Flamborough Head and Bempton Cliffs SPA Seabird Monitoring Programme

2014 Report

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Summary

The Flamborough Head and Bempton Cliffs seabird monitoring programme is a partnership between 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 were 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 condition of this site.

The results inform the Special Protection Area (SPA) 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.

The seabird monitoring programme was successfully completed by a dedicated team of staff, volunteers, a Seabird Research Assistant who is funded by the National Lottery, through the Heritage Lottery Fund and a residential seabird research volunteer.

2014 was a fairly robust breeding season; auks had their second best year since 2009, Kittiwake productivity bounced back after the affects of last year's spring storms, whilst Herring Gull and Fulmar productivity was down on last year and Gannet productivity, although still remaining high, dropped to the lowest levels recorded over the last six years, with most losses accounted for during the egg incubation stage. The productivity results were as follows:

- Northern Fulmar productivity – 80 nests were monitored, with a mean average of 0.48 chicks per apparently occupied site (AOS).
- Northern Gannet productivity – 259 nests were monitored, with a mean average of 0.78 chicks per apparently occupied nest (AON), the lowest since 2006.
- Razorbill productivity – 333 nests were monitored, with a mean average of 0.73 chicks per AOS.
- Common Guillemot productivity – 251 nests were monitored, with a mean average of 0.79 chicks per AOS, the second highest in the last ten years.
- Black-legged Kittiwake productivity – a remarkable 906 nests were monitored with an average productivity of 0.78 chicks per AON, reversing the downward trend of the last five years.
- Herring Gull productivity – 102 nests were monitored with an average 0.81 chicks per AON.

The population study-plot counts showed further increases; the Razorbill study-plots produced a mean count of 638 individuals (IND), an increase of 52 IND on last year, which was 586, the highest mean total recorded since the study was set up.

The Common Guillemot study-plot results produced a mean count of 1,454 IND, an increase of 175 IND on last year, which was 1279. This is the highest mean total recorded since the study started in 2009.

Black-legged Kittiwake study-plot results produced a mean count of 1957 AON; an increase of 426 AONs on last year. This appears to be in contrast to the large losses recorded in the Filey colony where an extraordinary c2,000 fewer pairs were counted during a whole-colony census.

The Common Guillemot diet composition study was carried out between 9th and 23rd June. A total of 126 prey items were recorded during the study; Clupeids were the most numerous comprising 46%, Sandeel spp accounted for 30.2%, Gadoids 1.6% and 22.2% went unidentified.

The Herring Gull whole-colony count was successfully completed this year. A total of 462 AONs were recorded during the boat-based census, a decline of 33 AONs since 2010 continuing the downward trend in the breeding population across the Flamborough and Bempton colony.

The Shag whole-colony count was successfully completed alongside the Herring Gull whole-colony count. A total of 16 AONs were recorded, 8 AONs fewer than in 2008 and a continued downward trend since the 'Seabird 2000' census.

A study was set up to look at how European Shag use the SPA throughout the year, and to assess whether communal winter roosts support nationally significant numbers of wintering Shag at this site. A desk top study was carried out to determine past wintering populations and roost counts have been completed every month since August 2013. Results to date show that the SPA attracts wintering birds, in addition to the local population, however after severe spring storms in 2013 resulted in heavy losses of breeding birds from northern colonies, numbers recorded have not yet been significant to warrant SSSI classification and become a feature of the SPA. This autumn, numbers have almost doubled, which is supported by a good breeding season in 2014, and further investigations will help us build a clearer picture and understanding of how birds use the SPA year-round.

This year, a national survey looking at the frequency of bridling in Common Guillemot was organised. At Flamborough and Bempton Cliffs the survey was completed over two days; a total of 1276 Guillemot were included in the sample across twelve sites between Flamborough and Bempton. Of the 1276, 32 (2.5%) were found to be of the bridled variation.

The Seabird Tracking and Research (STAR) project took place at Flamborough and Filey. The project is now in its fifth year of fieldwork and data collection at Flamborough and it's second year at Filey, tracking Black-legged Kittiwake to investigate foraging behaviour and areas during the chick rearing period. The findings from this year's tracking project once again highlight that the core foraging area of Flamborough nesting Kittiwake overlaps significantly with the proposed development footprint of the proposed offshore Hornsea wind array. Whilst the foraging area of Filey nesting birds overlaps with the proposed Dogger Bank offshore wind farm development area.

At a time when both the Flamborough and Bempton Cliffs SPA and underpinning SSSI and the UK Kittiwake population have undergone a fifty percent decline it is critical that every measure is taken to monitor the potential impact of these developments on the SPA features and that adequate mitigation is in place to safeguard the birds and these key foraging areas.

A further whole-colony count and Kittiwake productivity monitoring was carried out at Filey Cliffs in 2014 and is reported separately (Aitken, Babcock and Clarkson 2014). The Filey colony counts reported the highest Guillemot breeding population to date but also a significant reduction in Kittiwake with an alarming c2,000 fewer AONs recorded.

It is proposed to carry out a detailed analysis of the core foraging areas and compare these with known oceanographic features to determine a more accurate foraging hot spot map for the whole

SPA. This could be tested by extending the Filey Kittiwake study and rolling out tracking work to include Kittiwake nesting at Bempton and Speeton. Furthermore, it is recommended that this approach be used to determine core foraging areas of breeding Guillemot and Razorbill, key features of the Flamborough and Filey Coast pSPA, as soon as the technology allows data to be downloaded automatically without having to recapture birds.

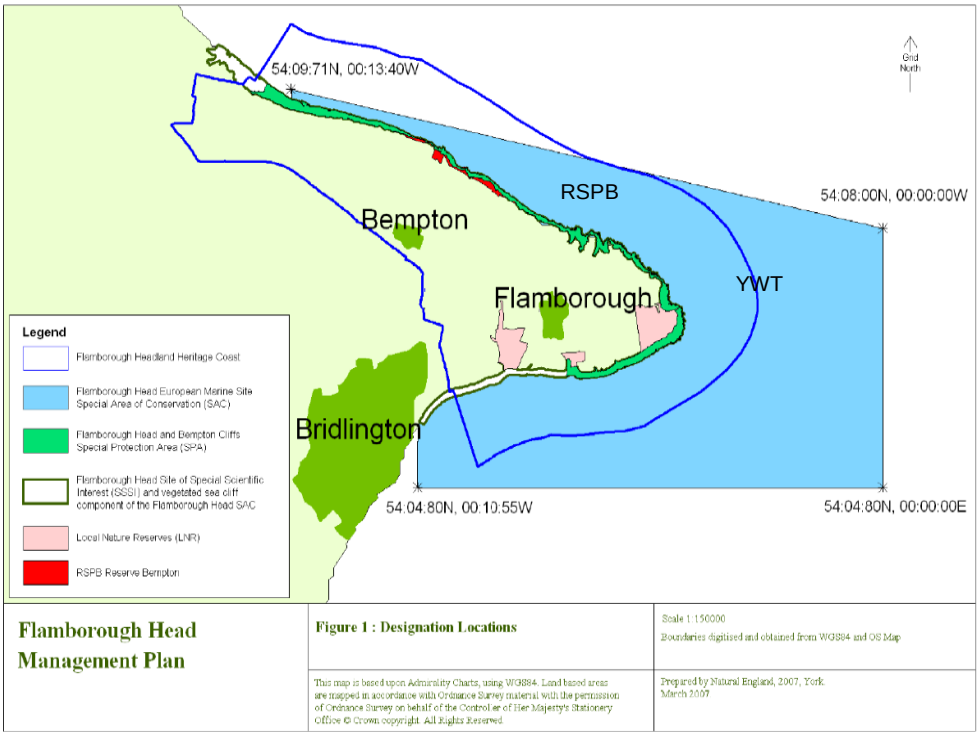
A voluntary angling code of conduct for the RSPB Bempton Cliffs nature reserve was reviewed and adopted by local angling groups and a consultation with personal watercraft users has been initiated by the European Marine Site Project Officer with a view to establish a voluntary code of conduct for jet skis and other personal watercraft.

Introduction

Flamborough Head and Bempton Cliffs SPA 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.

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 (SAC), a Special Protection Area (SPA), Site of Special Scientific Interest (SSSI), a Heritage Coast site which includes three Local Nature Reserves (LNR), the RSPB Bempton Cliffs nature reserve and the Yorkshire Wildlife Trust Flamborough Cliffs nature reserve (Figure 1).

Figure 1 – Site designations on Flamborough Headland



Flamborough and Bempton qualifies under Article 4.2 of the Birds Directive for the following reasons:

- Regularly supports internationally important populations of the following migratory species: Black-legged Kittiwake *(Rissa tridactyla)*
- Regularly supports an internationally important seabird assemblage; nationally important populations of Atlantic Puffin *(Fratercula arctic),* Razorbill *(Alca torda)* and Common Guillemot *(Uria aalge)*

Due to the importance of the seabird colony and level of site protection, Natural England and RSPB proposed a project to enable a baseline count, population monitoring and further research to collect data on the health of the colony. The data will inform the condition of the designated site and the proposed new Flamborough and Filey Coast pSPA and underpinning SSSIs. In addition, the results will also inform current 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 the tracking data will inform potential new offshore MPAs.

The project aims are as follows:

- **Understanding variation and trends in seabird productivity**
  Fulmar, Gannet, Razorbill, Guillemot, Kittiwake and Herring Gull plots to be monitored annually

- **Understanding population numbers and trends**
  Whole-colony census to be carried out every 5 years, commenced 2008
  Gannet whole-colony counts to be carried out on alternate years, commenced 2009
  Herring Gull whole-colony counts to be carried out on alternate years, commenced 2010
  Razorbill, Guillemot and Kittiwake study-plot counts to be carried out annually, commenced 2009

- **Understanding how RSPB Bempton Cliffs relates to wider SPA 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?
  For those activities that are of concern, develop specific research proposals which assess level of impact

- **Understanding foraging behaviours of colony including preferred foraging areas and trends in provisioning for example, determining key feeding areas for key species and factors influencing their location using range finders, remote tracking, and fish data and benthic mapping data, monitor annual variation in provisioning rates and prey types for Razorbill and Guillemot**

Population data has been collected at Flamborough and Bempton since 1969 (Table 1). In 1969, all species were counted as part of 'Operation Seafarer' except for Shag and Puffin. In 1987, all species were counted during the 'Seabird Colony Register' census, in 2000 for 'Seabird 2000' and again in 2008. Whole-colony counts for Gannet were completed in 1970-77, 1981-83, 1985-95, 1997-99, 2002, 2004-05, 2008-09 and 2012. In addition, whole -colony counts for Herring Gull were completed in 2010 and 2014.

Breeding success data has been collected for Gannet during 1973-79, 1988-94, 1998, 2005-06, 2008-13 and 2014. Kittiwake breeding success has been monitored continuously between 1986 and 2014. Razorbill were monitored in 2005-06, 2009-13 and 2014, Guillemot were monitored in 1991-95, 1998, 2005-06, 2009-13 and 2014. Fulmar and Herring Gull breeding success were monitored for the first time in 2009, and is ongoing (Table 2). Unfortunately, it is not possible to monitor breeding success for Shag or Puffin at this colony.

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

The results of the 2014 seabird monitoring and research programme are detailed in this document with the intention of providing all raw data and monitoring procedures to enable interpretation by others in the future.

Table 1 – Summary of Flamborough and Bempton whole-colony count data collected 1969-2014

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gannet	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓		✓	✓			✓	✓			✓		
Kittiwake	✓																		✓													✓									✓						
Razorbill	✓																		✓													✓									✓						
Guillemot	✓																		✓													✓									✓						
Puffin																			✓													✓									✓						
Herring Gull	✓																		✓													✓									✓		✓				✓
Fulmar	✓																		✓													✓									✓						
Shag																			✓													✓									✓						✓

Table 2 – Summary of Flamborough and Bempton breeding success data collected 1973-2014

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gannet					✓	✓	✓	✓	✓	✓	✓									✓	✓	✓	✓	✓	✓	✓				✓					✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Kittiwake																		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Razorbill																																					✓	✓			✓	✓	✓	✓	✓	✓
Guillemot																							✓	✓	✓	✓	✓			✓							✓	✓			✓	✓	✓	✓	✓	✓
Puffin																																														
Herring Gull																																									✓	✓	✓	✓	✓	✓
Fulmar																																									✓	✓	✓	✓	✓	✓
Shag																																														

Methods

The seabird monitoring programme follows the guidelines and methodologies set out in the '*Seabird monitoring handbook for Britain and Ireland. By Walsh, P.M., Halley, D.J., Harris, M.P., del Nevo, A., Sim, I.M.W., & Tasker, M.L. 1995*'. JNCC / RSPB / ITE / Seabird Group, Peterborough.

The handbook summarises the current census and productivity monitoring techniques for seabirds. The appropriate methods were followed according to resources and practicality for each species at this colony. Please refer to the '*Seabird monitoring handbook for Britain and Ireland, 1995'* for details on methodologies followed for each species and survey undertaken.

Productivity monitoring

Productivity monitoring was completed for a sixth year running for six of the eight breeding seabird species found at this site: Northern Fulmar, Northern Gannet, Razorbill, Common Guillemot, Black-legged Kittiwake and Herring Gull. Unfortunately, it is not possible to monitor European Shag or Atlantic Puffin at this colony. For a detailed description of the methodologies followed, please refer to the '*Seabird monitoring handbook for Britain and Ireland, 1995*'.

