Filey-Cayton Seabird Monitoring Report 2011

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Executive Summary

In 2009 a boat-based whole colony count of the breeding seabird assemblage nesting on the cliffs between Filey Brigg and Cayton Bay was carried out by the RSPB. The results suggested that the total number of breeding seabirds in the colony exceeded 20,000 birds, and as such, under the EU Birds Directive, met Special Protection Area (SPA) qualifying criteria.

In response to this evidence the RSPB, with funding support from Natural England, undertook annual whole colony counts in 2010 and 2011. In the latter year the JNCC Seabird Monitoring Programme(SMP) plots were used. The results of these counts are compared with earlier whole colony counts carried out in 1986 (Williams 1996), 2002 (SMP JNCC) and 2009 to establish population trends.

The results of the whole colony counts confirmed that the Filey – Cayton colony supports an internationally important breeding seabird assemblage with over 20,000 breeding seabirds. The breeding Kittiwake population of 7777 apparently occupied sites (AOS) in 2011 is the second largest colony in England and more than 1% of the UK breeding population. The counts suggest a 27% increase in numbers since 1986 when 5666 pairs were present.

The breeding Guillemot population showed a major increase from 416 pairs in 1986 to 3007 individuals in 2011. Similarly, Razorbill breeding numbers showed an increase from 104 pairs in 1986 to 1124 individuals in 2011, a scale of increase for both species that was mirrored across the Flamborough/Bempton Cliffs SPA. The number of Puffin counted remained low throughout the period but the count methodology for this species is not ideal.

The Fulmar breeding population increased from 252 pairs in 1986 to a peak of 842 AOS in 2010 and 771 AOS in 2011. Whilst changes in the Herring Gull population were more difficult to interpret with an apparent ongoing decline from 339 AOS to 245 AOS in the least three years, bringing numbers closer to the 200 pairs recorded in 1986. The Great Cormorant colony, appears to fluctuate between 20 and 40 pairs.

Land-based, safe and accessible productivity monitoring plots suitable for Kittiwake, Guillemot and Razorbill were located, to enable intra- and inter-colony comparisons of breeding success between years.

It is recommended that the seabird monitoring is continued to establish a five year continuous dataset to inform potential designation of whole or part of the colony as an extension of the Flamborough Head and Bempton Cliffs SPA and as a new SSSI designated for its breeding seabird assemblage and Kittiwake population.

1.0 Introduction

Whole colony counts carried out in 1986 (Williams 1996) and in 2002, as part of Seabird 2000, a major initiative to census all breeding seabirds in Britain and Ireland (Mitchell et al 2004) identified a significant seabird colony nesting on the cliffs to the north of Filey Bay.

The significance of this colony came to light in 2008 in response to large numbers of Razorbill and Guillemot being caught and killed in gill nets set by fishermen in the adjacent Filey Bay. It was recognised that birds caught in the nets could have originated from either the Flamborough Head and Bempton Cliffs SPA or the Filey colony. Unfortunately, there was no current data about the state of the Filey colony.

A cliff-top assessment was conducted in 2009 and established that it is not possible to carry out a whole colony count from land due to the lack of safe accessible vantage points. Therefore it is essential that whole colony counts are boat-based.

In 2009 a boat-based whole colony count of the breeding seabird assemblage nesting on the cliffs between Filey Brigg and Cayton Bay was carried out by the RSPB. The results suggested that the total number of breeding seabirds in the colony exceeded 20,000 birds, and as such, under the EU Birds Directive met Special Protection Area (SPA) qualifying criteria.

In response to this evidence the RSPB, with funding support from Natural England, undertook and mapped whole colony counts, using the JNCC Seabird Monitoring Programme (SMP) plots, in 2010 and 2011. The results of these counts are compared with earlier counts to determine population trends and compare these with results from the Flamborough Head and Bempton Cliffs SPA population trends.

Monitoring of seabird productivity has been carried out by members of the Filey Brigg Ornithological Group and Bird Observatory. However, whilst this data provides an invaluable local record of productivity it is not based upon common standards monitoring and cannot be directly compared with other colonies (Syd Cochrane pers comm.) Therefore, it is proposed to identify safe and accessible land-based Kittiwake, Guillemot and Razorbill productivity monitoring plots to enable an intra-colony m comparison of breeding success between years and an inter-colony comparison with the adjacent Flamborough Head and Bempton Cliffs SPA colony.

It is hoped that this information will be used to inform the potential designation of whole or part of the colony as an extension of the Flamborough Head and Bempton Cliffs SPA and as a new SSSI designated for it's breeding seabird assemblage.

