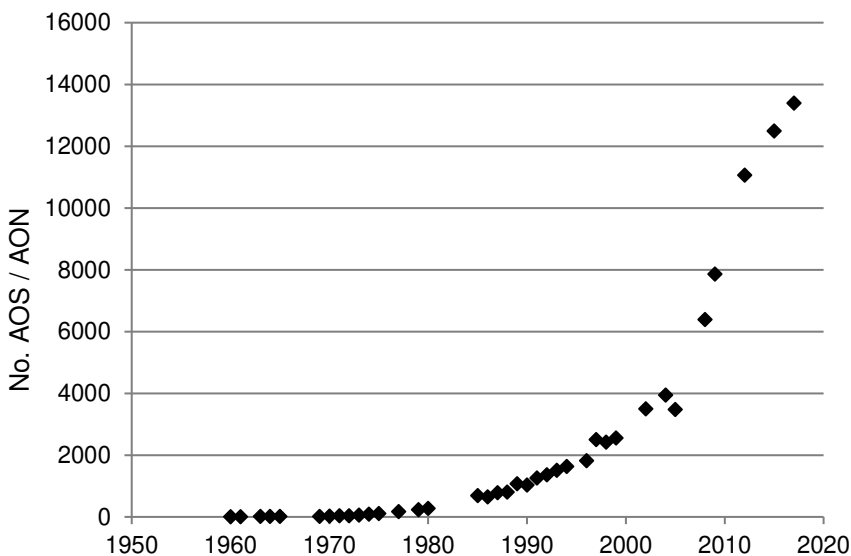


Fig. 9: Trend in Northern Gannet *Morus bassanus* breeding population within the Flamborough Head and Bempton Cliffs SPA (1960-2017).

European Shag *Phalacrocorax aristotelis*

25 pairs with apparently occupied nests were counted, typically, at the base of the cliffs within the SPA (Figure 10).

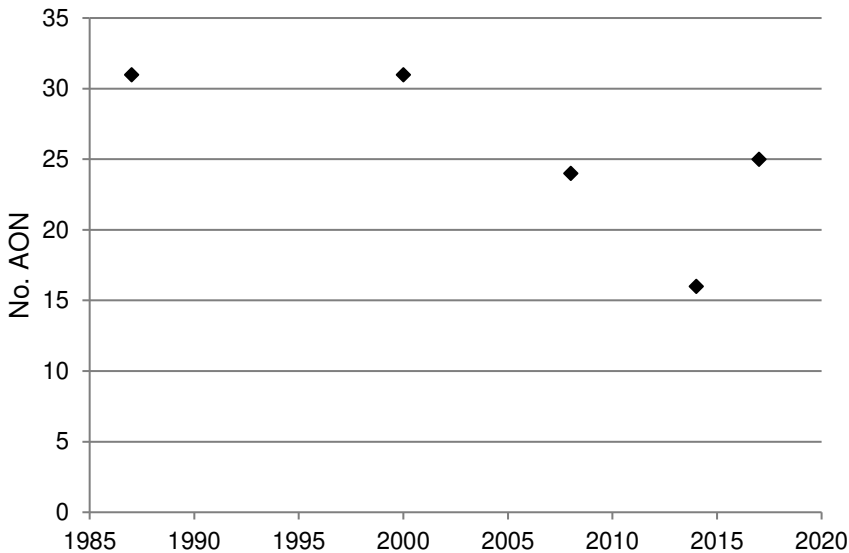


Fig. 10: Trend in European Shag *Phalacrocorax aristotelis* breeding population within the Flamborough Head and Bempton Cliffs SPA (1987-2017).

Great Cormorant *Phalacrocorax carbo*

27 pairs with apparently occupied nests were recorded. The breeding range of the Great Cormorant is restricted to the high sandstone cliffs north of Filey in the pSPA extension, where breeding numbers have remained stable over the last 7 years.

Black-legged Kittiwake *Rissa tridactyla*

45,504 AON were counted across the SPA (Figure 11). An additional 6,031 AON were recorded at Filey, bringing the pSPA total to 51,535 AON or 103,070 breeding individuals.

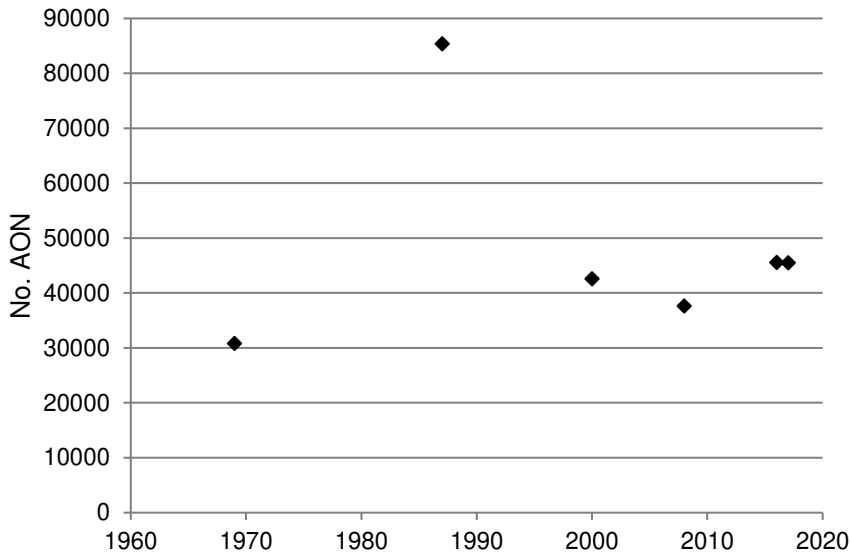


Fig. 11: Trend in Black-legged Kittiwake *Rissa tridactyla* breeding population within the Flamborough Head and Bempton Cliffs SPA (1969-2017).

European Herring Gull *Larus argentatus*

351 AON were counted across the SPA (Figure 12). An additional 115 pairs were recorded at Filey, bringing the pSPA total to 466 AON or 932 breeding individuals.