Northern Fulmar (*Fulmarus glacialis*)

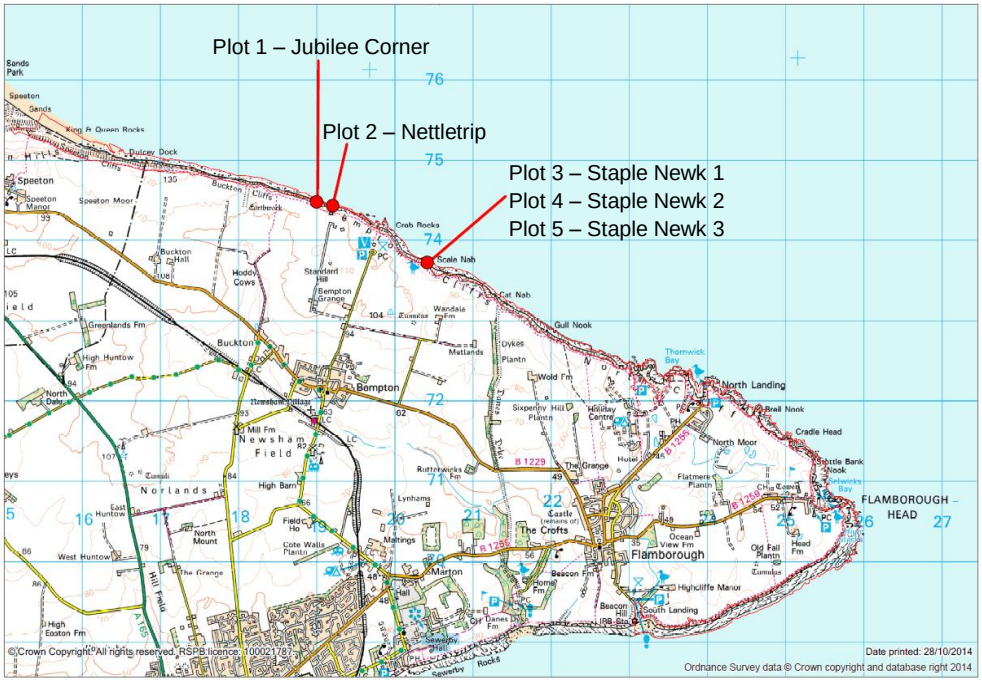
Five productivity plots were monitored on three visits between the end of May and first two weeks of June, with a final visit mid-August 2014 (Figure 2).

Figure 2 – Fulmar productivity plot locations

Northern Gannet (*Morus bassanus*)

Five productivity plots were monitored from the end of April until the end of October 2014 (Figure 3).

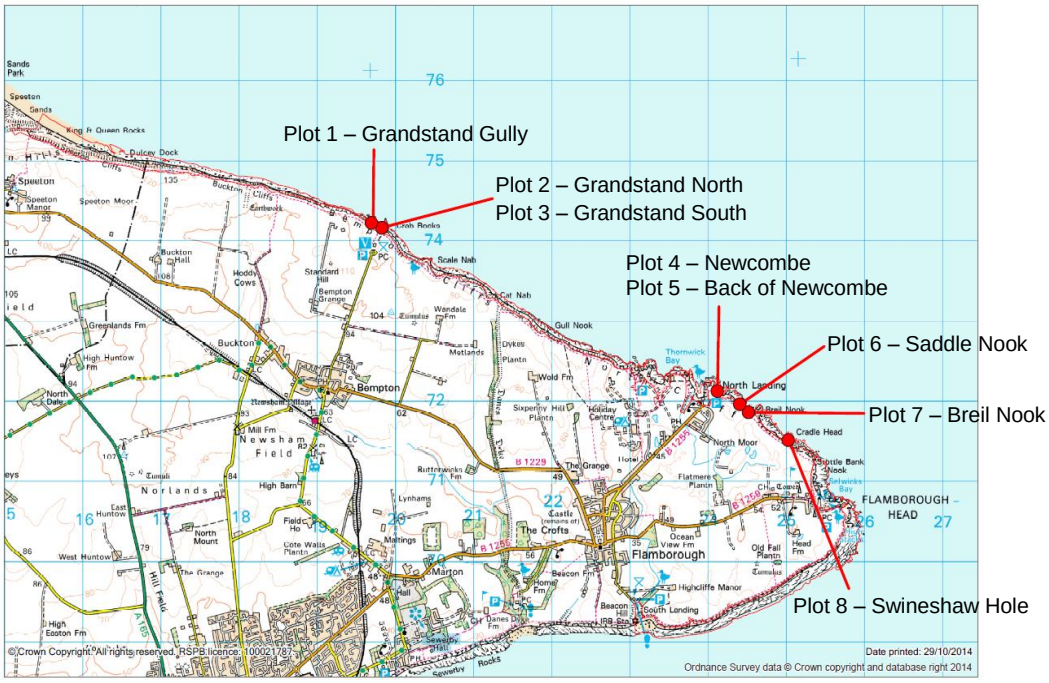
Figure 3 – Gannet productivity plot locations



Razorbill (*Alca torda*)

Eight productivity plots were monitored between April and July 2014 (Figure 4).

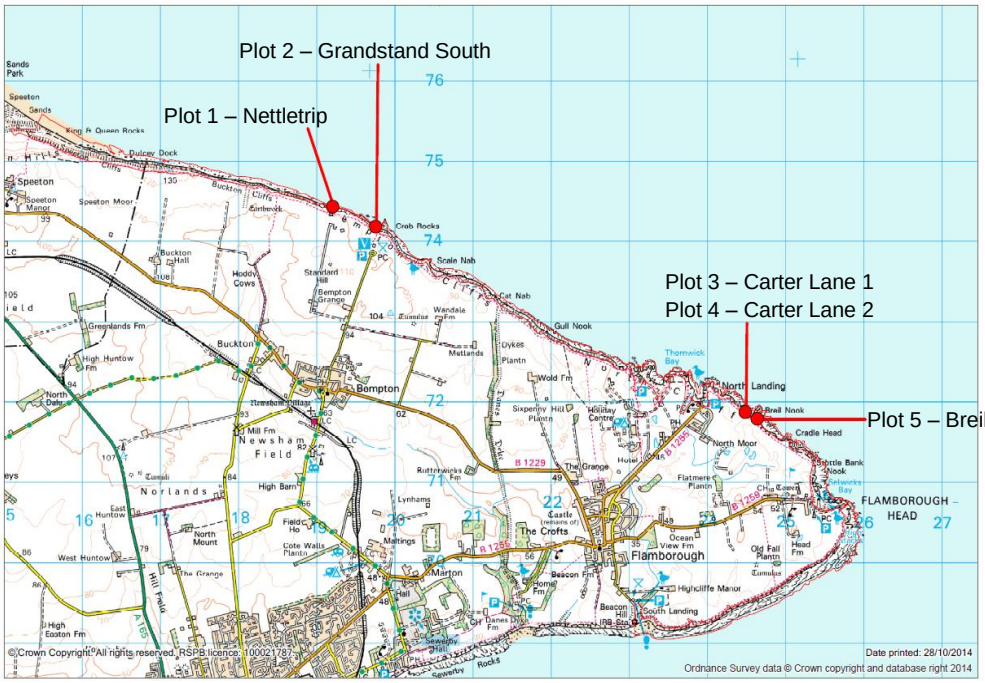
Figure 4 – Razorbill productivity plot locations



Common Guillemot (*Uria aalge*)

Five productivity plots were monitored between April and end of July 2014 (Figure 5).

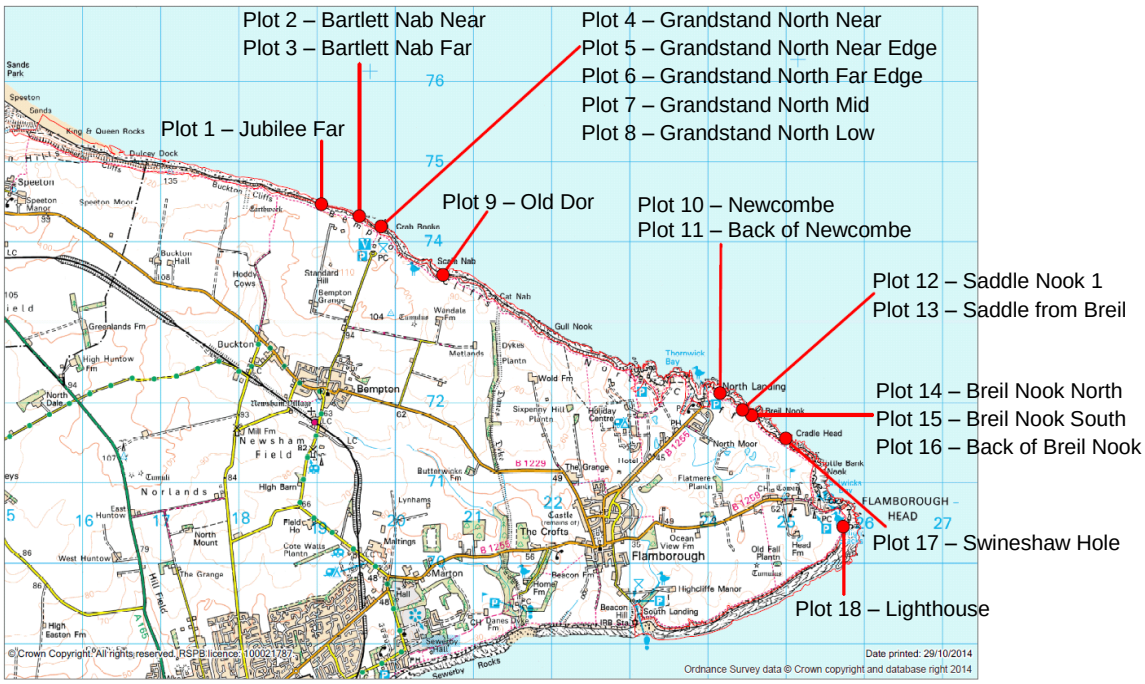
Figure 5 – Guillemot productivity plot locations



Black-legged Kittiwake (*Rissa tridactyla*)

Eighteen productivity plots were monitored between May and August 2014 (Figure 6).

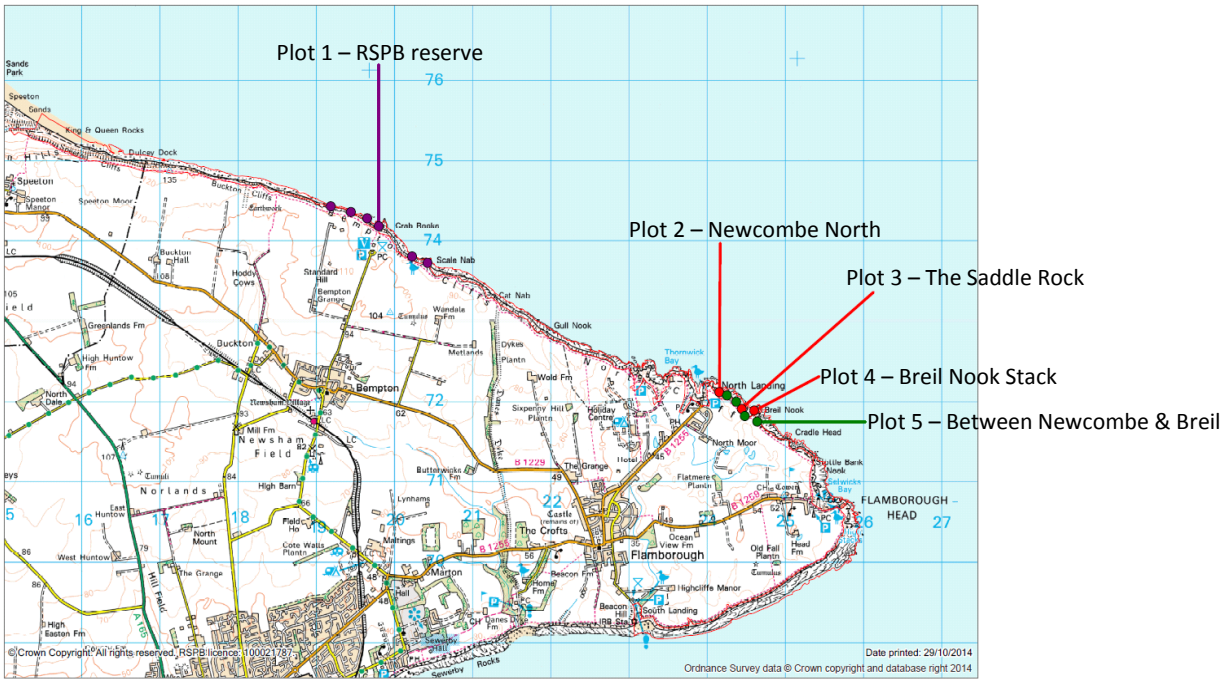
Figure 6 – Kittiwake productivity plot locations



Herring Gull (*Larus argentatus*)

One hundred and two AONs were monitored from mid May through to mid August 2014 (Figure 7).

Figure 7 – Herring Gull productivity plot locations

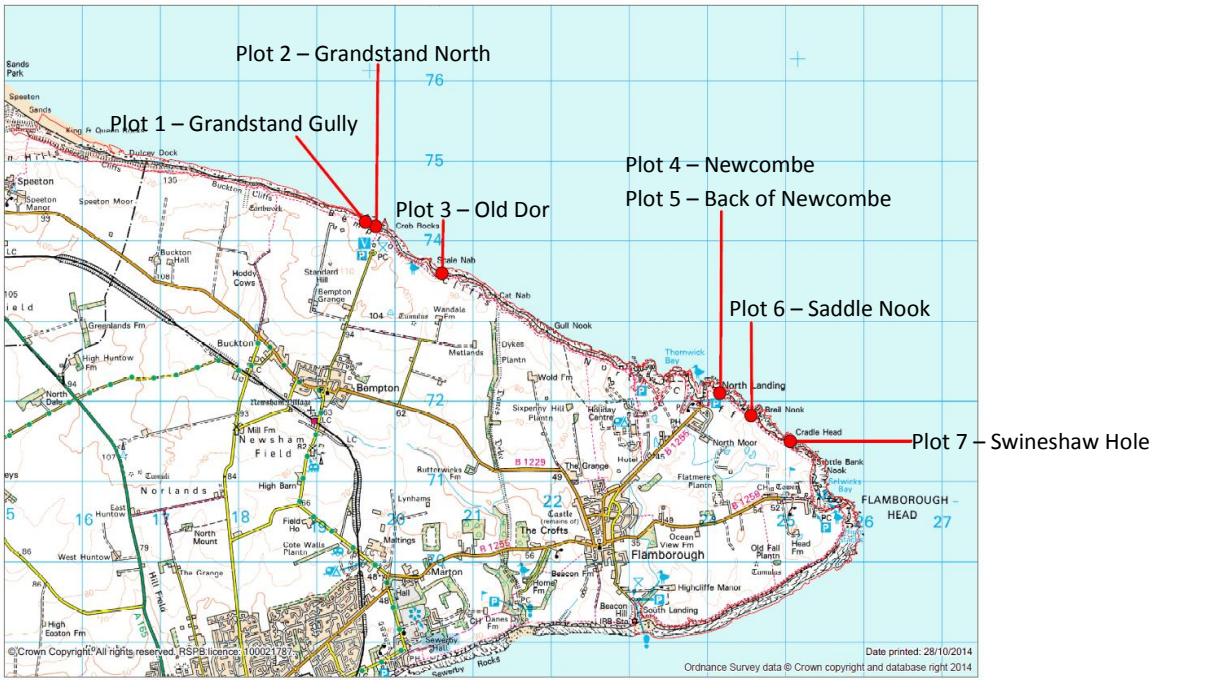


Study-plot counts

Razorbill study-plot count

Seven study-plots were counted on five occasions in the peak season (Figure 8). The study-plots were originally set up in 2009 and were again repeated in 2010, 2012 and 2013. In 2011, counts were abandoned due to an early breeding season.