2.0 Location

The Filey Brigg to Cayton Bay stretch of coastline falls within the country of North Yorkshire. It is approximately 7 kilometres long and situated 10 kilometres north of RSPB Bempton Cliffs, on the East coast of Yorkshire, England (Figure 1).

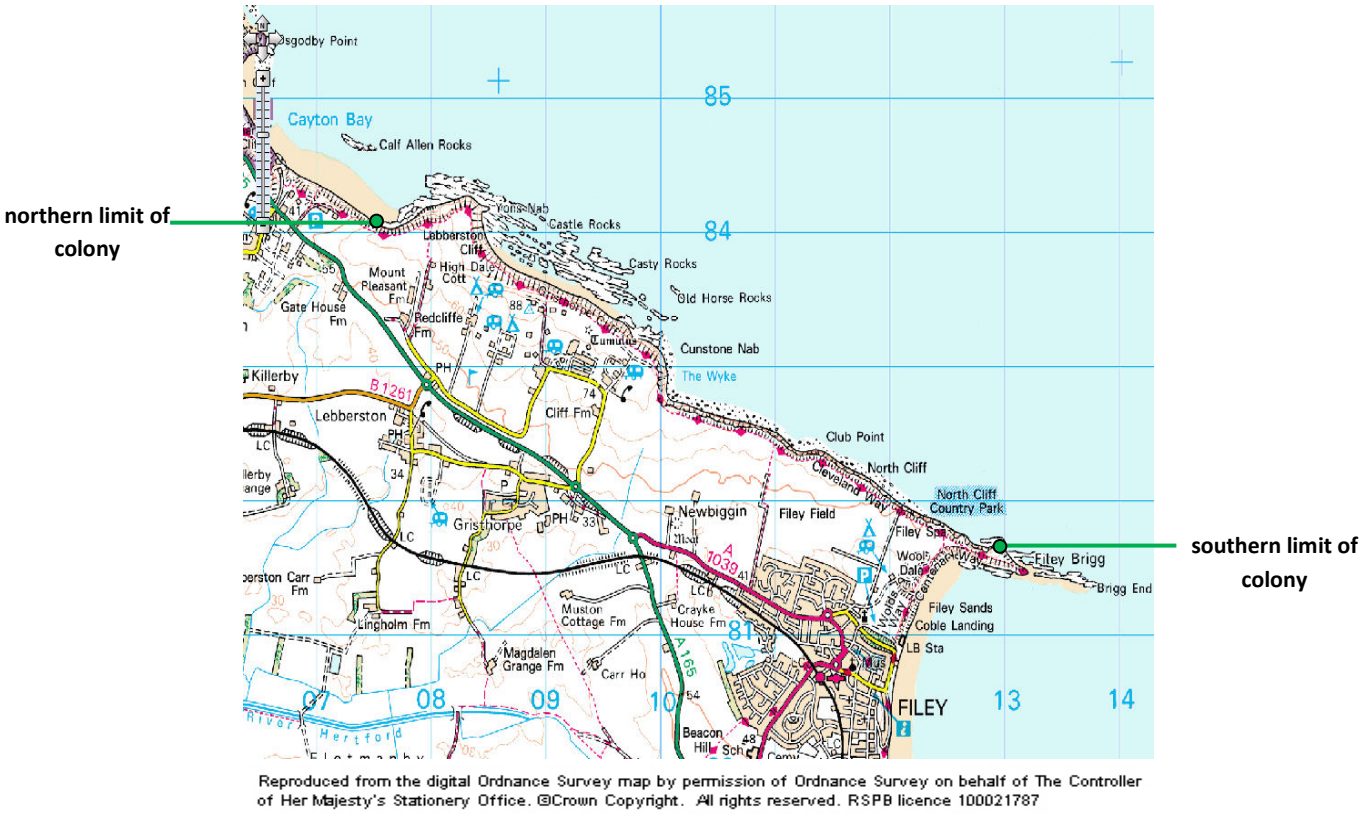

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Figure 1: Filey and Cayton seabird colony location

The geology between Filey Brigg and Cayton Bay is made up of a mixture of Jurassic limestone and sandstone rock with calcareous grits covered with glacial boulder clay at Filey, moving to oxford clay at Cayton. The cliff height ranges from 160 foot to the south, to 270 foot in the north. There are several signs of geomorphological activity along this area of cliff, with landslips and erosion causing sections of the overlying clays to slip, taking with it segments of the cliff face. In the most part, the cliff face is vertical, with ledges and crevices providing suitable nesting areas for a range of breeding seabirds. Other sections of cliff line are more gradual and covered in vegetation, the result of previous landslips and are largely unsuitable for nesting seabirds.