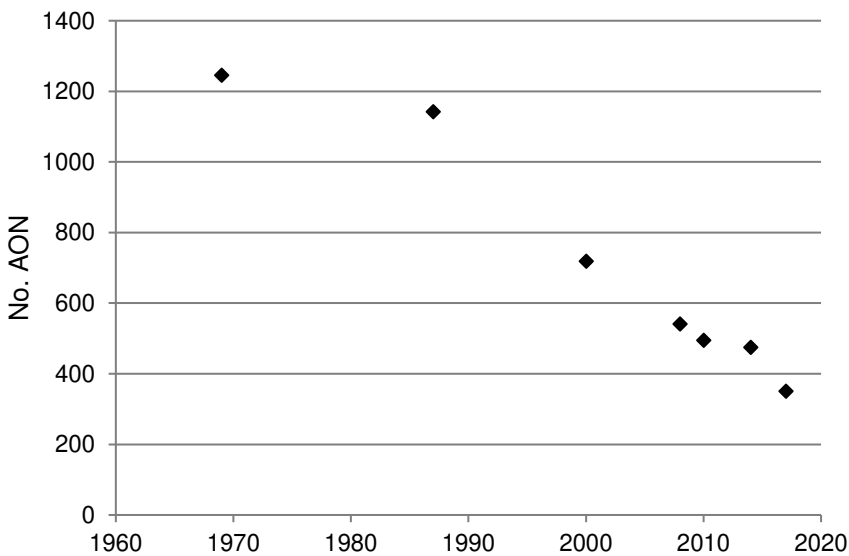


Fig. 12: Trend in European Herring Gull *Larus argentatus* breeding population within the Flamborough Head and Bempton Cliffs SPA (1969-2017).

Common Guillemot *Uria aalge*

84,647 individuals were counted on the cliffs across the SPA (Figure 13). An additional 6,214 individuals were recorded at Filey, bringing the pSPA total to 90,861 individuals. Using a conversion factor of 0.67 (Birkhead, 1978; Harris, 1989) translates to 60,877 pairs or 121,754 breeding individuals within the pSPA.

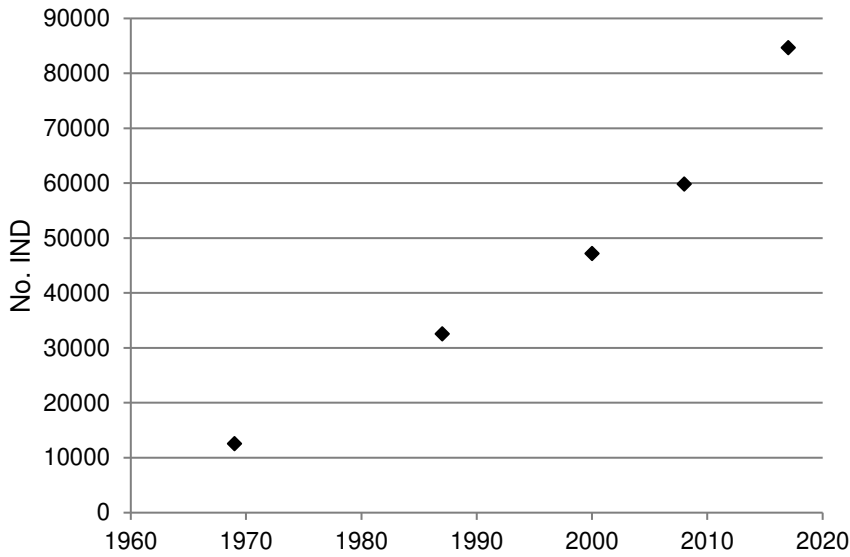


Fig. 13: Trend in Common Guillemot *Uria aalge* breeding population within the Flamborough Head and Bempton Cliffs SPA (1969-2017).

Razorbill *Alca torda*

27,967 individuals were counted on the cliffs across the SPA (Figure 14). An additional 2,261 individuals were recorded at Filey, bringing the pSPA total to 30,228 individuals. Using a conversion factor of 0.67 (Birkhead, 1978; Harris, 1989) translates to 20,253 pairs or 40,506 breeding individuals within the pSPA.

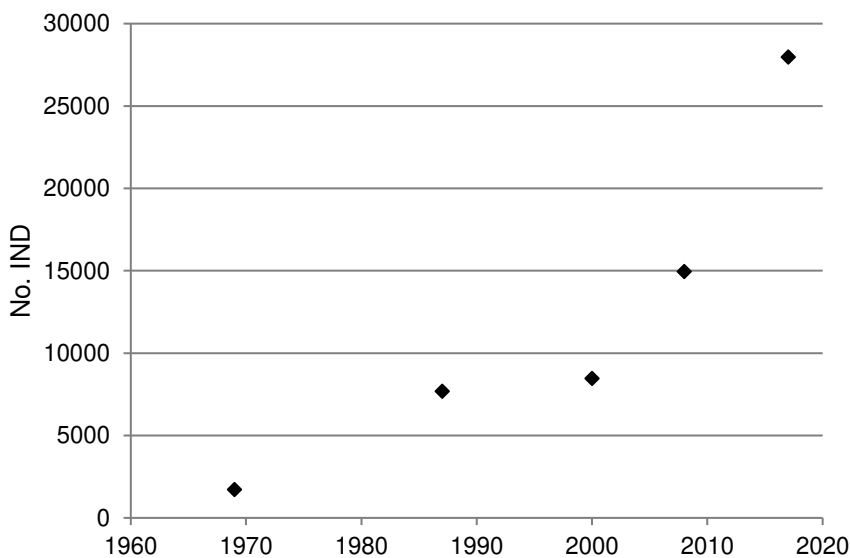


Fig. 14: Trend in Razorbill *Alca torda* breeding population within the Flamborough Head and Bempton Cliffs SPA (1969-2017).