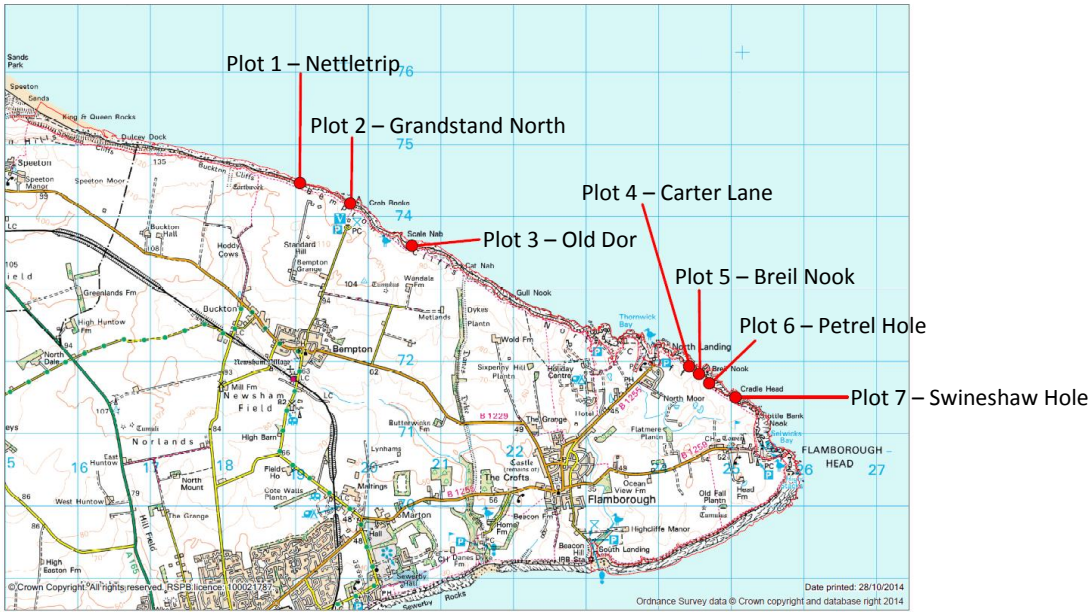
Figure 8 – Razorbill study-plot locations



Common Guillemot study-plot count

Seven study-plots were counted on five occasions in the peak season (Figure 9). The study-plots were originally set up in 2009 and were repeated in 2010, 2012 and 2013. In 2011, counts were abandoned due to an early breeding season.

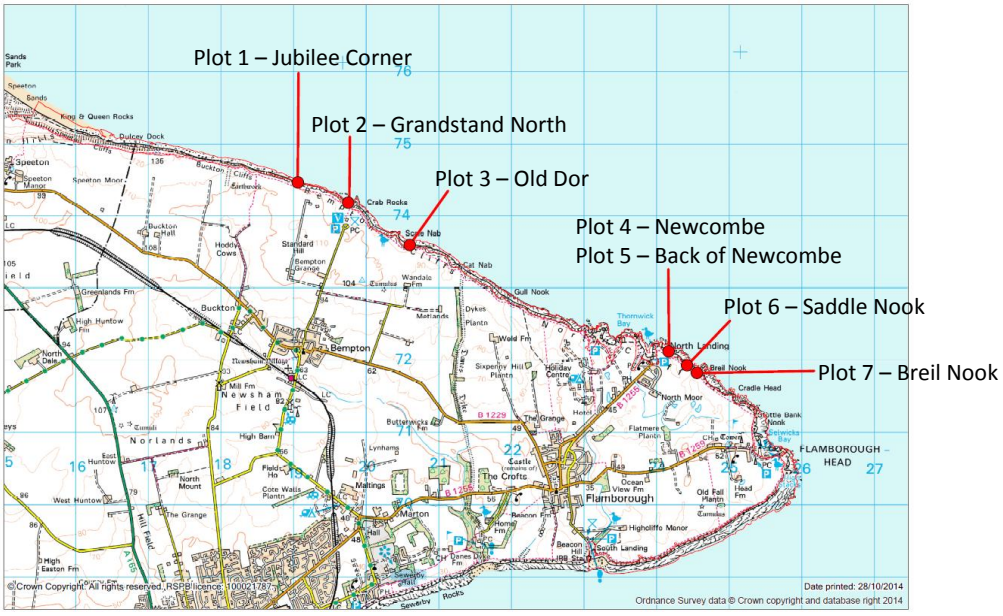
Figure 9 – Guillemot study-plot locations



Black-legged Kittiwake study-plot count

Seven study-plots were counted twice in the peak season (Figure 10). The handbook suggests that study-plot counts are not recommended for general use when counting 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.

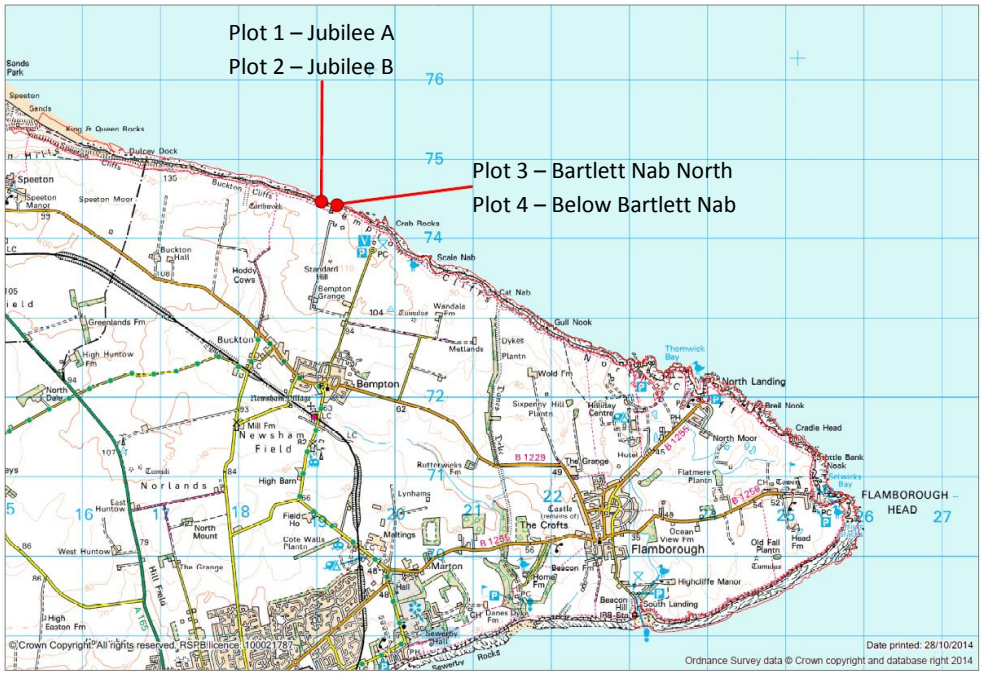
Figure 10 – Kittiwake study-plot locations



Common Guillemot diet study

Four diet and provisioning study-plots were established in 2009 to collect data on different prey species fed to chicks, as well as calculating provisioning rates throughout an 18-hour foraging window (Figure 11). These plots were monitored again in 2010, 2011 and 2012. For details of diet monitoring timetable and plot locations see Appendix 3 – Table 18, Figure 28.

Figure 11 – Guillemot diet and provisioning plot locations



Following discussions with Natural England and RSPB Reserves Ecology no data was gathered on Guillemot diet and provisioning in 2013 whilst the study was reviewed.

In 2014, it was decided to concentrate on diet composition and not to attempt to collect data on provisioning rates.

The survey was carried out between 9th and 23rd June 2014. One member of the research team monitored one of the four diet study-plots for a two hour period on each of these days, a total of 27.5 hours (two sessions were shortened due to rain). To fit around other monitoring commitments, diet monitoring usually took place in the morning or late afternoon/early evening. In addition, the monitoring team recorded other Guillemot feeds observed during this period on a casual basis.

The core monitoring effort was intended to be informally rotated among the diet study-plots. However, one of the plots (Jubilee A) had been affected by landslip from above and contained fewer birds. Monitoring effort was therefore concentrated on the Jubilee B, Below Bartlett Nab and Bartlett Nab North plots. An hour of the final session was spent observing a potential future site at Grandstand South. This is considered to be a useable plot, although the popularity of this viewpoint means it would be difficult to use at busy times of the day.

Details were noted on a recording sheet each time an adult bird returned with a prey item, whether it was used to provision chicks or for display purposes. If possible, each fish was identified as Sandeel, Clupeid or Gadoid. If identification was not possible, the fish was marked as other/unidentified. In addition, fish were also assigned to a size category – small, medium or large – based on the amount of tail protruding from the bill. Identification and sizing was done using an RSPB in-house identification guide.

Whole-colony counts

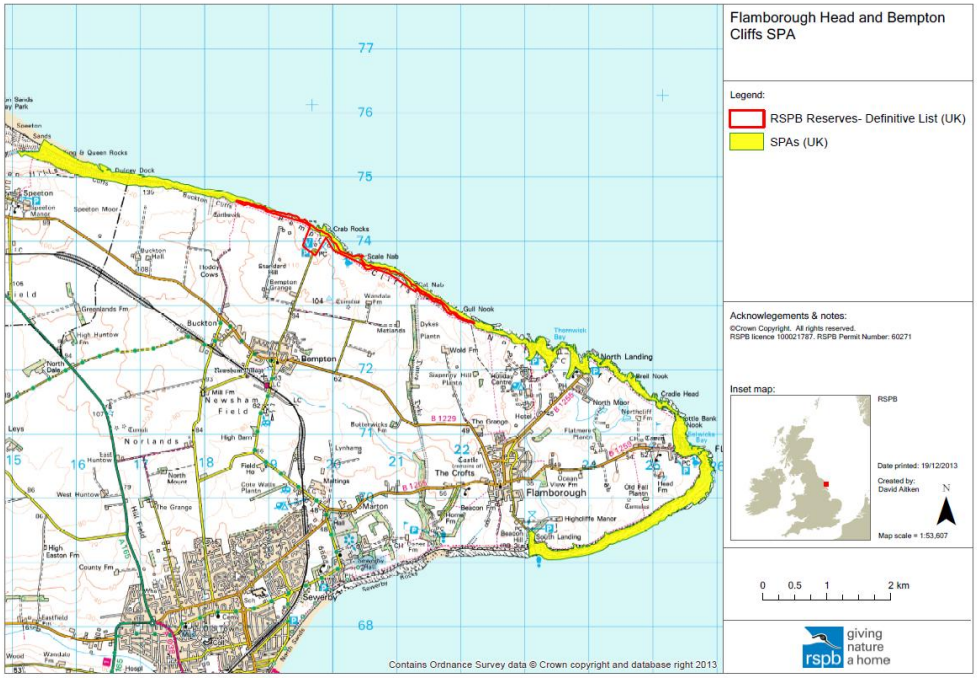
Herring Gull (*Larus argentatus*)

The Herring Gull whole-colony census was completed on 21st May and took approximately eight hours to complete. It was a boat-based survey, backed up with additional land counts comparable to previous years, and was undertaken by 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 '*Seabird monitoring handbook for Britain and Ireland, 1995*'. The colony is divided into 178 sub-sections, comprising 15km of coastline and makes up the Flamborough and Bempton SPA (Figure 12); Herring Gull nests are dispersed along the length of the colony.

European Shag (*Phalacrocorax aristotelis)*

The European Shag whole-colony census was completed on 21st May and was carried out alongside the Herring Gull whole-colony boat-based survey, with additional land counts comparable to previous years. Survey methods followed the methodologies and guidelines set out in the '*Seabird monitoring handbook for Britain and Ireland, 1995*'. Shag nests are concentrated at Staple Newk and Breil Nook areas of the colony.