3.0 Site Designations

There are two SSSI (Site of Special Scientific Interest) designations that fall within the colony, these are the Filey Brigg SSSI to the south, and the Gristhorpe Bay and Red Cliff SSSI to the north (Figure 2). This highlights the fact that there is a stretch of coastline, approximately 3.5 Kilometres long within the colony that is not currently under SSSI designation. In order for the colony to attain full SPA protection, this section of coastline would need to be designated a SSSI in order to achieve the SPA classification needed to secure future protection for this significant seabird colony.

In addition to this, the two aforementioned SSSI's already in place would need to be reviewed as they do not currently include protection for internationally important breeding seabirds.

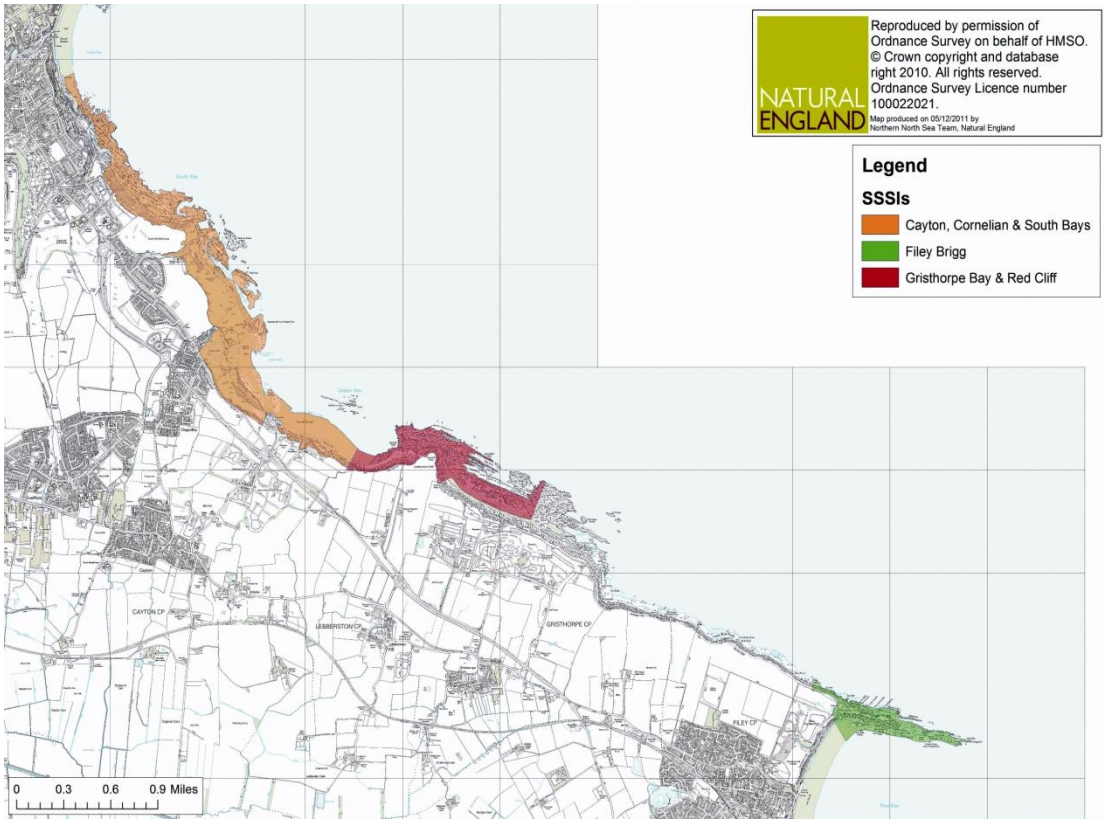


Figure 2: SSSI designations within and adjacent to the Filey to Cayton colony

Filey Brigg SSSI

Natural England designated Filey Brigg as a SSSI for its geological and ornithological interest. The site is identified for its national importance in the Geological Conservation Review.

Description:

"It is a key Corallian site showing the most extensive exposures through the Lower Calcareous Grit, the Hambleton Oolite and Middle Calcareous Grit. Filey Brigg affords the best opportunity to examine the Calcareous Grit and its faunas. The 'Ball Beds', which are lost further west in Yorkshire, are particularly well exposed here. The comparatively thin development of the lower Calcareous Grit Passage Beds and Hambleton Oolite is of interest in palaeogeographic and facies studies.