Atlantic Puffin *Fratercula arctica* pSPA whole-colony count

A total of 2,879 Atlantic Puffin were recorded staging on the sea on Friday 24 March 2017. The count was broken down into sections as follows (from South to North):-

Flamborough Head to Thornwick Bay:	712
Thornwick Bay to Speeton Cliffs:	1,924
Filey Brigg to Cunstone Nab:	243

It should be stressed that these numbers are not to be treated as a count of the breeding population; they are intended to serve as an index and enable detection of relatively large scale year-to-year variation.

Study-plot counts

Black-legged Kittiwake study-plot counts

Seven study-plots were each counted on two separate occasions in the first three weeks of June. The mean of the two counts was 1,943 AONs, an increase after the poor year in 2016 but still relatively low (Table 8).

Table 8: Black-legged Kittiwake study-plot count results - last 6 years

Visit	2012 AON total	2013 AON total	2014 AON total	2015 AON total	2016 AON total	2017 AON total
1	1967	1554	1917	1966	1858	1945
2	1952	1508	1996	1977	1816	1940
Mean	1960	1531	1957	1972	1837	1943

Common Guillemot study-plot counts

Seven study-plots were each counted on five separate occasions in the first three weeks of June. The mean of the study-plot counts for Common Guillemot was 1,348 IND (Table 9). Both the high count and mean were similar to the last two years.

Table 9: Common Guillemot study-plot count results - last 5 years

Count	2013 IND total	2014 IND total	2015 IND total	2016 IND total	2017 IND total
1	1193	1411	1396	1491	1335
2	1226	1486	1410	1342	1428
3	1333	1327	1494	1361	1424
4	1323	1475	1420	1351	1323
5	1318	1573	1226	n/a	1231
Mean	1279	1454	1389	1386	1348

Razorbill study-plot counts

Seven study-plots were each counted on four separate occasions in the first three weeks of June. The mean of the study-plot counts for Razorbill was 676 IND; this is the highest mean count recorded and is in line with the general upward trend since the first counts in 2009 (Table 10).

Table 10: Razorbill study-plot count results - last 5 years

Count	2013 IND total	2014 IND total	2015 IND total	2016 IND total	2017 IND total
1	552	584	592	570	731
2	584	694	535	654	700
3	556	565	662	686	657
4	624	591	607	660	689
5	613	754	482	n/a	658
Mean	586	638	576	643	676

Continuation of study-plot counts

The completion of the whole colony count allowed us to compare the trend in colony counts of Black-legged Kittiwake, Common Guillemot and Razorbill in 2000, 2008 and 2017 with the trend shown by study-plot counts since 2009. Overall, the study-plot counts reflect the increase in Common Guillemot and Razorbill numbers shown by the whole colony counts starting in 2009 and the more or less steady Black-legged Kittiwake numbers. Accordingly, the study plot counts will be continued in the belief that they do at reflect changes in the larger colony even if they do not capture the potential magnitude of these changes.

Common Guillemot diet study

A total of 284 prey items were recorded during the study, reflecting the lack of dedicated diet observation sessions. Of these 69% were clupeids, 20% were sandeel spp., 3% were cephalopods and 8% were other/unidentified (Figure 15). Although the absolute number is quite small, this is the first time in recent years that more than one or two cephalopods have been recorded.

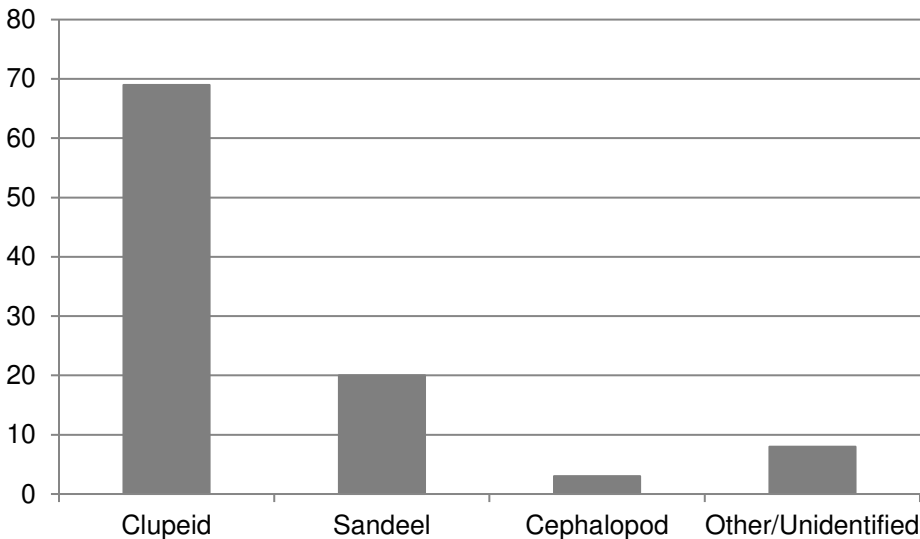


Fig. 15: 2016 Common Guillemot diet composition – percentage of observed prey items at Bempton Cliffs/Flamborough Head. n = 284 prey items.

European Shag roost counts and colour ring re-sighting

Winter roost counts were discontinued in 2016-17 as they continued to fall well short of anticipated numbers. Colour ring re-sightings continue to provide valuable insight in to the origins and movements of European Shag using the colony and effort was concentrated on collecting this data. To date, thirty individuals have been re-sighted, including nine new individuals in 2017 (Table 11).