Figure 12 – Flamborough and Bempton SPA and seabird colony recording boundary



European Shag roost counts

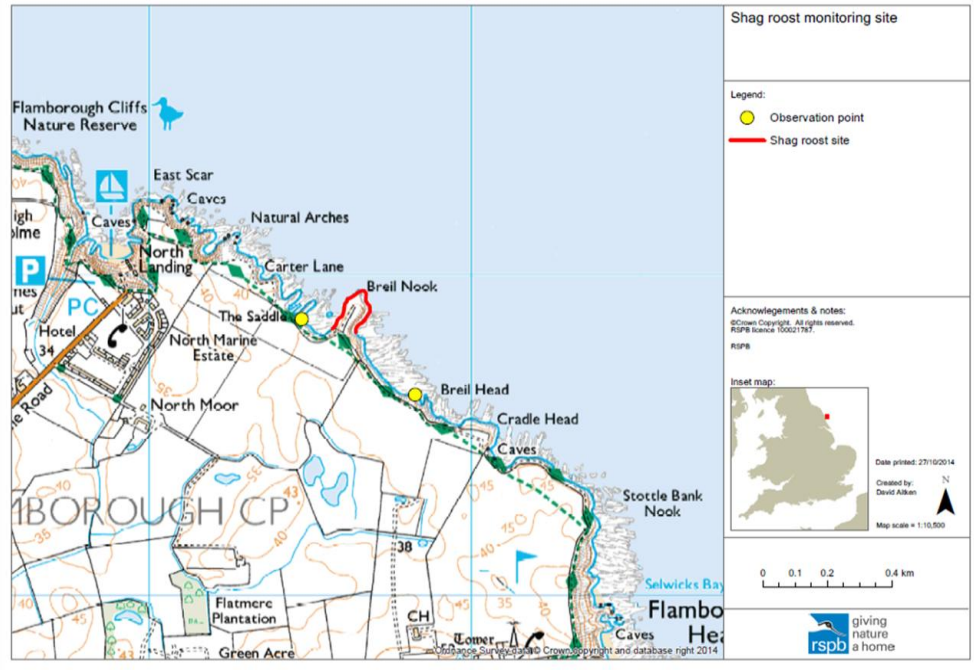
In the autumn of 2012, Flamborough Bird Observatory (FBO) were recording peak counts of up to 900 European Shag moving south during regular seawatches from the headland. These were assumed to be birds dispersing from communal winter roosts situated somewhere on the SPA. There are also historical seawatch records which show maximum counts of up to and above 1000 Shag recorded past the headland; these numbers are significant enough to warrant further investigation into whether birds are using the SPA as a wintering roost site. If found to be correct, the volume of potential roosting birds represents nationally important numbers and may classify as a SSSI feature in its own right. In response to this, an ongoing study to better understand how Shag use the SPA throughout the year was initiated. The aims of the study are to:

- Locate Shag roosting sites
- Determine whether Shag recorded on FBO seawatches are from local roost sites

- Undertake independent roost counts to assess population size throughout the year
- Use findings to help inform conservation status of Shag within the SPA and SSSI

Land based checks by RSPB staff discovered a communal roost at Breil Nook, Flamborough. No other significant sites were located on the SPA that were visible from land. Vantage points were set-up either side of Breil Nook to enable an observer to view from a safe location and to be able to see as much of the communal roost as possible (Figure 13). Counts are made from an hour before dusk until dark, using binoculars and telescope, recording all birds already present and birds that subsequently arrive into the roost. In addition, darvic colour-ring data is collected, were practicable, and fed back to the CEH Shag winter distribution project.

Figure 13 – Shag communal roost monitoring site at Flamborough



Common Guillemot bridling survey

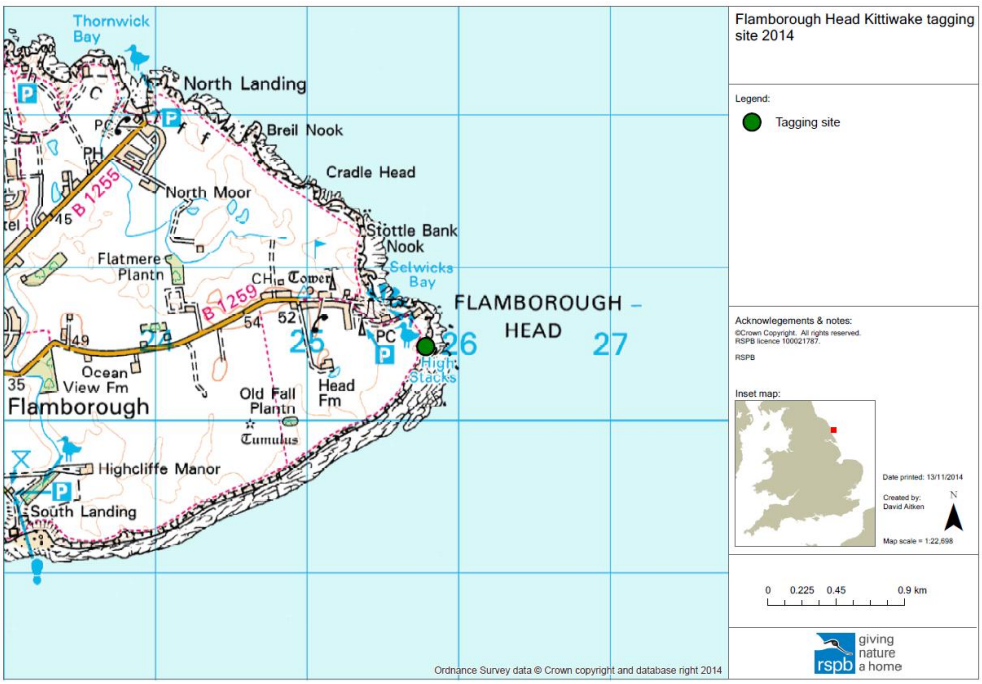
This year, Bempton took part in a national survey looking at the frequency of bridling in Common Guillemot, coordinated by Professor Sarah Wanless, Centre for Ecology & Hydrology. This survey updates the results of a similar UK-wide study carried out in the early 1980s (Birkhead, T.R. (1984) Journal of Zoology 202:165-176). The survey was completed over two days in mid-June; twelve sites were visited between Flamborough and Bempton providing a sample size of 1276 birds.

Kittiwake tracking

Tracking work has taken place at Flamborough Head between 2010 and 2014 (Figure 14); in 2013 and 2014, tracking also took place at Filey Brigg. This year, fieldwork was carried out by Dr Guy Anderson, RSPB Principal Research Manager and David Aitken, RSPB Bempton Cliffs Warden. Tags were deployed on breeding (incubating or chick rearing) adult Kittiwakes following strict protocols to minimise disturbance caused by catching and tagging birds. GPS tags were used to obtain high-resolution (one position every 100 seconds to an accuracy of approximately 25m) location data. Modified IgotU gt120 GPS tags (Mobile Action) were used to reduce weight and increase water resistance for use on Kittiwakes. Tags varied in weight depending on the size of battery installed in the tag. Tags, including attachment material, weighed between 11g and 19g. Adult Kittiwakes typically weight 400g and so tags were between 2.75% and 4.75% of body weight.

The upper end of this exceeds the current recommended tag burden (set at 3%) which after consideration was deemed to be acceptable since deployments were very much shorter in duration than most tagging upon which the recommendations are set. It is also well within the ~50g known to be regularly carried by this species as food bought back to chicks. Tags were attached to plumage on the mantle using Tesa Tape and deployments were typically between one and four days in duration. The bird must be re-caught and tag removed in order to recover the data. Breeding success and trip lengths were observed to monitor the effect of tagging. No differences were observed between tagged birds and undisturbed birds in either of these measures (Gough, 2012. MSc thesis).

Figure 14 – Flamborough Head Kittiwake tagging site 2014



Recreational disturbance

The European Marine Site (EMS) study into recreational activity has identified that recreational disturbance is still an ongoing issue across the SPA and pSPA. Key activities such as fisherman descending the cliffs to access the shore and cliff-top angling during the breeding season are still issues that need addressing, as is boat, jet skis and kayak-use in the intertidal area and hand gliders and low flying aircraft activity overhead. All events are recorded and information passed to the EMS project officer, Heather Davison, who is gathering data on recreational disturbance across the Flamborough Head and Bempton Cliffs SPA 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 SPA. 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

For detailed plot locations and boundaries for each species monitored, please refer to '*Flamborough Head and Bempton Cliffs SPA Seabird Monitoring Programme Report 2012. By Aitken, D et al*'.

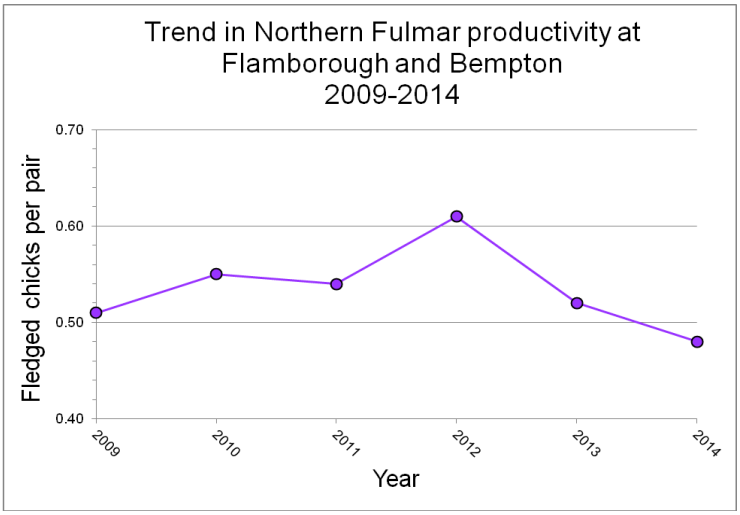
Northern Fulmar *(Fulmarus glacialis)*

Overall productivity for Fulmar averaged 0.48 chicks per pair. A total of 80 AOSs were monitored across five plots, of which 38 chicks successfully fledged (Table 3, Figure 15). The national mean for Fulmar is 0.41 chicks per pair, recorded between 1986-2005 from between thirteen and forty-one colonies annually (Mavor et al. 2008).

Table 3 – Fulmar productivity results 2009-2014

Monitoring site	AOS 2009	Fledged chicks '09	Productivity ch/pr '09	AOS 2010	Fledged chicks '10	Productivity ch/pr '10	AOS 2011	Fledged chicks '11	Productivity ch/pr '11	AOS 2012	Fledged chicks '12	Productivity ch/pr '12	AOS 2013	Fledged chicks '13	Productivity ch/pr '13	AOS 2014	Fledged chicks '14	Productivity ch/pr '14
New Roll-up	6	4	0.67	10	4	0.40	6	2	0.33	8	3	0.37	6	2	0.33	6	3	0.50
Old Dor	16	8	0.50	19	8	0.42	17	8	0.47	27	16	0.59	26	13	0.50	27	13	0.48
Newcombe	7	4	0.57	11	6	0.55	12	7	0.58	9	7	0.78	7	4	0.57	14	5	0.36
Breil Nook	7	3	0.43	15	14	0.93	16	12	0.75	16	12	0.75	10	8	0.80	18	9	0.50
Swineshaw Hole	9	4	0.44	16	7	0.44	15	7	0.47	12	6	0.50	14	6	0.43	15	8	0.53
Total	**45**	**23**	**0.51**	**71**	**39**	**0.55**	**66**	**36**	**0.54**	**72**	**44**	**0.61**	**63**	**33**	**0.52**	**80**	**38**	**0.48**

Figure 15 – Trend in Fulmar productivity 2009-2014



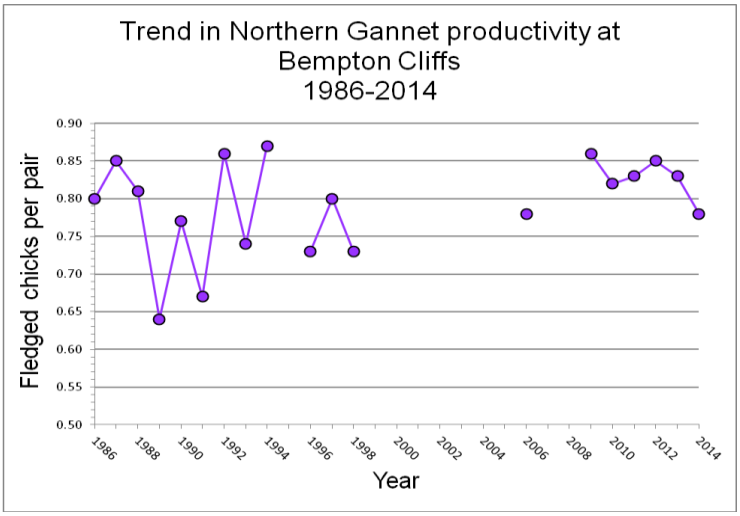
Northern Gannet *(Morus bassanus)*

Overall productivity for Gannet averaged 0.78 chicks per pair. A total of 259 AONs were monitored across five plots, of which 201 chicks successfully fledged (Table 4, Figure 16). The national mean for Gannet is 0.69 chicks per pair, recorded between 1986-2005 from between three and six colonies annually (Mavor et al. 2008).

Table 4 – Gannet productivity results 2009-2014

Monitoring site	AON 2009	Fledged chicks '09	Productivity ch/pr '09	AON 2010	Fledged chicks '10	Productivity ch/pr '10	AON 2011	Fledged chicks '11	Productivity ch/pr '11	AON 2012	Fledged chicks '12	Productivity ch/pr '12	AON 2013	Fledged chicks '13	Productivity ch/pr '13	AON 2014	Fledged chicks '14	Productivity ch/pr '14
Jubilee Corner	52	43	0.83	50	41	0.82	49	40	0.82	51	46	0.90	51	42	0.82	52	41	0.79
Nettletrip	49	45	0.92	50	41	0.82	49	44	0.90	52	46	0.88	51	40	0.78	55	36	0.65
Staple Newk 1	50	43	0.86	50	41	0.82	49	40	0.82	50	45	0.90	50	46	0.92	50	42	0.84
Staple Newk 2	50	43	0.86	50	44	0.88	49	39	0.80	50	41	0.82	50	42	0.84	52	39	0.75
Staple Newk 3	50	41	0.82	50	39	0.78	50	43	0.86	52	40	0.77	52	42	0.81	50	43	0.86
Total	**251**	**215**	**0.86**	**250**	**206**	**0.82**	**248**	**206**	**0.83**	**255**	**218**	**0.85**	**254**	**212**	**0.83**	**259**	**201**	**0.78**

Figure 16 – Trend in Gannet productivity 1986-2014



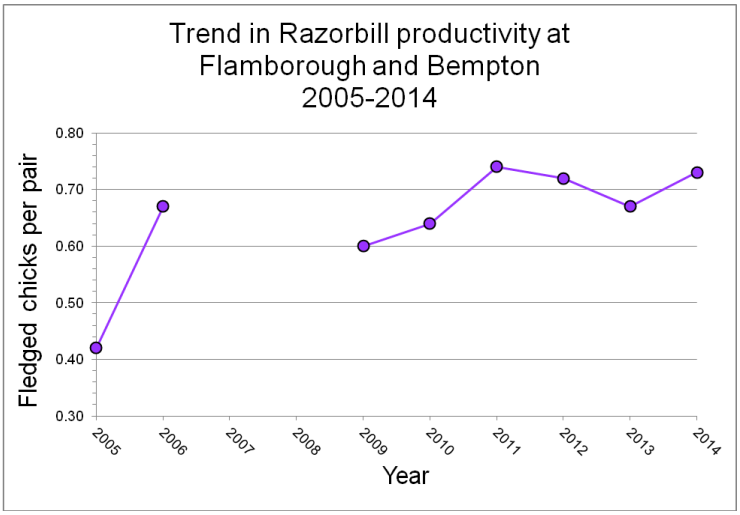
Razorbill *(Alca torda)*

Overall productivity for Razorbill averaged 0.73 chicks per pair. A total of 333 AOSs where monitored across eight plots, of which 243 chicks successfully fledged (Table 5, Figure 17). The national mean for Razorbill is 0.65 chicks per pair, recorded between 1986-2005 from between one and seven colonies annually (Mavor et al. 2008).