During the winter months, the intertidal areas and rocky shoreline of Filey Brigg support Purple Sandpiper in nationally significant numbers."

Natural England 2001. *SSSI Designation.* Available at: http://www.sssi.naturalengland.org.uk/Special/sssi/sitedocuments.cfm?type=citation&sssi_id=1002497 [Accessed: 20 Dec 2011]

Gristhorpe Bay and Red Cliff SSSI

Natural England designated Gristhorpe Bay and Red Cliff as a SSSI for its geological interest. The site is identified for its national importance in the Geological Conservation Review.

Description:

"A nationally important stratigraphic locality for the Middle Jurassic, Gristhorpe Bay is of great historical significance in the development of the study of the Jurassic in Yorkshire. It is the type locality of the Cayton Bay Formation (*Millepore* and Yon Nab Beds) and the Gristhorpe Plant Bed and also preserves an important section in the attenuated Scarborough Formation, near the southern limit of its present distribution. The overlying Scalby Formation is also of considerable interest at this locality.

High Red Cliff exposes a thick sequence of Callovian (Upper Jurassic) rocks from the Cornbrash to the Oxford Clay and is of great importance in interpreting the history of the Yorkshire area during this part of geological time. This is a critical site for studies of Callovian palaeogeography and is extensively used for geological study and research."

Natural England 2001. *SSSI Designation.* Available at: http://www.sssi.naturalengland.org.uk/Special/sssi/sitedocuments.cfm?type=citation&sssi_id=1002632 [Accessed: 20 Dec 2011]

4.0 Methodology

4.1 Colony Counts

In 2009 a boat-based whole colony count was carried out by Keith Clarkson on 20 June, from the Scarborough-based sea-angling boat 'The Skylark', skippered by Brian Wallace, at a cost of £50 per hour. Weather conditions on the day were far from ideal with a Force 4, west-north-west wind making sea conditions difficult for counting. The count started at 0600h and finished at 1200h, on a low falling tide which greatly restricted access to the cliffs. Some of Guillemot and Razorbill had fledged so this count was a minimum. Total cost £300.

In 2010 the boat-based whole colony count was carried out by Keith and Clare Clarkson following guidance from the 'Seabird Monitoring Handbook for Britain and Ireland 1995' under 'General techniques for counting cliff colonies', details of which can be found under Appendix 3. The count was made on 21st May, in perfect calm conditions, using the Filey Sailing Club safety RIB at the cost of a £100 donation to the club. The boat departed at 0830h returning at 1300h. By using a RIB we were able to approach within close proximity of the cliffs and manoeuvre amongst the underwater rocks and scars. The count date was ideal ahead of any fledging or significant losses.

The 2011 boat-based whole-colony count took 7 hours and was conducted by Keith Clarkson and David Aitken from the RSPB. The boat was again hired from the Filey Sailing Club, with funding from Natural England, and was operated by a trained boat handler from the sailing club.

The colony count in 2011 followed boundary markers established on the Seabird Monitoring Programme website (Figure 3).