Table 11: European Shag colour ring re-sightings at Flamborough Head 2014 – 2017

Code	BTO ring number	Date	Age	Colony	First and last date recorded at Flamborough Head
EUH		2014	Pullus	Fidra	10/11/14 - 13/05/17
CLR		2014	Pullus	Farnes	10/11/14 - 21/10/15
END	1478565	2014	Pullus	Inchmickery	10/11/14 - 22/05/17
CHC	G8898	2006	Pullus	Isle of May	25/11/14 - 04/08/17
CNE		2014	Pullus	Farnes	04/12/14
ACE	1472974	2014	Adult	Craigleith	19/01/15 - 18/02/16
ESB	1478625	2014	Pullus	Inchmickery	19/01/15
ARI		2014	Pullus	Craigleith	24/07/15
NEJ		2015	Pullus	Farnes (Inner)	21/10/15
DAN	1485389	2016	Pullus	North Sutor, Inverness-shire	06/02/17
UWE		2016	Pullus	Farnes (Inner)	20/05/17
FTA		2016	Pullus	Isle of May	21/05/17
IAX		2016	Pullus	Isle of May	21/05/17
HUD		2016	Pullus	Isle of May	22/05/17 - 07/08/17
DAN		2016	Pullus	Isle of May	04/08/17
TPC	1396622	20/06/09	Adult	Craigleith	10/11/14 - 28/02/17
RZF		2013	Adult	Farnes	21/10/15
PCA		2010	Pullus	Farnes (Staple)	21/10/15 - 26/08/16
AUL	1483281	2015	Adult	Isle of May	18/02/16 - 06/02/17
AFP		25/06/14	Pullus	Isle of May	10/11/14
AUH	1483074	2014	Pullus	Isle of May	18/02/16 - 28/02/17
ADA	1473962	2014	Pullus	Isle of May	18/02/16
IPJ		30/05/16	Pullus	Isle of May	13/09/16 - 19/09/16
DAP	1472058	2015	Pullus	Isle of May	11/03/17
IDT		2016	Pullus	Isle of May	04/08/17
CUX	1472024	2015	Pullus	Isle of May	13/02/17
HZA		2015	Pullus	Isle of May	19/06/17
NDC		16/06/14	Pullus	Isle of May	10/11/14
FTX		2012	Pullus	Isle of May	16/12/14
AFN	1453306	2011	Pullus	Isle of May	28/02/17

Seabird tracking

Overall, 168 foraging trips (longer than 1km and 1h) were collected from 18 of the 20 deployed tags (Figure 16), which showed large variability in trip duration, distance and range (Table 12). The utilization distribution for all trips collected in 2017 highlighted a substantial overlap with many of the offshore windfarm developments already in place or planned in front of the Yorkshire coast (Figure 17). However, there was a strong North/South divide between trips from Filey and Flamborough in the 2017 data set resulting in a decreased overlap with the Hornsea zones compared to tracking data from previous years (Figure 18). One successfully tracked bird from the new Speeton study site

appeared to go to foraging sites further North, following a similar pattern to the Filey birds. However, as the centre of the colony is home to the biggest proportion of the population, it needs to be assessed whether the divide between northern and southern foraging areas is maintained, or if birds from the centre of the colony fill the gap in foraging distributions.

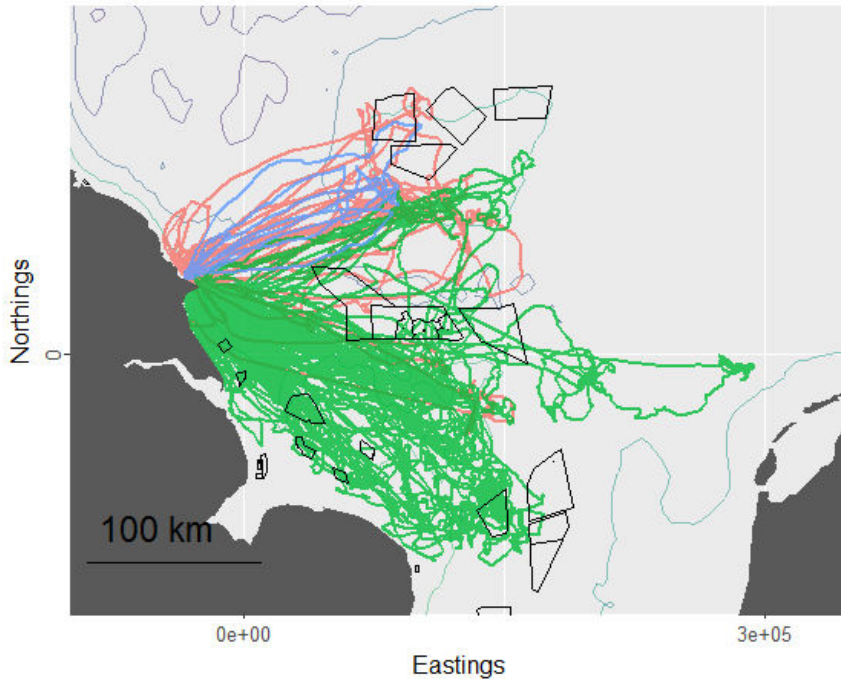


Fig. 16: Kittiwake GPS trips collected during the 2017 breeding season at the Flamborough and Filey Coast pSPA. All trips are shown from Flamborough (Green, N=133 trips from 13 birds), Filey (Red, N=29 trips from 4 birds) and Speeton (Blue, N=6 trips from 1 bird). Bathymetric contours and scale bars are shown, with land in dark grey (UK, left; the Netherlands, right) and the footprints of constructed, consented and planned offshore wind farms outlined in black (the Hornsea Zone includes the large group of windfarms in the centre of the map). The map is projected to the Azimuthal Equal Area centred on the mid-point of all the tracking data.

Table 12: Summary of the three trip metrics calculated for all 168 Kittiwake trips. Trips ranged over a maximum period of 29 days across the chick rearing period and also included trips from failed individuals. Note that the reported large standard deviations are due left skewed distribution of all three trip metrics. N=168 from 18 birds.