Table 5 – Razorbill productivity results 2009-2014

Monitoring site	AOS 2009	Fledged chicks '09	Productivity ch/pr '09	AOS 2010	Fledged chicks '10	Productivity ch/pr '10	AOS 2011	Fledged chicks '11	Productivity ch/pr '11	AOS 2012	Fledged chicks '12	Productivity ch/pr '12	AOS 2013	Fledged chicks '13	Productivity ch/pr '13	AOS 2014	Fledged chicks '14	Productivity ch/pr '14
Grandstand Gully	13	3	0.23	14	6	0.43	11	4	0.36	13	5	0.38	12	7	0.58	16	7	0.44
Grandstand North	32	25	0.78	34	26	0.76	28	14	0.50	29	14	0.48	45	30	0.67	49	37	0.76
Grandstand South	16	6	0.38	17	11	0.65	18	12	0.67	18	15	0.83	16	6	0.38	16	11	0.69
Newcombe	52	34	0.65	61	43	0.70	66	52	0.79	47	40	0.85	52	27	0.52	53	39	0.74
Back of Newcombe	–	–	–	18	13	0.72	36	28	0.78	42	29	0.69	42	32	0.76	45	37	0.82
Saddle Nook	–	–	–	35	21	0.60	50	41	0.82	50	36	0.72	52	42	0.81	48	26	0.54*
Breil Nook	19	11	0.58	40	26	0.65	49	41	0.84	49	38	0.77	52	39	0.75	53	44	0.83
Swineshaw Hole	–	–	–	34	16	0.47	48	35	0.73	53	39	0.74	50	32	0.64	53	42	0.79
Total	**132**	**79**	**0.60**	**253**	**162**	**0.64**	**306**	**227**	**0.74**	**301**	**216**	**0.72**	**321**	**215**	**0.67**	**333**	**243**	**0.73**

Figure 17 – Trend in Razorbill productivity 2005-2014



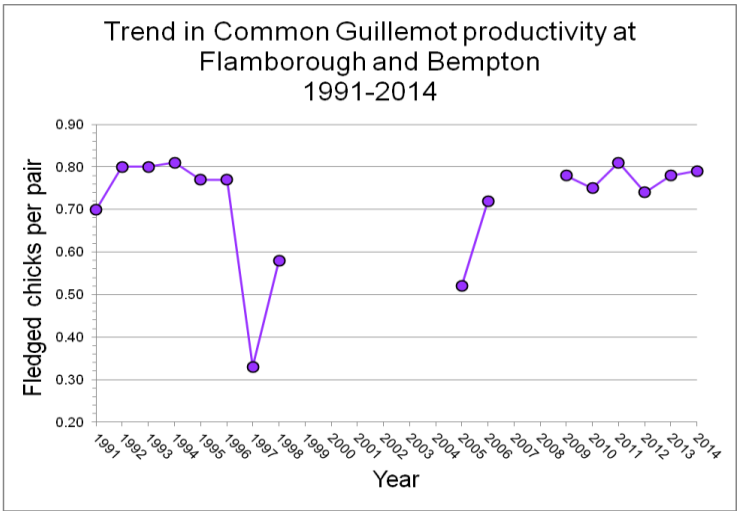
Common Guillemot *(Uria aalge)*

Overall productivity for Guillemot averaged 0.79 chicks per pair. A total of 251 AOSs were monitored across five plots, of which 198 chicks successfully fledged (Table 6, Figure 18). The national mean for Guillemot is 0.69 chicks per pair, recorded between 1986-2005 from between three and fifteen colonies annually (Mavor et al. 2008).

Table 6 – Guillemot productivity results 2009-2014

Monitoring site	AOS 2009	Fledged chicks '09	Productivity ch/pr '09	AOS 2010	Fledged chicks '10	Productivity ch/pr '10	AOS 2011	Fledged chicks '11	Productivity ch/pr '11	AOS 2012	Fledged chicks '12	Productivity ch/pr '12	AOS 2013	Fledged chicks '13	Productivity ch/pr '13	AOS 2014	Fledged chicks '14	Productivity ch/pr '14
Nettletrip	51	36	0.71	50	31	0.62	50	37	0.74	58	33	0.57	52	30	0.58	47	30	0.64
Grandstand North	48	39	0.81	50	36	0.72	–	–	–	55	35	0.64	-	-	-	-	-	-
Grandstand South	45	36	0.80	49	36	0.73	48	32	0.67	48	33	0.69	45	36	0.80	50	41	0.82
Carter Lane 1	47	39	0.83	48	39	0.81	50	46	0.92	48	40	0.83	49	42	0.86	49	41	0.84
Carter Lane 2	45	34	0.76	54	38	0.70	50	41	0.82	54	44	0.81	51	38	0.75	51	37	0.73
Breil Nook	–	–	–	50	46	0.92	50	46	0.92	65	57	0.88	52	48	0.92	54	49	0.91
Total	**236**	**184**	**0.78**	**301**	**226**	**0.75**	**248**	**202**	**0.81**	**328**	**242**	**0.74**	**249**	**194**	**0.78**	**251**	**198**	**0.79**

Figure 18 – Trend in Guillemot productivity 1991-2014



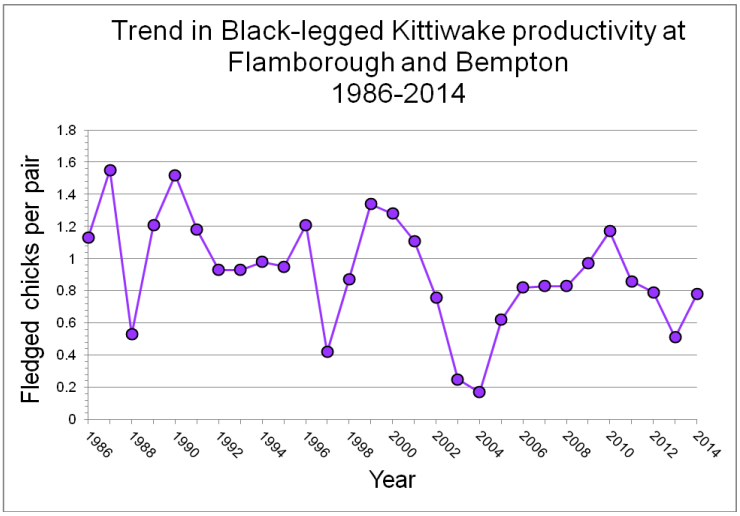
Black-legged Kittiwake *(Rissa tridactyla)*

Overall productivity for Kittiwake averaged 0.78 chicks per pair. A total of 906 AONs were monitored across eighteen plots, of which 709 chicks successfully fledged (Table 7, Figure 19). The national mean for Kittiwake is 0.68 chicks per pair, recorded between 1986-2005 from between thirty and sixty-one colonies annually (Mavor et al. 2008). For Kittiwake productivity results per monitoring site between 2009-2014 see Appendix 1, Table 14.

Table 7 – Kittiwake productivity results 2014

	Jubilee Far	Bartlett Nab Near	Bartlett Nab Far	Grandstand North Near	Grandstand North Near Edge	Grandstand North far Edge	Grandstand North Mid	Grandstand North Low	Old Dor	Newcombe	Back of Newcombe	Saddle Nook 1	Saddle from Breil	Breil Nook North	Breil Nook South	Back of Breil Nook	Swineshaw Hole	Lighthouse	**Total**
Nests fledging 0 chicks	15	15	15	11	17	9	14	20	27	18	22	22	27	15	26	42	19	14	348
Nests fledging 1 chick	26	29	25	34	23	32	25	26	18	21	18	27	24	19	15	6	27	17	412
Nests fledging 2 chicks	9	6	10	6	10	9	9	7	4	11	12	3	0	16	9	2	3	18	144
Nests fledging 3 chicks	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	3
Total fledged	44	41	45	46	43	50	49	40	26	43	42	33	24	51	33	10	33	56	709
Total AON	50	50	50	51	50	50	50	53	49	50	52	52	50	50	50	50	49	50	906
Productivity per plot	**0.88**	**0.82**	**0.90**	**0.90**	**0.86**	**1.00**	**0.98**	**0.75**	**0.53**	**0.86**	**0.81**	**0.63**	**0.48**	**1.02**	**0.66**	**0.20**	**0.67**	**1.12**	**0.78**

Figure 19 – Trend in Kittiwake productivity 1986-2014



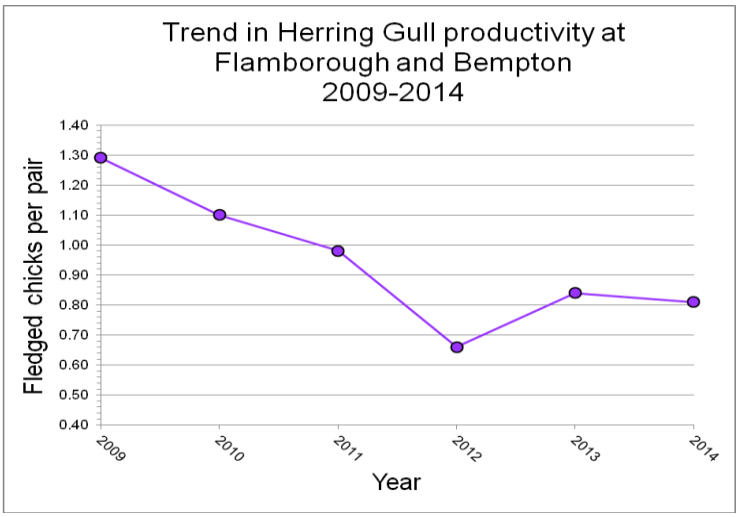
Herring Gull *(Larus argentatus)*

Overall productivity for Herring Gull averaged 0.81 chicks per pair. A total of 102 AONs were monitored throughout the colony, of which 83 chicks successfully fledged (Table 8, Figure 20).

Table 8 – Herring Gull productivity results 2009-2014

Monitoring site	AON 2009	Fledged chicks '09	Productivity ch/AON '09	AON 2010	Fledged chicks '10	Productivity ch/AON '10	AON 2011	Fledged chicks '11	Productivity ch/AON '11	AON 2012	Fledged chicks '12	Productivity ch/AON '12	AON 2013	Fledged chicks '13	Productivity ch/AON '13	AON 2014	Fledged chicks '14	Productivity ch/AON '14
Jubilee to Old Dor	–	–	–	13	10	0.77	23	12	0.52	17	11	0.65	18	7	0.39	17	3	0.18
Newcombe North	–	–	–	12	9	0.75	9	12	1.33	12	5	0.42	9	7	0.78	8	8	1.00
The Saddle Rock	19	19	1.00	16	18	1.13	21	27	1.29	20	10	0.50	19	22	1.16	21	23	1.10
Breil Nook Stack	14	19	1.36	16	11	0.69	15	10	0.67	18	17	0.94	16	17	1.06	20	25	1.25
Newcombe to Breil	19	29	1.53	27	44	1.63	19	24	1.26	22	16	0.73	17	13	0.76	36	24	0.67
Total	**52**	**67**	**1.29**	**84**	**92**	**1.10**	**87**	**85**	**0.98**	**89**	**59**	**0.66**	**79**	**66**	**0.84**	**102**	**83**	**0.81**

Figure 20 – Trend in Herring Gull productivity 2009-2014



Study-plot counts

Razorbill study-plot count

Seven study-plots were each counted on five separate occasions in the first three weeks of June. The fifth count provided the highest total of 754 individuals (IND); the third count produced the lowest total of 565 IND (Table 9). The mean count for Razorbill was 638; this is the highest mean

count recorded since the study was set up, an increase of 52 IND on last year and 306 IND since the first study in 2009.

Table 9 – Razorbill study-plot count results

Count	2009 Total Ind	2010 Total Ind	2012 Total Ind	2013Total Ind	2014 Total Ind
1	338	316	476	552	584
2	365	344	455	584	694
3	320	348	629	556	565
4	309	358	591	624	591
5	328	343	522	613	754
Mean	**332**	**342**	**535**	**586**	**638**

For individual study-plot results see Appendix 2, Table 15.

Common Guillemot study-plot count

Seven study-plots were each counted on five separate occasions in the first three weeks of June. The fifth count provided the highest total of 1573 IND; the third count provided the lowest total of 1327 IND (Table 10). The mean count for Guillemot was 1454; the highest mean count recorded since the study was set up, an increase of 175 IND on last year and 329 individuals since the first study.

Table 10 – Guillemot study-plot count results

Count	2009 Total Ind	2010 Total Ind	2012 Total Ind	2013 Total Ind	2014 Total Ind
1	1191	1164	1120	1193	1411
2	1138	1123	980	1226	1486
3	1069	1151	1228	1333	1327
4	1101	1114	1205	1323	1475
5	1126	1103	926	1318	1573
Mean	**1125**	**1131**	**1092**	**1279**	**1454**

For individual study-plot results see Appendix 2, Table 16.