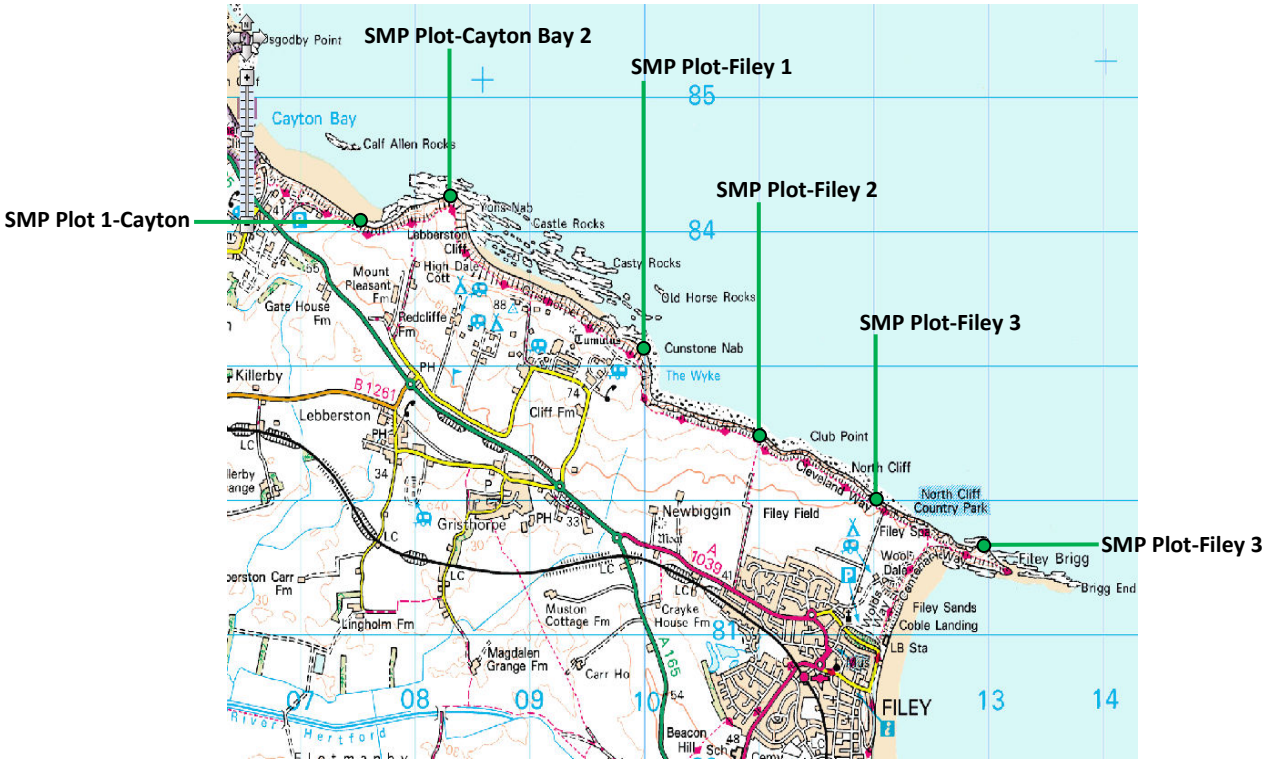


Figure 3: SMP plot boundaries

Photographs of the colony were taken from a boat on 2 June 2011, prior to survey commencement and labelled against the SMP plot locations. There are 5 SMP plot boundaries at the Filey & Cayton colony, within these plots 26 sub-sections were identified, labelled and recorded accordingly to assist with the monitoring at this colony (Appendix 2).

4.2 Productivity Monitoring

Initial land-based site visits were carried out to identify potential productivity monitoring study-plots for each species in the breeding assemblage. These study-plots should usually be selected at random or dispersed throughout the colony, however, the most important factor is that they offer safe vantage points for the recorder and cause little or no disturbance to the birds. At Filey the priority was to provide safe vantage points.

Atlantic Puffin productivity monitoring is very difficult at cliff colonies as the birds nest in cracks and holes in the cliffs.

A recommended minimum number of AON (Apparently Occupied Nests) or AOS (Apparently Occupied Sites) are required to provide adequate sample size and meet Common Standard requirements (Seabird Monitoring Handbook for Britain and Ireland 1995). Failure to achieve this sample size may not provide a representative sample of the colony as a whole

and also may not be comparable against data collected from other seabird colonies around the UK.

Each species ideally require 5 study-plots in order to give an adequate sample size of several hundred breeding pairs. The plots should contain 50 birds or more where possible, however, some species such as Herring Gull and Northern Fulmar nest loosely along the cliff colony and so may require several additional monitoring plots which will contain fewer birds.

5.0 Results

5.1 Breeding seabird assemblage

The results of the sea- based whole colony counts carried out in 2009,2010 and 2011 are shown below and compared with the 1986 (Williams 1996) and 2002 counts (Table 1).

Table 1: A comparison of boat based whole colony counts at Filey –Cayton Bay between 1986 and 2011

	1986 (14 Jun)	2002	2009 (20 June)	2010 (21 May)	2011 (3 June)
Fulmar	252 pairs	243 AOS	410 AOS	842 AOS	771 AOS
Cormorant	25 pairs	23 AOS	42 AOS	20 AOS	38 AOS
Shag	0	0	0	0	4 individ
Herring Gull	200 pairs	110 AOS	339 AOS	240 AOS	245 AOS
Kittiwake	5666 pairs	5120 AOS	6413 AOS	6420 AOS	7777 AOS
Guillemot	416 pairs	470 ind	2695 ind	3100 ind	3007 ind
Razorbill	104 pairs	72 ind	613 ind	814 ind	1120 ind
Puffin	36 ind	35 ind	19 ind	15 ind	32 ind

The data shows that within the last 25 years there has been a substantial rise in the numbers of breeding birds for most species present at this colony with an increase from 11,569 individuals in 2002 to 21,825 in 2011. The current population exceeds the SPA qualifying threshold for a breeding seabird assemblage of 20,000 birds.