Trip metric	Mean (\pm SD)	Range
Trip duration (h)	22.12 (\pm 28.69)	1.00 - 168.67
Foraging range (km)	88.65 (\pm 74.22)	3.20 - 323.85
Travelled distance (km)	256.62 (\pm 261.88)	7.91 - 1249.70

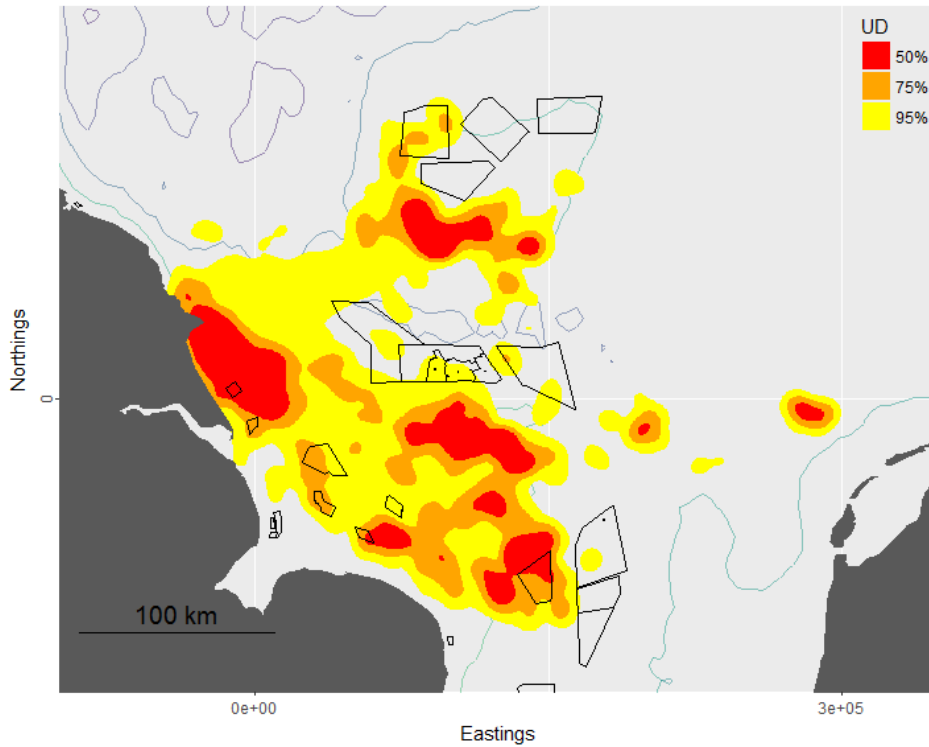


Fig. 17: Utilization distributions of all Kittiwakes tracked at Flamborough and Filey Coast pSPA during the 2017 breeding season. N=168 trips from 18 birds. 50, 75 and 95% contours are shown. Bathymetric contours, scale bar and outlines of all proposed, planned or active windfarm zones are shown, with land in dark grey (UK, left; the Netherlands, right). The map is projected to the Azimuthal Equal Area centred on the mid-point of all the tracking data.

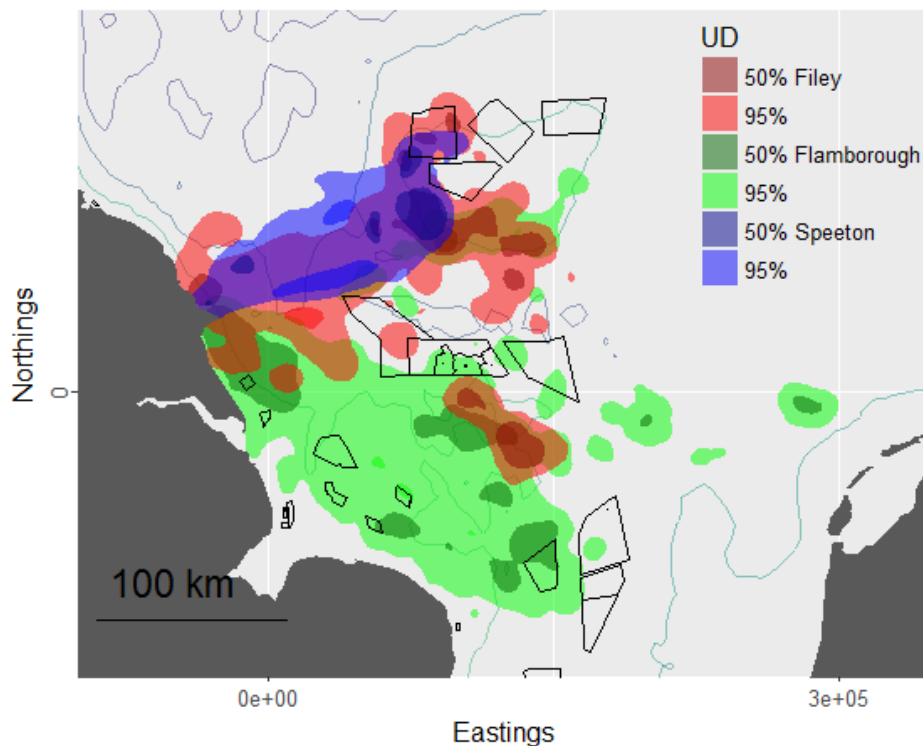


Fig. 18: Utilization distributions of all Kittiwakes tracked at Flamborough and Filey Coast during the 2017 breeding season by study site. 50 and 95% contours are shown. Green tones refer to Flamborough (N=133

trips from 13 birds), red tones to Filey (N=29 trips from 4 birds) and blue tones to Speeton (N= 6 trips from 1 bird). Bathymetric contours, scale bar and outlines of all proposed, planned or active windfarm zones are shown, with land in dark grey (UK, left; the Netherlands, right). The map is projected to the Azimuthal Equal Area centred on the mid-point of all the tracking data.

Note that construction of the Hornsea wind farms did not start, yet, and no turbines are in place in this area (though some of the smaller wind farms nearer the coast are already operational). In 2017 accelerometer samples were only collected for 3 birds due to a combination of small battery size and tag settings that were not able to compensate for shading effects in cliff nesting seabirds and therefore had a slow solar re-charge rate. These issues were discussed with the tag manufacturer and should be successfully addressed for future years by modifications to the tag design and operating system.

Because of the longer attachment method (glue mounting) and the remote download of data that does not require re-trapping of birds, this study not only provides a unique and scarce insight into the distribution of birds later in the breeding season when they are on larger chicks, it also includes some trips collected from failed breeders. Therefore, the next step (currently work in progress led by Saskia Wischnewski) is to assess how distributions and foraging trip characteristics change across the breeding season and after breeding failure.