Black-legged Kittiwake study-plot count

Seven study-plots were each counted on two separate occasions in the first three weeks of June. Kittiwake study-plot counts were completed in 2014 for a sixth year running. The results show an increase of 426 AON on 2013 (Table 11).

Table 11 – Kittiwake study-plot count results

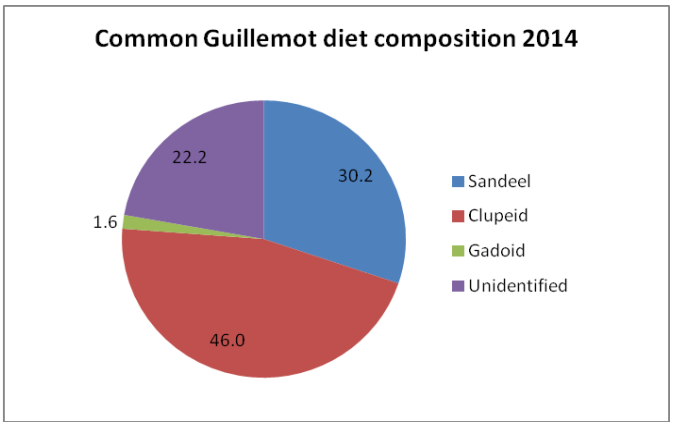
Visit	2009 AON Total	2010 AON Total	2011 AON Total	2012 AON Total	2013 AON Total	2014 AON Total
1	1585	1967	2035	1967	1554	1917
2	1541	1938	2067	1952	1508	1996
3	1554					
4	1497					
Mean	**1544**	**1953**	**2051**	**1960**	**1531**	**1957**

For individual study-plot results see Appendix 2, Table 17.

Common Guillemot diet study

A total 126 prey items were recorded during the study. Clupeids were most numerous, comprising 46%. Sandeel accounted for 30.2%, Gadoid 1.6% and 22.2% were unidentified (Figure 21).

Figure 21 – Guillemot diet composition 2014



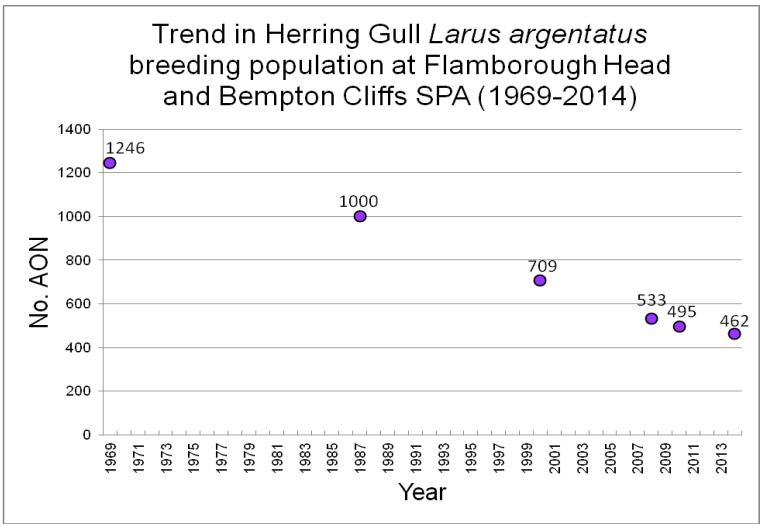
The breakdown of diet composition is broadly consistent with previous years, although see caveat below. The size breakdown of prey items is not reported since this year was an attempt to calibrate sizing by different observers and requires more work.

Caveat: Although prey ID and sizing followed standard guidelines, there is always some variation in the data collected on prey species. Each new observer has had limited experience in prey species identification, coupled with a very brief window of opportunity to make each observation. As a result, comparisons between years and prey species composition data should be treated with caution and should not be used in any external publications. A variation in the proportion of unidentified prey will affect the relative proportion of the other prey classes as it is unlikely that the unidentified items were an equal split between Clupeid and Sandeel. In particular, the general impression of the team was that small and medium Sandeels were more difficult to ID than similar Clupeids.

Herring Gull whole-colony count

The results from the Herring Gull whole-colony count recorded 462 apparently occupied nests, a decline of 33 AON's since 2010 (Figure 22).

Figure 22 – Herring Gull population trend at Flamborough and Bempton 1969-2014

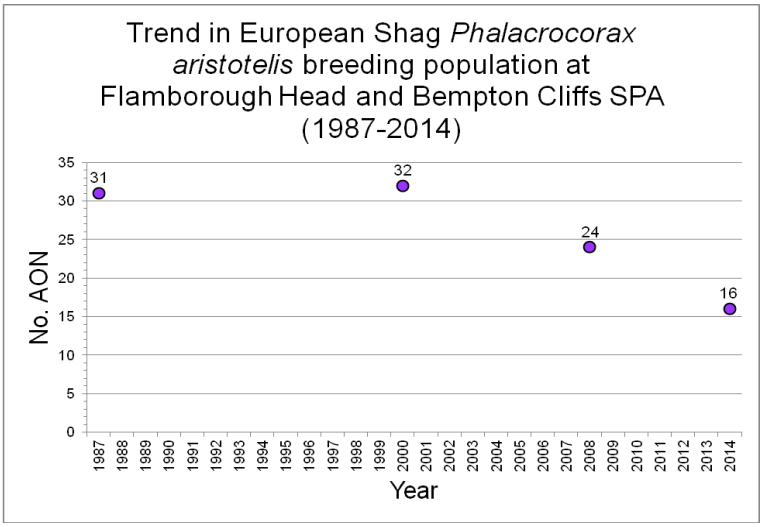


For Herring Gull whole-colony count data, see Appendix 4.

European Shag whole-colony count

The results from the Shag whole-colony count recorded 16 apparently occupied nests, concentrated in the Staple Newk and Breil Nook areas of the colony, a decline of 8 AONs since 2008 (Figure 23).

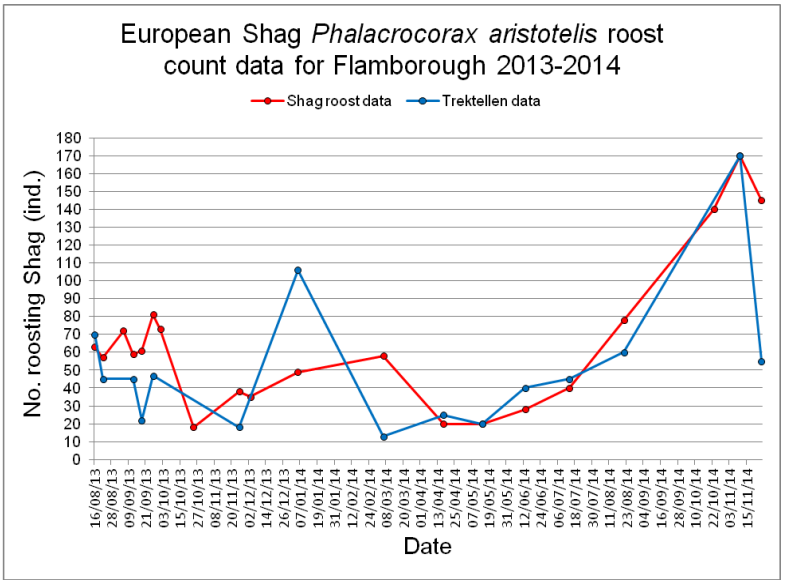
Figure 23 –Shag population trend at Flamborough and Bempton 1987-2014



European Shag communal roost study

The results show that Shag numbers increase at the roost during autumn/winter months (Figure 24). So far, numbers have not risen to levels anticipated from FBO seawatch data that suggested significant numbers of Shag were potentially using the SPA as a wintering roost site, however, the severe storms of spring 2013 resulted in heavy losses of breeding birds on the Farne Islands and Isle of May. A successful breeding season this year has already seen roost numbers almost double. Further investigations will help build a clearer picture and understanding of how birds use the SPA year-round.

Figure 24 – Shag roost and Trektellen seawatch data for Flamborough



Common Guillemot bridling survey

The survey was completed on 11th and 12th June. Twelve sites were visited between Flamborough and Bempton providing a total sample size of 1276 birds; of those 1276, 32 (2.5%) were bridled (Table 12).

Table 12 – Common Guillemot bridling survey results 2014

Common Guillemot bridling survey 2014			
	Bridled	Not Bridled	Total
Bempton sites			
Jubilee	0	49	49
Nettletrip	2	142	144
Behind Nettletrip	2	32	34
Below Bartlett	2	38	40
Bartlett North	1	36	37
Grandstand Gully	1	37	38
Grandstand South	5	123	128
Flamborough sites			
Carter Lane	5	171	176
Saddle Nook	1	78	79
Breil Nook	3	133	136
Petrel Hole	10	284	294
Swineshaw Hole	0	121	121
Total	**32**	**1244**	**1276**

Kittiwake tracking

Tracking work took place between 22nd June and 1st July. Twenty-three GPS tags were deployed at Flamborough, of which seventeen were recovered. Nineteen GPS tags were deployed at Filey, of which sixteen were recovered. In addition, four GLS tags (Geo-locators) were retrieved at Flamborough from birds originally tagged in June 2011.

Between 56% and 80% of tags that were deployed were recovered and data successfully retrieved in any year. This has resulted in 86 Kittiwakes tacked from Flamborough Head over 5 years and 32 individuals from Filey over 2 years (Table 13). Data from 2014 are currently being processed and screened for errors and so are not included in this report.

Table 13 – Sample size and foraging range data from Flamborough and Filey

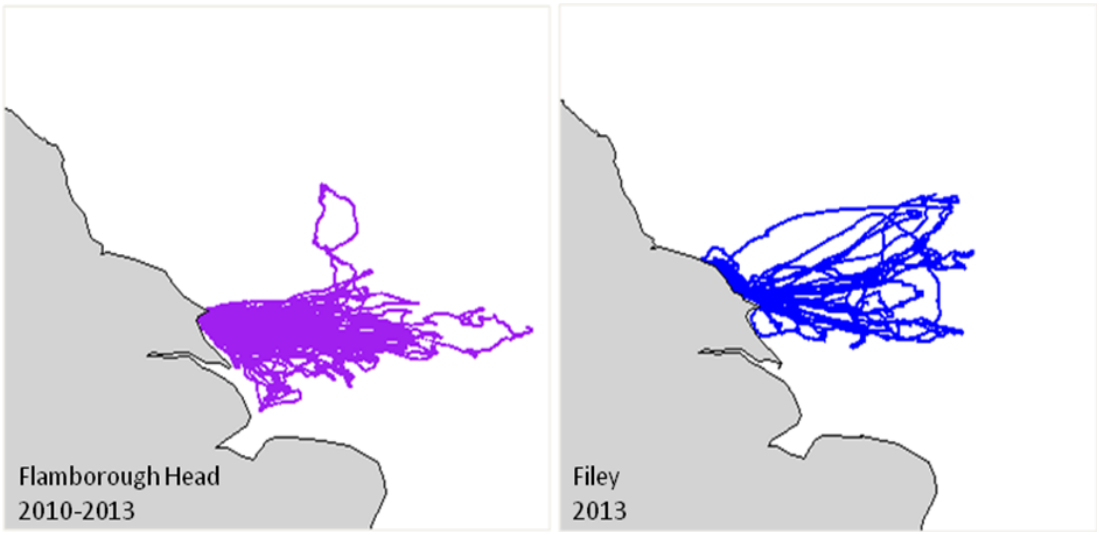
Site	Year	No. tags retrieved with data	Max Foraging range (km)	Mean (±sd) of individual bird Max (km)
Flamborough Head	2010	25	123.6	74.1 ± 41.1
	2011	17	136.4	58.2 ± 40.2
	2012	8	219.4	156.4 ± 28.2
	2013	19	145.5	55.7 ± 31.9
	2014	17	To be calculated	
Filey	2013	17	172.2	101.2 ± 52.3
	2014	15	To be calculated	

Kittiwakes tracked from Flamborough Head travelled up to 219.4km from the colony to feed. This is more than double the current accepted maximum foraging range for this species (Thaxter et al.

2012). The mean across each bird's individual max foraging range varied from 58.2(±40.2)km in 2011 to 156.4(±28.2) in 2012.

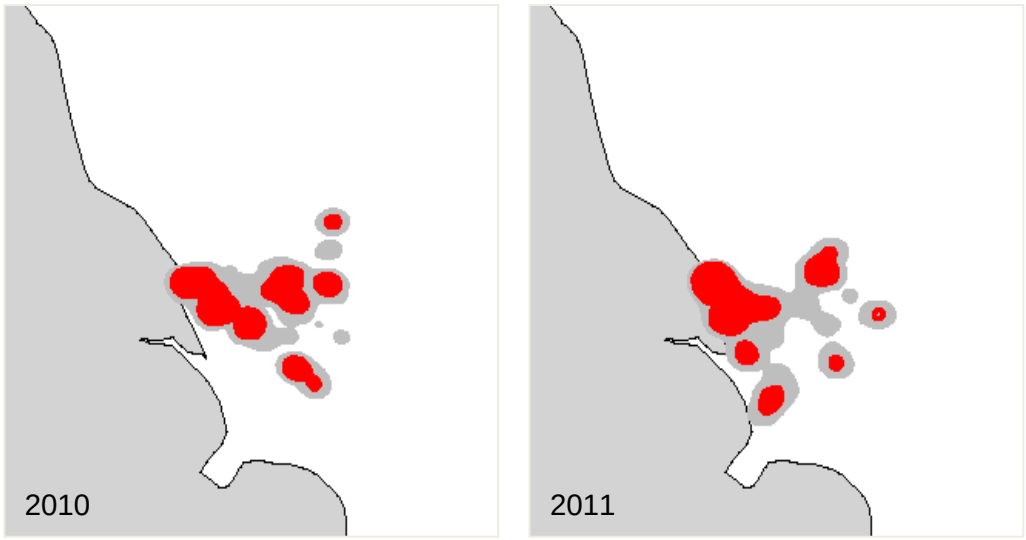
Initial indications are that Kittiwakes from Flamborough and Filey forage in different, but overlapping, areas with Filey birds tending to feed further to the north of birds from Flamborough, at least in the short time frame over which foraging behaviour was measured (Figure 25).