The breeding Kittiwake population has shown a generally upward trend, increasing by 27% (5314 individuals), from 5666 pairs in 1986 to 7777 pairs in 2011.

Even larger scale population growth was reported for nesting Guillemot which increased by 640% (2537 individuals) and Razorbill which increased by a remarkable 1455% (1048 individuals). Both increases appear to have occurred since 2002. Similar large-scale increases have been reported from the Flamborough Head and Bempton Cliffs SPA.

The Northern Fulmar breeding population has increased from a low of 243 pairs in 2002 to a maxima of by 842 pairs in 2010. The count in 2011 revealed a loss of 71 pairs, with 771 AOS. The Herring Gull breeding population has increased by 45 pairs since 1986. However, this increase masks fluctuating fortunes in the intervening period which show an increase to a maxima of 339 AOS in 2009 followed by a year on year decline to 245 AOS in 2011.

The Great Cormorant breeding population appears to fluctuate between 20 and 42 pairs.

Atlantic Puffin numbers have remained relatively low for this species throughout. Caution should be used when interpreting the Puffin counts as this survey methodology is not recommended for this species (Mitchell et al 2004).

The spatial distribution of the breeding assemblage and changes in distribution between 2002 (Table 2) and 2011 (Table 3) are demonstrated below.

Table 2: Spatial distribution of the breeding assemblage using Seabird Monitoring Plots in 2011

Cayton Bay to Filey Brigg Whole Colony Count 2011							
Species	**Filey 1**	**Filey 2**	**Filey 3**	**Cayton 1**	**Cayton 2**	**Total**	**Total Individuals**
Common Guillemot (Ind.)	80	708	2219	-	-	**3007**	**3007**
Razorbill (Ind.)	144	251	725	-	-	**1120**	**1120**
Northern Fulmar (AOS)	261	177	116	123	94	**771**	**1542**
Black-legged Kittiwake (AON)	1418	3941	2418	-	-	**7777**	**15554**
Herring gull (AON)	101	57	40	24	23	**245**	**490**
Atlantic Puffin (Ind.)	7	2	23	-	-	**32**	**32**
Great Cormorant (AON)	4	19	15	-	-	**38**	**76**
European Shag (Ind.)	-	-	4	-	-	**4**	**4**

Table 3: Spatial distribution of the breeding assemblage using Seabird Monitoring Plots in 2002

Cayton Bay to Filey Brigg Whole Colony Count 2002							
Species	**Filey 1**	**Filey 2**	**Filey 3**	**Cayton 1**	**Cayton 2**	**Total**	**Total Individuals**
Common Guillemot (Ind.)	100	320	50	-	-	**470**	**470**
Razorbill (Ind.)	40	22	10	-	-	**72**	**72**
Northern Fulmar (AOS)	170	27	5	21	20	**243**	**486**
Black-legged Kittiwake (AON)	1800	3200	120	-	-	**5120**	**10240**
Herring gull (AON)	60	20	5	20	5	**110**	**220**
Atlantic Puffin (Ind.)	20	5	10	-	-	**35**	**35**
Great Cormorant (AON)	23	-	-	-	-	**23**	**46**

The results suggest that growth in the colony is not uniform across its length, rather, the main growth in the colony has occurred in the Filey Two and Filey Three sections on Filey North Cliff.

The shift in the Great Cormorant colony was caused by a cliff fall destroying nest sites (Syd Cochrane pers comm.)

5.2 Productivity Monitoring

Ten potential productivity monitoring plots were identified (Figure 4). Photographs of the plots and viewing points are shown in Appendix 1.