Recreational disturbance

Recreational disturbance continues to be a threat to the breeding success of the colony. The Flamborough Head EMS partnership study of disturbance incidents across the SPA identified incidents involving Jet Skis, motorised boats and kayakers in 2017.

The voluntary code of conduct developed with local angling clubs for Bempton and Speeton Cliffs, incorporating a closed season for cliff-top angling from 1 March to 30 September, was largely considered to be a success. Review meetings will continue, however, to ensure the code of conduct remains relevant and effective.

A personal watercraft (Jet Ski) Code of Conduct applies from 1 March to 30 September; users are asked to maintain a no-wake speed within 300m of the cliffs and near rafts of birds. The Flamborough Head EMS Project Officer continues to work with personal watercraft users, the Personal Watercraft Partnership, local authorities, Natural England and the RSPB in order to ensure that the voluntary agreement is effective

Last year, the EMS Project Officer also facilitated an agreement with the Chief Pilot of the Humberside Search and Rescue helicopter whereby from 15 March to 15 August crews will not carry out training exercises between North Landing and High Stacks (just south of the lighthouse). This agreement compliments the existing Ministry of Defense 'Environmental Avoidance' area around Bempton Cliffs and does not cover emergency responses, which will continue as normal.

A PhD student from Leeds University has been conducting research around the EMS, in partnership with the Yorkshire Wildlife Trust and the Flamborough Head EMS Management Scheme, to look at recreational activity issues in comparison with another marine protected area in Bulgaria. It is hoped that this work will further the Management Scheme's understanding of recreational disturbance and potentially provide some ideas for new management measures.

DISCUSSION

The Flamborough and Filey Coast pSPA (formally Flamborough Head and Bempton Cliffs SPA) supports the largest mainland seabird colony and largest Black-legged Kittiwake colony in the UK, as well as the only Northern Gannet colony in England. It is also the most southerly large cliff-nesting seabird colony on the North Sea coast. The Flamborough and Filey Coast pSPA Seabird Monitoring Programme has been operating since 2009, providing a real insight into trends in breeding seabird productivity and populations.

Productivity was average at best for most species monitored: Common Guillemot breeding success was the lowest recorded (0.59 chick/pair) since detailed monitoring commenced in 2009 and Razorbill productivity was low at 0.56 chick/pair. Plot specific factors such as displacement by prospecting Northern Gannet and corvid predation may account for this. Both of these factors will continue to be monitored closely. Black-legged Kittiwake productivity was also low (0.58 chick/pair) when compared to the national mean of 0.69 chick/pair (Mavor et al., 2008). A period of bad weather during chick provisioning in June may have affected adult birds' ability to forage, thus resulting in unattended nests susceptible to exposure and vulnerable to predation. This is the six consecutive year that productivity has been below the 0.80 chicks/pair believed to be necessary to sustain a population (Coulson, 2011). Northern Fulmar and Northern Gannet produced average results and European Herring Gull was again below average.

A total assemblage colony count was successfully completed in 2017 when favorable weather conditions and sea state allowed 10 days of boat-based surveys to be completed during the survey window, conditions which had not been replicated since the 2008 census. The data from 2017 will contribute to the next national census, 'Seabirds Count', scheduled to take place during the 2018-19 breeding seasons as confirmed by JNCC (Daisy Burnell, pers. comm., 2017). The full colony results are encouraging for most species with the exception of Northern Fulmar and European Herring Gull; both of which have experienced a steady decline since the last national census, 'Seabird 2000'. Conversely, the Northern Gannet population has grown exponentially with a 425% increase in that same time; similarly, Razorbill has undergone a 230% increase and Common Guillemot 79% since 'Seabird 2000'. The Black-legged Kittiwake population has seen a small 7% increase which is positive when compared with colonies elsewhere in the UK. A paper on the 2017 count is being prepared (Clarkson, 2017) and will provide more detail about the results, trends and methodology employed.

The completion of the whole colony count allowed us for the first time to review the annual study plot counts and compare the trends with the counts in 2000, 2008 and 2017. Overall, the study-plot counts reflect the increase in Common Guillemot and Razorbill numbers shown by the whole colony counts starting in 2009 and the relatively stable Black-legged Kittiwake numbers. Accordingly, the study plot counts will be continued in the belief that they do reflect changes in the larger colony even if they do not capture the potential magnitude of these changes.

This year, a dedicated residential volunteer was available to undertake the auk diet composition study. The observer had limited fieldwork experience and so only Common Guillemot prey items were monitored. It was valuable to test the feasibility of using a volunteer with limited experience to see if meaningful data could be collected and the results suggest that it is possible to collect useable data; although it is crucial that time is spent assessing the observer and ensuring quality control during the study period. The diet observations form an important indicator of prey availability in the North Sea and so it is essential that a sustainable model for this monitoring work is developed.

In 2017, the reserve supported a Black-legged Kittiwake tracking project, led by RSPB's Conservation Science team and part-funded by Ørsted (formerly DONG Energy). This tracking project informs the Flamborough and Filey Coast Seabird Monitoring Group (RSPB, Flamborough Head European Marine Site, and Natural England), and builds on tracking previously undertaken at this colony. For the first time, automatic-download solar tracking devices were fitted to adult birds; employing this technology meant that a bird only needs to be caught once in order to attach the device, after which data is downloaded wirelessly to a base station whenever the device is in range. In total, twenty devices were deployed, eighteen of which successfully collected data.

Construction of the first phase of Hornsea Project One is due in 2019 and so it is vital to collect as much data as possible before completion in order that bird behaviour before and after construction can be compared. In 2018, it is hoped to tag 20 additional Black-legged Kittiwake at Speeton and Flamborough, in addition to 20 Northern Gannet at Bempton. This year's tags will include altimeters as well as accelerometers, so that altitude as well as flight patterns can be collected. This data will be invaluable in understanding risk from collision with blades and turbines, as well as in future understanding changes in flight pattern associated with avoidance. In addition, the tags will collect higher resolution data in the core foraging areas, and less data when resting on the cliffs, where re-charging solar batteries is problematic. This higher rate of sampling within the windfarm footprint should provide greater insights into the behaviour of birds in this zone prior to construction.