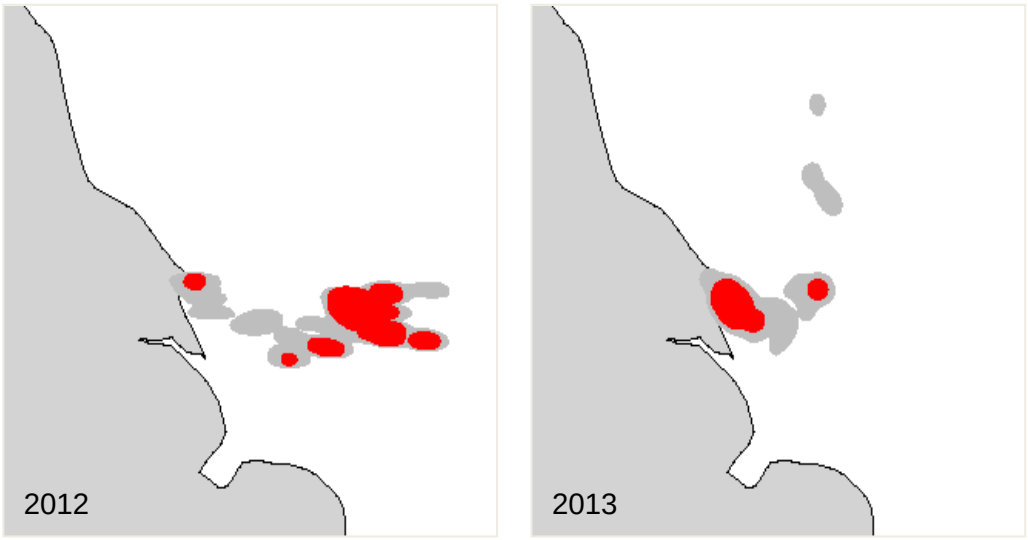
Figure 25 – GPS tracking data from Kittiwakes at Flamborough and Filey



Kittiwake tracking data were filtered to remove points where birds were within 1km of the colony or travelling faster than 14km/hr. This removes points which are close to the nest and points likely to be commuting birds. Kernel density estimates (KDEs) were calculated from the remaining points and the 50% (core) and 90% (use) contours plotted (Figure 26). Differences were observed between years of the study. In all years an area close to the colony was used by a high density of birds as well as areas located further to the east. These are currently being examined to investigate how foraging behaviours relate to changes in colony level productivity.

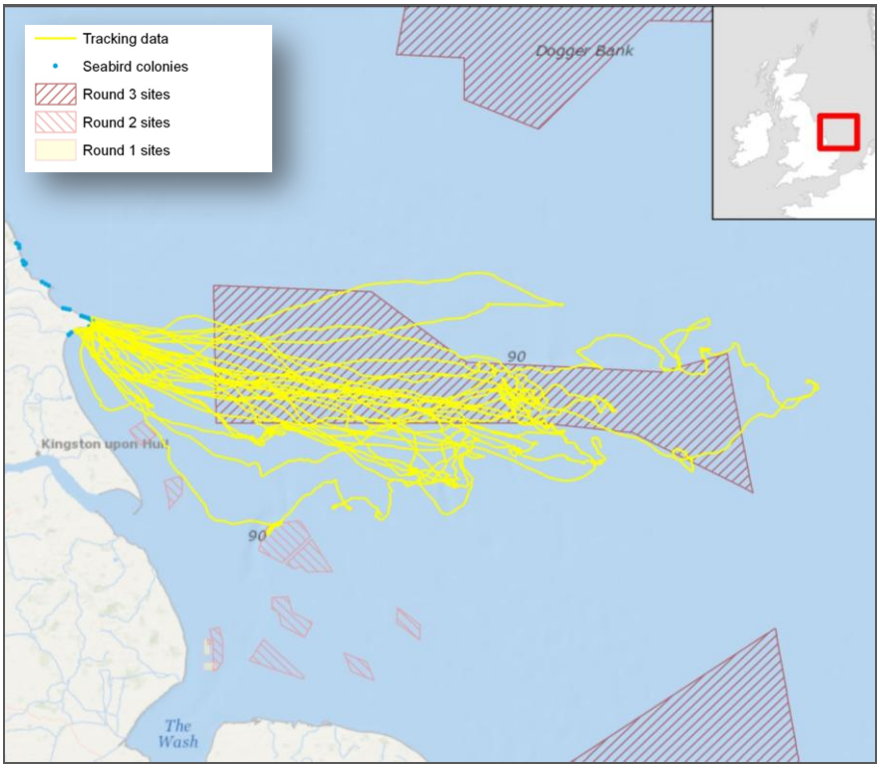
Figure 26 – KDE contours for Kittiwakes tracked at Flamborough 2010-2013





It was apparent that foraging areas overlapped significantly with areas of seabed zoned for wind energy development. For example, Figure 27 overlays tracking data from all Kittiwakes tracked from Flamborough Head in 2012 against the Round 1, 2 and 3 wind energy development sites.

Figure 27 – Kittiwakes tracked through wind energy development zones during 2012



The hot spots within this data are now being mapped against oceanographic features both at Flamborough and Bempton and at other Kittiwake colonies in the UK to determine whether core foraging areas can be accurately predicted. These results should be available in 2015.

Discussion and conclusion

A full programme of monitoring and research was successfully completed this year at Flamborough and Bempton. This included Fulmar, Gannet, Razorbill, Guillemot, Kittiwake, and Herring Gull productivity monitoring, Razorbill, Guillemot, and Kittiwake study-plot counts, Guillemot diet composition study and a Herring Gull and Shag whole-colony count. In addition, a study was set-up to look at, and record, how Shag use the SPA throughout the year and a census was also undertaken as part of a national survey looking at the frequency of bridling in Guillemots. Kittiwake tracking took place at Flamborough and Filey and Kittiwake productivity monitoring was completed at Filey as well as a boat based whole-colony assemblage count there.

A total of 27 staff and volunteers were involved in the Flamborough and Bempton seabird monitoring programme, contributing 1150 hours to monitoring and research projects across the SPA.

Identifying Kittiwake key foraging areas and possible marine protected area boundaries

The UK Kittiwake breeding population has undergone a 50% decline in the last forty years, mirroring a similar decline in the Flamborough and Bempton Cliffs SPA, one of the largest Kittiwake breeding colonies in the UK. The cause of this decline is not fully understood but may be linked to an increase in surface sea temperatures in the North Sea, during this period. During this same period the biomass of Arctic plankton species have reduced dramatically and populations of Lesser Sand-eel, the staple food of Black-legged Kittiwake, have similarly declined (Frederiksen et al, 2004).

At a time when the UK Kittiwake population is undergoing such a dramatic decline it is critical that the legal protection offered to nesting Kittiwake is broadened to incorporate key foraging areas and Lesser Sand-eel populations. The Birds Directive states that the SPA should include the most suitable territories of the SPA feature. To date, the Government have focussed on designated nesting areas and inshore maintenance areas only. ESAS data has been used to determine where key foraging areas might be located but the Minister has publically criticised the quality of this data.

The five years of tagging data for nesting Kittiwake at Flamborough, is now, for the first time, enabling us to develop a more comprehensive understanding of where these core foraging areas are located. By comparing these foraging hot spots with known oceanographic features it may be possible to develop a kernel-density model that accurately predicts the core foraging hot spots across the whole of the SPA which in turn can be ground-truthed. This data can then be used to inform the boundaries of an offshore mSPA for Kittiwake at Flamborough and Filey as well as potential Lesser Sand-eel Marine Conservation Zones (MCZ) which could help safeguard both species.

Kittiwake core foraging areas and the possible impact of offshore wind arrays

In 2013 the core foraging areas of Kittiwakes, feeding nestlings at Flamborough, were once again shown to overlap significantly with the development footprint of the proposed Hornsea offshore wind array. Similarly, the foraging areas of Kittiwakes nesting at Filey also showed some overlap with the proposed Dogger Bank offshore wind array. This overlap raises the possibility of collision risk and/or displacement of feeding birds due to avoidance of the wind-farm which could ultimately result in reduced Kittiwake breeding success and a negative impact on the SPA features.

It is crucial that if consent is given for the wind arrays to go ahead, that monitoring is carried out by the developers to determine the impact on the SPA and pSPA features and that measures can be taken to mitigate any potential damage.

Tagging – the next steps

It is proposed to carry out a detailed analysis of the core foraging areas to determine a more accurate foraging hot spot map for the whole SPA. This could be tested by extending the Filey Kittiwake study and rolling out tagging work to include Kittiwakes nesting at Bempton and/or Speeton. Furthermore, it is recommended that this approach be used to determine core foraging areas of breeding Razorbill and Guillemot, key features of the Flamborough and Filey Coast pSPA, as soon as the technology allows data to be downloaded automatically without having to recapture birds.

Recreational disturbance

The EMS recreational disturbance study has identified that recreational activity is still an ongoing issue across the SPA and pSPA. Anglers descending the cliffs to access the shore and cliff-top angling during the breeding season are still issues that need addressing, as is jet ski, recreational boat and kayak-use in the intertidal area and hand gliders and low flying aircraft activity overhead. A voluntary angling code of conduct has been reviewed and agreed between the RSPB and the two main local angling groups, the Filey Brigg Angling Society and the Bridlington Shore Anglers, to help minimise disturbance to the SPA features during the breeding season between the northern boundary of the SPA and the southern boundary of the Bempton Cliffs reserve. It is hoped to review the success of this code of conduct on an annual basis and explore the potential to adapt it and roll it out across the SPA and underpinning SSSIs.

Moves are afoot to develop a similar voluntary code of conduct for pleasure watercraft and in particular jet skis following a number of incidents in 2013 when auks were reported being killed or injured by jet skiers and nestling Gannets were reported to have been disturbed and caused to fledge prematurely.

A further voluntary code of conduct has been drawn up by the British Canoeing Union working with the RSPB. It is hoped to apply this in 2015 once the final wording has been agreed.

A future challenge is to determine how to assess the impact of hang gliders on the breeding seabird assemblage and then manage this impact.

The Flamborough and Filey Coast pSPA

The data collected through the Flamborough Head and Bempton Cliffs Seabird Monitoring Programme has been used to inform a proposed new SPA the Flamborough and Filey Coast pSPA. A consultation has been carried out in 2014 by Natural England and a decision should be made about the pSPA and boundaries in 2015. The features of the new pSPA include Kittiwake, Razorbill Guillemot, and Gannet and the boundary includes an inshore maintenance extension of 1km for Razorbill and Guillemot and a 2km extension for Gannet and Kittiwake. The coastal boundary includes the existing Flamborough Head and Bempton Cliffs SPA plus the stretch of coastal cliffs from Filey Brigg to Cayton Bay.

A further consultation will follow regarding the underpinning SSSIs in 2015.

A further whole-colony count and Kittiwake productivity monitoring was carried out at Filey Cliffs in 2014 and is reported separately (Aitken, Babcock and Clarkson 2014). The Filey colony counts reported the highest Guillemot breeding population to date but also a significant reduction in the number of AONs for Kittiwake with an alarming 2,000 fewer AONs.

The project is making significant progress against its population and productivity monitoring objectives, informing the assessment and review of SPA and SSSI condition and boundaries.

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

Appendix 1

Table 14 – Kittiwake productivity results per site 2009-2014

Monitoring site	AON 2009	Fledged chicks '09	Productivity ch/pr '09	AON 2010	Fledged chicks '10	Productivity ch/pr '10	AON 2011	Fledged chicks '11	Productivity ch/pr '11	AON 2012	Fledged chicks '12	Productivity ch/pr '12	AON 2013	Fledged chicks '13	Productivity ch/pr '13	AON 2014	Fledged chicks '14	Productivity ch/pr '14
Jubilee Far	50	54	1.08	50	60	1.20	50	50	1.00	50	32	0.64	50	9	0.18	50	44	0.88
Bartlett Nab Near	-	-	-	56	72	1.29	50	52	1.04	49	50	1.02	50	36	0.72	50	41	0.82
Bartlett Nab Far	50	50	1.00	50	55	1.10	50	47	0.94	48	37	0.77	50	19	0.38	50	45	0.90
Grandstand North Near	50	48	0.96	61	87	1.43	50	43	0.86	49	31	0.63	50	23	0.46	51	46	0.90
Grandstand North Near Edge	-	-	-	50	50	1.00	50	59	1.18	49	50	1.02	50	35	0.70	50	43	0.86
Grandstand North Mid	50	54	1.08	50	50	1.00	50	57	1.14	50	41	0.82	50	39	0.78	50	49	0.98
Grandstand North Far Edge	-	-	-	50	68	1.36	50	53	1.06	51	61	1.20	-	-	-	50	50	1.00
Grandstand North Low	-	-	-	50	63	1.26	50	45	0.90	53	41	0.77	51	43	0.84	53	40	0.75
Old Dor	50	55	1.10	50	61	1.22	50	57	1.14	50	49	0.98	50	24	0.48	49	26	0.53
Newcombe	50	36	0.72	50	58	1.16	50	38	0.76	50	42	0.84	49	25	0.51	50	43	0.86
Back of Newcombe	-	-	-	50	59	1.18	50	33	0.66	53	44	0.83	50	23	0.46	52	42	0.81
Carter Lane 1	-	-	-	50	52	1.04	50	38	0.76	-	-	-	-	-	-	-	-	-
Carter Lane 2	-	-	-	50	51	1.02	-	-	-	-	-	-	-	-	-	-	-	-
Saddle Nook 1	50	48	0.96	50	65	1.30	50	34	0.68	50	18	0.36	49	21	0.43	52	33	0.63
Saddle Nook 2	50	55	1.10	50	62	1.24	50	52	1.04	48	34	0.71	52	28	0.54	-	-	-
Saddle from Breil	-	-	-	51	54	1.06	51	31	0.61	51	18	0.35	50	17	0.34	50	24	0.48
Breil Nook North	50	44	0.88	50	45	0.90	50	39	0.78	48	35	0.73	50	18	0.36	50	51	1.02
Breil Nook South	50	49	0.98	50	57	1.14	50	33	0.66	48	43	0.90	50	21	0.42	50	33	0.66
Back of Breil Nook	-	-	-	50	67	1.34	50	41	0.82	-	-	-	51	34	0.67	50	10	0.20
Swineshaw Hole	-	-	-	50	49	0.98	50	34	0.68	53	38	0.72	44	8	0.18	49	33	0.67
Lighthouse	50	38	0.76	50	78	1.56	50	27	0.54	48	46	0.96	49	35	0.71	50	56	1.12
Tagging Site	-	-	-	74	69	0.93	-	-	-	-	-	-	-	-	-	-	-	-
Total	**550**	**531**	**0.97**	**1142**	**1332**	**1.17**	**1001**	**863**	**0.86**	**898**	**710**	**0.79**	**895**	**458**	**0.51**	**906**	**709**	**0.78**