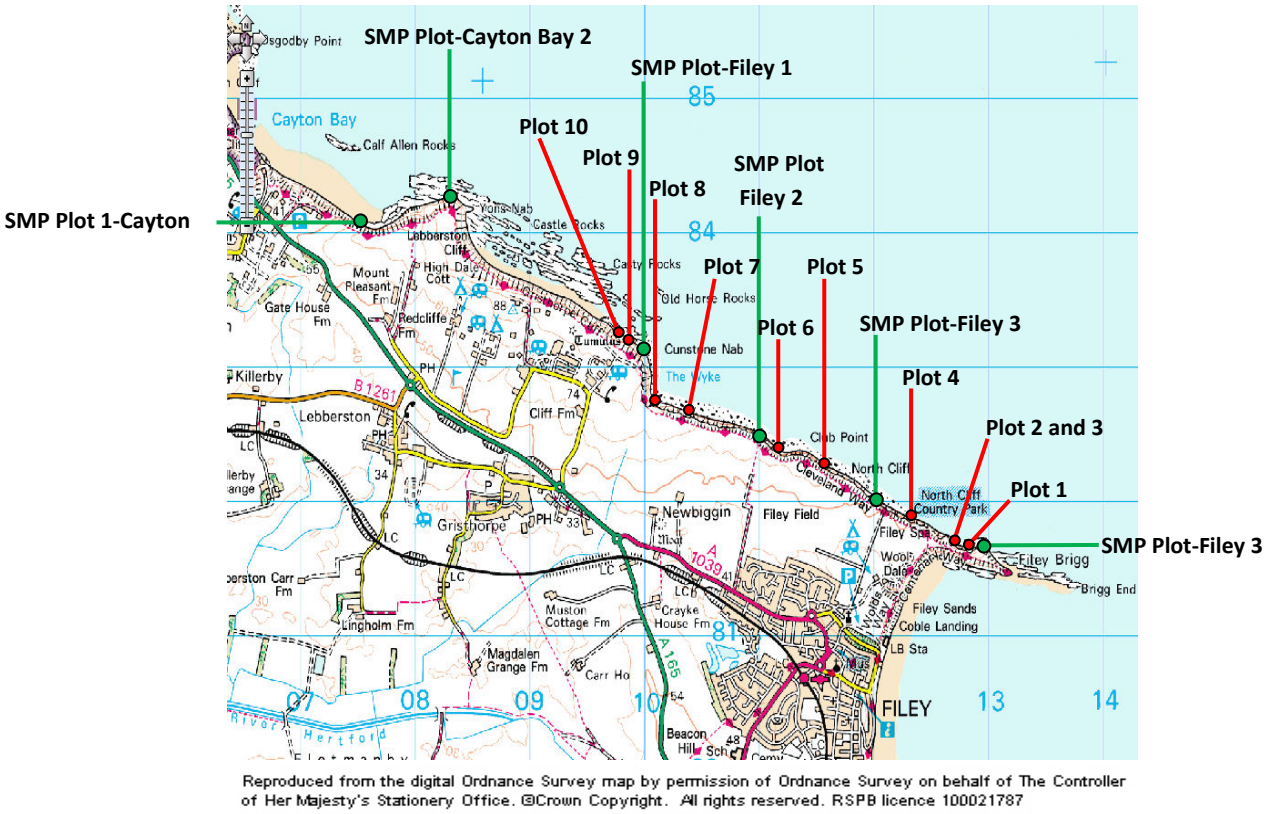


Figure 4: Proposed breeding productivity study-plot sites

6.0 Discussion

6.1 Seabird Assemblage

Repeatable whole-colony census monitoring is now established for Filey and Cayton. This has been achieved by carrying out boat-based counts from the sea following boundary markers set-up on the Seabird Monitoring Programme (SMP). Within these established boundaries sub-plots have been created and photographs produced of the length of the colony to assist with these counts (Appendix 2). Continued annual census monitoring of this site will enable assessment of changes in population size, trends, and variations in colony assemblage over time and comparisons with the adjacent Flamborough Head and Bempton Cliffs SPA.

After successfully completing the full colony census at Filey in 2011, the data shows there has been a significant rise in the number of breeding seabirds since 1986 and 2002. The number of birds recorded in 2002 was 11,569; by 2011 the number has risen to 21,825 showing an increase of 10,256 individuals over 9 years.

The colony is likely to be an extension of the Bempton and Flamborough meta-colony, located 10km south of Filey Brigg. The Bempton/Flamborough colony has expanded from 199,872 breeding seabirds in 1999/2000, to 243,800 in 2008; a population growth of 43,928 individuals. This has created a constant pressure for the seabirds to find new and suitable breeding grounds. The stretch of coastline between Filey Brigg and Cayton Bay offers the ideal assortment of ledges, cracks and crevices that these birds require as nest sites. No other suitable nest sites exist between the northern end of the Flamborough Head and Bempton Cliffs SPA and Filey Brigg. It would seem logical that birds from Bempton and Flamborough would select Filey and Cayton Bay as a natural extension of the main SPA colony site.

6.2 Kittiwake

The 2011 breeding population of 7777 AOS suggests that, based upon Seabird 2000, the last complete census of the UK and Irish seabirds, that the Filey-Cayton colony is the second largest Kittiwake colony in England, the largest being the Flamborough Head and Bempton Cliffs SPA, and supports more than 1% of the UK breeding Kittiwake population.