A Black-legged Kittiwake colour ringing project is also proposed in 2018, and re-sighting data will help determine survivorship. These projects will be managed by RSPB and part-funded by Ørsted and Natural England.

The Flamborough and Filey Coast Seabird Monitoring Group will continue to meet regularly in 2018 to assess data collected and to understand what further data is required to understand this colony and its dependency on the Hornsea Zone. This collaborative working with Ørsted to gather data will allow us to focus our energies on data interpretation, rather than disputing validity of data or data collection methodologies.

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LEADER for funding optics and other monitoring equipment that continue to provide essential tools for our volunteer team.

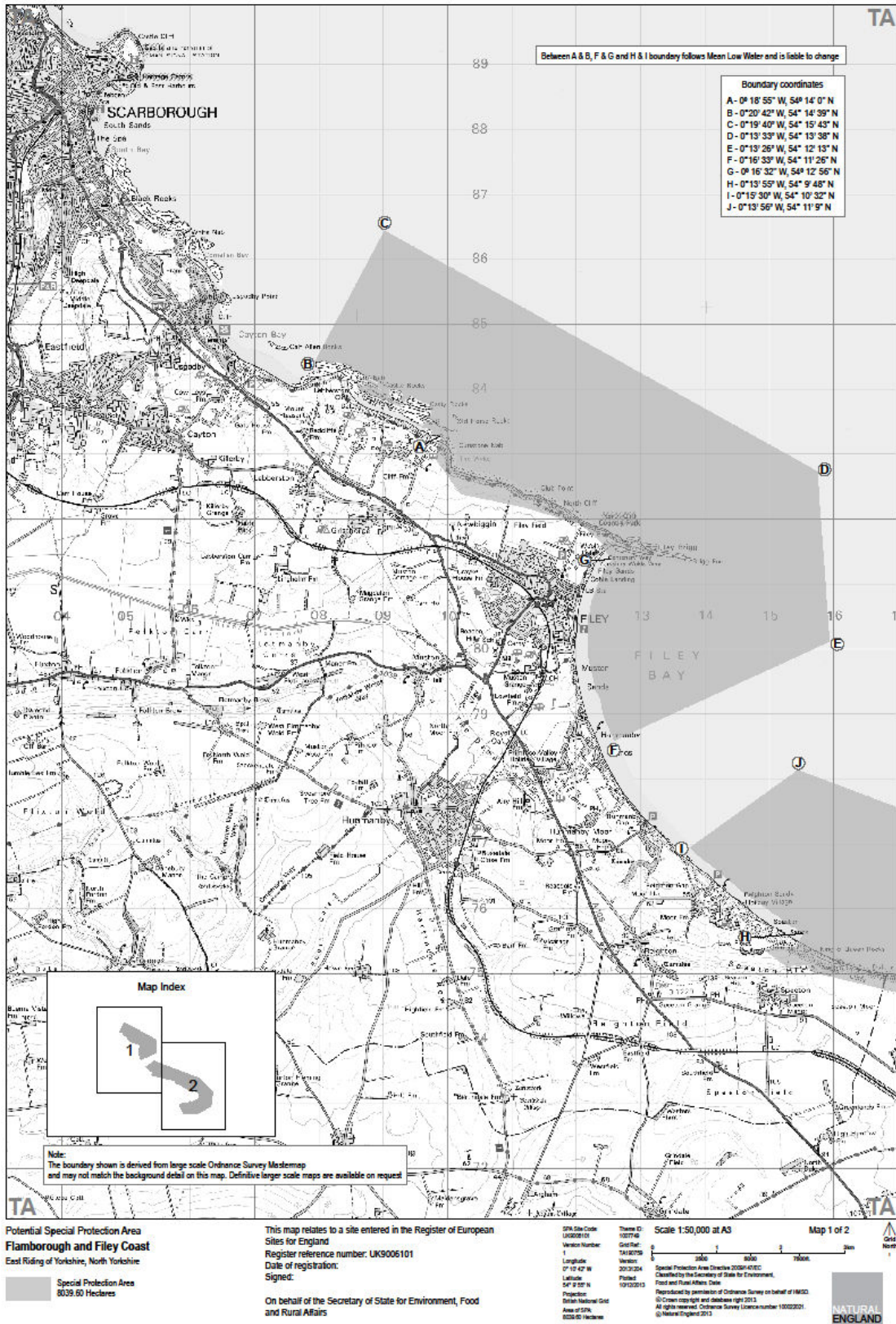
Blue Dolphin Holiday Park at Filey for allowing access to reach important sections of the colony for essential monitoring works.

And last but not least, the owners and management at Thornwick Bay Holiday Village at Flamborough for providing invaluable parking permits for North Landing car park.