Appendix 2

Table 15 – Razorbill study-plot count data 2014

Plot 1: Grandstand Gully									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
02/06/2014	33	8/8	1	2	1	2	1	1	S
07/06/2014	32	3/8	1	2	2	3	1	2	SE
10/06/2014	31	1/8	1	2	1	3	1	2	NW
13/06/2014	33	5/8	1	2	1	3	1	1	W
16/06/2014	35	8/8	1	4	2	2	1	4	N
Average	**33**								

Plot 2: Grandstand North									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
02/06/2014	38	8/8	1	1	1	1	1	1	S
05/06/2014	62	8/8	2	2	2	1	1	1	E
08/06/2014	40	7/8	1	2	2	1	1	1	S
11/06/2014	32	2/8	1	1	2	1	1	2	S
14/06/2014	58	8/8	1	2	2	2	2	1	N
Average	**46**								

Plot 3: Old Dor									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
02/06/2014	53	7/8	1	2	1	2	1	2	S
07/06/2014	64	3/8	1	2	2	1	1	2	SSE
10/06/2014	31	1/8	1	2	2	1	1	2	SW
13/06/2014	51	4/8	1	2	1	1	1	1	W
16/06/2014	59	8/8	1	4	2	2	1	4	N
Average	**52**								

Plot 4: Newcombe									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
04/06/2014	114	8/8	4	2	2	2	1	1	S
06/06/2014	111	1/8	1	2	2	3	1	2	S
11/06/2013	110	3/8	1	1	2	2	1	2	S
14/06/2014	113	8/8	1	2	2	2	1	1	N
17/06/2014	130	8/8	1	5	4	2	1	3	N
Average	**116**								

Plot 5: Back of Newcombe									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
03/06/2014	116	8/8	2	1	2	2	1	0	
06/06/2014	146	3/8	1	2	2	3	1	2	SW
10/06/2014	107	4/8	1	1	2	3	1		SSW
12/06/2014	94	3/8	1	1	1	2	1		
17/06/2014	191	8/8	2	2	3	3	1		
Average	**131**								

Plot 6: Saddle Nook									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
04/06/2014	113	6/8	1	2	2	2	1	1	S
07/06/2014	116	2/8	1	3	3	2	1	3	E
10/06/2014	106	1/8	1	2	2	2	1	1	S
13/06/2016	121	5/8	1	2	2	2	1	1	
16/06/2014	113	8/8	1	4	4	2	1	4	N
Average	**114**								

Plot 7: Swineshaw Hole									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
03/06/2014	117	8/8	2	2	2	2	1	2	S
09/06/2014	163	6/8	1	2	1	2	1	2	
12/06/2014	140	4/8	1	2	1	2	1	2	W
15/06/2014	147	8/8	1	2	2	2	1	3	NE
18/06/2014	168	8/8	1	4	3	2	1	4	NW
Average	**147**								

Table 16 – Guillemot study-plot count data 2014

Plot 1: Nettletrip									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
02/06/2014	148	8/8	1	2	1	2	1	2	S
07/06/2014	113	5/8	1	2	2	2	1	2	SSE
11/06/2014	165	4/8	1	2	1	2	1	1	
13/06/2014	141	7/8	1	2	1	2	1	1	W
17/06/2014	158	8/8	2	2	2	2	1	3	N
Average	**145**								

Plot 2: Grandstand North									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
02/06/2014	147	8/8	1	1	1	1	1	1	S
05/06/2014	161	6/8	1	2	2	1	1	1	E
08/06/2014	144	7/8	1	2	2	1	1	1	S
11/06/2014	121	2/8	1	1	2	1	1	2	S
14/06/2014	149	8/8	1	2	2	2	2	1	N
Average	**144**								

Plot 3: Old Dor									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
02/06/2014	118	7/8	1	2	1	2	1	2	S
07/06/2014	148	3/8	1	2	2	1	1	2	SSE
10/06/2014	105	1/8	1	2	2	1	1	2	SW
13/06/2014	137	4/8	1	2	1	1	1	1	W
16/06/2014	130	8/8	1	4	2	2	1	4	N
Average	**128**								

Plot 4: Carter Lane									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
04/06/2014	234	8/8	1	2	2	2	2	0	
07/06/2014	256	6/8	2	2	3	2	1	2	E
10/06/2014	216	1/8	1	2	2	2	1	1	S
13/06/2014	252	5/8	1	2	2	2	1	1	
16/06/2014	264	8/8	1	4	4	2	1	4	N
Average	**244**								

Plot 5: Breil Nook									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
03/06/2014	274	8/8	2	1	1	2	2	1	S
09/06/2014	287	7/8	3	2	1	2	1	1	
12/06/2014	238	1/8	1	2	1	2	1	2	W
15/06/2014	285	8/8	1	3	2	2	1	2	NE
18/06/2014	297	6/8	1	2	2	3	1	3	NNW
Average	**276**								

Plot 6: Petrel Hole									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
03/06/2014	329	7/8	1	2	1	1	1	1	S
09/06/2014	316	3/8	1	2	1	1	1	2	
12/06/2014	288	4/8	1	2	1	1	1	1	W
15/06/2014	332	8/8	1	2	2	2	1	3	NE
18/06/2014	350	8/8	1	4	3	2	1	4	NW
Average	**323**								

Plot 7: Swineshaw Hole									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
03/06/2014	161	8/8	2	2	2	2	1	2	S
09/06/2014	205	6/8	1	2	1	2	1	2	
12/06/2014	171	4/8	1	2	1	2	1	2	W
15/06/2014	207	8/8	1	2	2	2	1	3	NE
18/06/2014	225	8/8	1	4	3	2	1	4	NW
Average	**194**								

Table 17 – Kittiwake study-plot count data 2014

Plot 1: Jubilee Corner									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
06/06/2014	258	1/8	1	2	2	1	1	1	S
18/06/2014	281	6/8	1	4	3	1	1	3	N
Average	**270**								

Plot 2: Grandstand North									
Date	Total count	Cloud cover (in eights)	Rain	Sea conditions	Swell	Light conditions	Visibility	Wind Speed (Beaufort scale)	Wind direction
02/06/2014	473	8/8	1	1	1	1	1	1	S
05/06/2014	502	8/8	1	2	2	1	1	1	W
Average	**488**								

Plot 3: Old Dor									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
02/06/2014	207	7/8	1	2	1	2	1	1	S
13/06/2014	219	5/8	1	2	1	2	1	2	W
Average	**213**								

Plot 4: Newcombe									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
04/06/2014	243	8/8	4	2	2	2	1	0	
14/06/2014	243	8/8	1	2	2	2	1	1	N
Average	**243**								

Plot 5: Back of Newcombe									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
03/06/2014	259	8/8	2	1	2	2	1	0	
10/06/2014	264	4/8	1	1	2	3	1		SSW
Average	**262**								

Plot 6: Saddle Nook									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
04/06/2014	318	7/8	4	2	2	2	1	1	S
10/06/2014	332	1/8	1	2	2	2	1	1	S
Average	**325**								

Plot 7: Breil Nook									
Date	**Total count**	**Cloud cover (in eights)**	**Rain**	**Sea conditions**	**Swell**	**Light conditions**	**Visibility**	**Wind Speed (Beaufort scale)**	**Wind direction**
03/06/2014	159	8/8	2	2	1	2	2	1	S
12/06/2014	155	2/8	1	2	1	2	1	1	W
Average	**157**								

Appendix 3

Table 18 - Diet monitoring timetable

Date	Plot	Hours	Prey items recorded
9 June 2014	Below Bartlett Nab (BBN)	0530-0730	7
10 June 2014	BBN	1715-1905	7
11 June 2014	Bartlett Nab North (BNN)	0730-0930	9
12 June 2014	Jubilee B (Jub B)	0815-1015	1
13 June 2014	BBN	1825-2025	3
14 June 2014	BNN	0545-0745	3
15 June 2014	Jub B	0440-0620	11
16 June 2014	BBN	1700-1900	6
17 June 2014	Jub B	0425-0625	8
18 June 2014	Jub B	0810-1010	5
19 June 2014	BBN	0655-0855	6
20 June 2014	BNN	0535-0735	17
21 June 2014	Jub B	0455-0700	8
22 June 2014	BBN	1725-1925	3
23 June 2014	BNN Grandstand South	0630-0730 0735-0835	3 3

Figure 28 - Diet monitoring plot locations

Jubilee B

Below Bartlett Nab

Bartlett Nab North (note Gannet nest which has appeared since this plot was last used)

Appendix 4

Table 19 – Herring Gull whole-colony counts 2000-2014

Plot no.	2000 AON count	2008 AON count	2010 AON count	2014 AON count
1	0	0	0	0
2	11	15	18	12
3	2	1	0	0
4	0	1	0	2
5	0	0	0	1
6	0	1	0	3
7	2	1	7	5
8	12	16	10	16
9	1	0	0	0
10	2	0	0	0
11	0	1	1	2
12	1	4	4	2
13	1	0	0	0
14	0	1	3	4
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	1
20	1	0	0	0
21	0	0	1	1
22	2	1	0	0
23	1	0	0	4
24	5	0	7	6
25	0	1	0	0
26	0	1	0	0
27	0	0	0	0
28	1	0	1	1
29	8	5	9	6
30	12	1	0	0
31	0	1	2	0
32	1	4	1	4
33	1	2	2	0
34	1	1	2	0
35	1	0	0	0
36	2	2	1	0
37	1	0	0	0
38	0	0	1	1
39	5	1	0	0
40	0	0	0	1
41	0	0	0	0

42	0	0	0	0
43	1	0	0	0
44	3	1	0	0
45	19	14	9	0
46	13	19	0	0
47	0	0	1	0
48	12	8	3	1
49	16	24	17	0
50	0	2	1	0
51	3	2	1	2
52	0	1	0	1
53	0	1	1	1
54	3	2	1	1
55	3	1	1	3
56	0	0	1	0
57	2	1	1	0
58	0	0	1	0
59	0	0	1	0
60	1	1	0	0
61	2	1	0	0
62	3	1	0	4
63	2	1	1	0
64	9	3	3	0
65	2	0	1	0
66	6	0	0	0
67	9	7	3	0
68	4	5	3	3
69	1	2	0	1
70	8	4	2	1
71	0	1	0	1
72	1	1	0	1
73	0	0	0	1
74	2	0	0	1
75	0	0	0	0
76	0	0	0	0
77	0	1	1	1
78	5	1	0	0
79	0	1	0	0
80	3	2	2	0
81	0	0	0	0
82	1	0	0	0
83	1	0	1	1
84	0	0	0	0
85	4	0	3	1
86	2	1	1	1
87	0	0	0	0
88	2	0	1	0

89	14	9	3	7
90	0	1	0	0
91	1	1	0	1
92	3	1	1	2
93	3	2	4	2
94	4	3	0	2
95	1	1	1	1
96	0	1	0	0
97	0	1	0	0
98	1	2	0	0
99	2	2	2	3
100	2	2	0	4
101	0	0	0	3
102	8	3	8	4
103	12	10	6	7
104	7	10	8	10
105	6	8	4	5
106	0	1	0	0
107	2	3	3	0
108	3	6	30	2
109	10	19	20	28
110	15	27	30	2
111	6	5	1	0
112	1	2	4	0
113	12	2	5	1
114	11	7	7	2
115	5	3	1	4
116	1	1	1	1
117	8	8	4	11
118	27	26	22	32
119	27	6	17	9
120	4	6	0	2
121	0	1	1	1
122	3	0	0	0
123	3	1	1	2
124	15	14	18	6
125	14	23	19	19
126	1	10	2	4
127	16	6	5	3
128	6	13	12	4
129	3	5	1	4
130	1	3	7	3
131	2	3	0	0
132	4	2	0	1
133	0	0	1	0
134	4	1	0	0
135	3	3	5	2

136	3	4	5	2
137	3	3	1	3
138	4	5	1	4
139	12	1	4	1
140	6	3	1	1
141	6	0	1	1
142	3	4	2	1
143	4	0	1	1
144	1	0	1	2
145	2	0	2	2
146	2	0	0	0
147	1	0	1	2
148	3	1	0	1
149	4	0	1	2
150	4	0	1	1
151	1	1	0	1
152	0	2	0	1
153	6	3	1	1
154	3	0	0	0
155	3	4	0	0
156	4	1	0	1
157	3	5	1	2
158	3	2	0	1
159	10	0	0	1
160	6	0	2	2
161	6	5	1	0
162	3	1	1	1
163	3	2	2	2
164	5	1	0	1
165	2	1	1	1
166	0	0	0	2
167	0	0	0	0
168	2	4	2	1
169	1	0	0	2
170	7	4	5	4
171	4	2	2	1
172	3	0	2	2
173	1	1	3	1
174	3	13	9	7
175	34	20	13	19
176	14	11	10	15
177	14	1	5	6
178	18	2	4	2
Sub total	705	541	471	393
Land count	0	0	24	69
Total	**705**	**541**	**495**	**462**