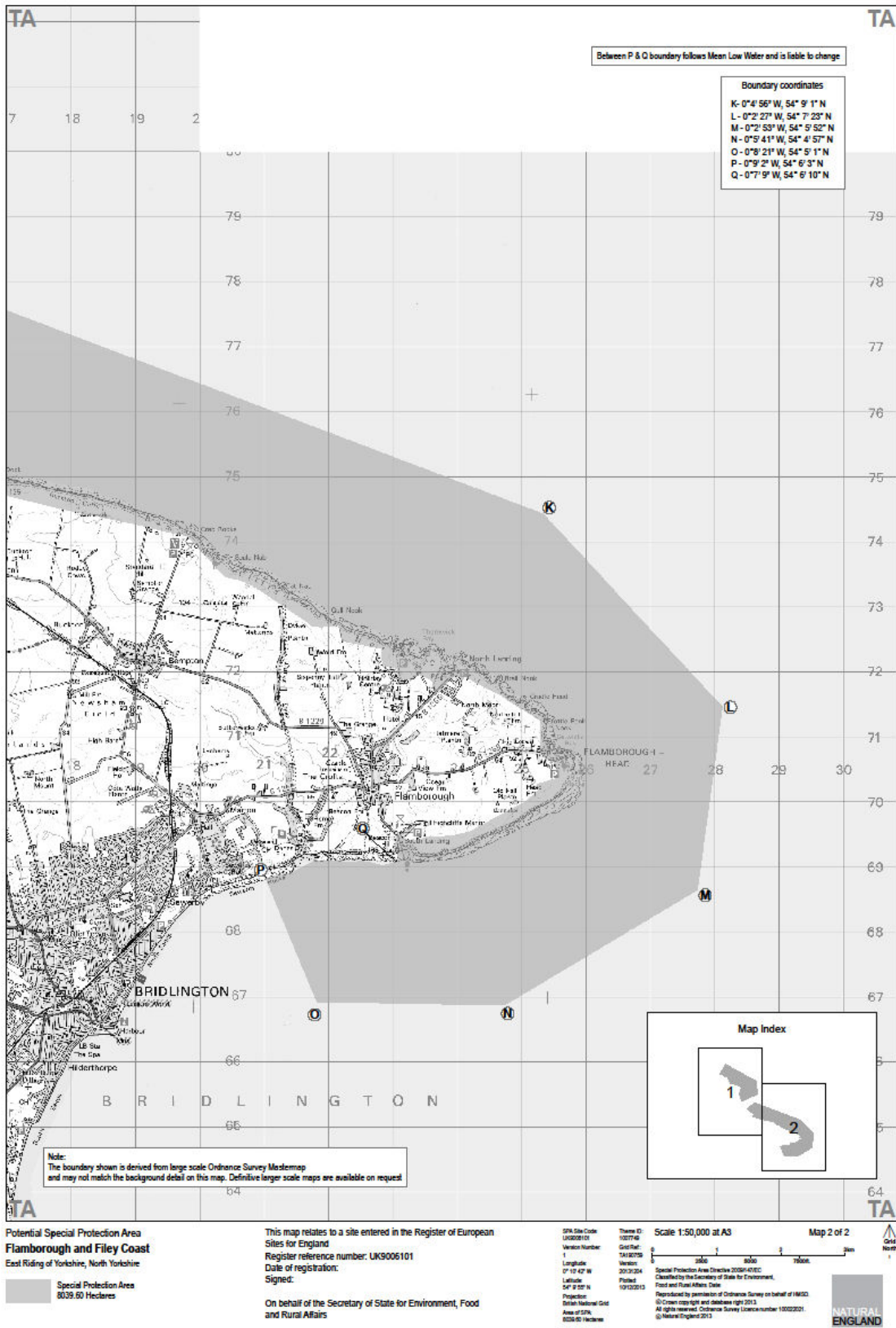
Without all of the aforementioned, the Flamborough and Filey Coast seabird monitoring programme would not be the success that it is.

Appendix 1: Flamborough and Filey Coast pSPA Maps

North



South



Appendix 2 - Productivity Plot Locations

Northern Fulmar productivity plots



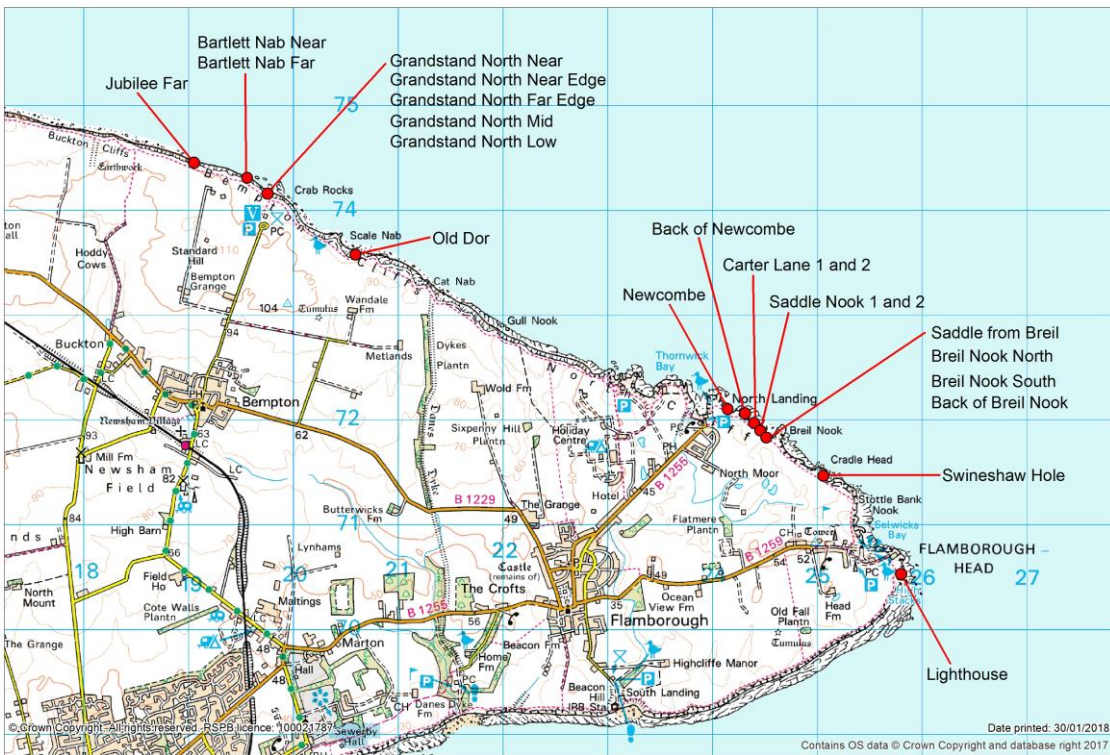
Northern Gannet productivity plots



European Herring Gull productivity plots



Black-legged Kittiwake productivity plots – Flamborough and Bempton



Black-legged Kittiwake productivity plots – Filey



Common Guillemot productivity plots



Razorbill productivity plots



Appendix 3 – Study-plot Locations

Black-legged Kittiwake study-plot locations



Common Guillemot study-plot locations



Razorbill study-plot locations