6.3 Productivity Monitoring

Initial land-based site inspections have shown there is an opportunity to carry out productivity monitoring at this colony. Collecting this data would allow monitoring of breeding success for a number of seabirds, including an internationally important breeding population of Kittiwake. With potential plots selected, the methodology already employed at Bempton Cliffs and Flamborough Head could be used to conduct this research. The monitoring programme would be based out of RSPB Bempton Cliffs, and be led by the Assistant Warden and team of volunteers.

A further site visit is required at the beginning of the 2012 breeding season to establish whether there are adequate numbers of visible nest sites at each study-plot for each species.

6.4 Identifying Foraging, Migratory Routes and Wintering Areas

Future monitoring research of this colony could include the deployment of GPS tags or geo-locators that collect data of bird's movements away from the colony. Unpublished results from work carried out as part of the Flamborough Head and Bempton Cliffs SPA seabird

monitoring programme suggest that breeding Kittiwake may be undertaking regular feeding trips into the proposed Hornsea, Round Three, offshore windfarm development area. Furthermore, first results from the geo-locator data suggest that the Flamborough/Bempton birds may behave similarly to those from the Isle of May, Scotland (Bogdanova 2011) where failed breeders left the colony early and undertook a 3000km round trip, wintering on the Grand Banks, off the coast of Newfoundland, Canada. In contrast successful breeders undertook much shorter journeys, up to 1000km, wintering in the East Atlantic.

Initial site visits by RSPB seabird researchers suggest that sections of the Kittiwake colony are accessible from below the cliffs and lend themselves to catching and tagging the birds in safety. The results would show whether birds from Filey are utilising the same foraging and wintering grounds as those at Bempton and behaving as part of the Flamborough/Bempton super-colony, or as a colony in its own right. This data will, in turn, inform the location of potential off-shore marine SPAs and Marine Conservation Zones.

6.5 Proposed designations

The colony site currently supports more than 1% of the UK Kittiwake population and therefore meets the threshold for Site of Special Scientific Interest (SSSI) designation. Whilst the breeding seabird assemblage exceeds the SPA qualifying level of 20,000 birds.

7.0 Recommendations

7.1 Whole colony count

It is recommended that a programme of annual whole colony counts, using the SMP plots, should be carried out in 2012 and 2013 thereby providing a five year continuous database. This data can then be used to inform potential designations and provide population criteria for establishing favourable condition.

7.2 Seabird 2015

It is recommended that a further sea-based whole colony count be carried out in 2015 as part of the UK and Ireland wide seabird colony count. After which, whole colony counts should be carried out every five years to provide tie in with Flamborough Head and Bempton Cliffs SPA whole colony counts.

7.3 Productivity monitoring

It is recommended that a detailed analysis of the proposed productivity monitoring plots (Appendix 1) is carried out in 2012 to determine whether an adequate sample size is available for each of the target species.

If the threshold sample size can be met it is recommended that productivity monitoring is carried out using common standards productivity monitoring (Seabird Monitoring Handbook for Britain and Ireland 1995). This will allow comparisons with the results of the annual productivity monitoring carried out as part of the ongoing Flamborough Head and Bempton Cliffs SPA Seabird Monitoring programme.

7.4 Identifying Foraging, Migratory Routes and Wintering Areas

It is recommended that a pilot project is carried out to determine the feasibility of tagging a sample of thirty individual Kittiwake. The feasibility should be carried out in 2012 and if successful both geo-locators, to determine winter feeding areas, and GPS tags, to identify foraging areas during the breeding season, should be applied in 2013.

7.5 Managing the Filey – Cayton Bay Seabird Monitoring programme

It is recommended that the above seabird monitoring programme be headed up by the RSPB Bempton Cliffs seabird monitoring team; lead by David Aitken, Assistant Warden, with a team of RSPB seabird research scientists and volunteer seabird researchers. Links with Filey Brigg Ornithological Group (FBOG) should be explored as a possible volunteer resource for the monitoring work, as well as the opportunity of involving existing volunteer researchers and potentially the recruitment of new volunteers from the local area.

7.6 Designations

It is recommended that the site be designated a Site of Special Scientific Interest (SSSI) for its breeding seabird assemblage and the Kittiwake population. Furthermore it is recommended that the site be incorporated into an extension of the Flamborough Head and Bempton Cliffs SPA on the grounds that the breeding seabird assemblage exceeds the qualifying level of 20,000 birds.

8.0 References

Bogdanova, M.I., et al (2011) Seasonal interactions in the Black-legged Kittiwake, Rissa tridactyla: links between breeding performance and winter distribution Proc. Royal Soc. B

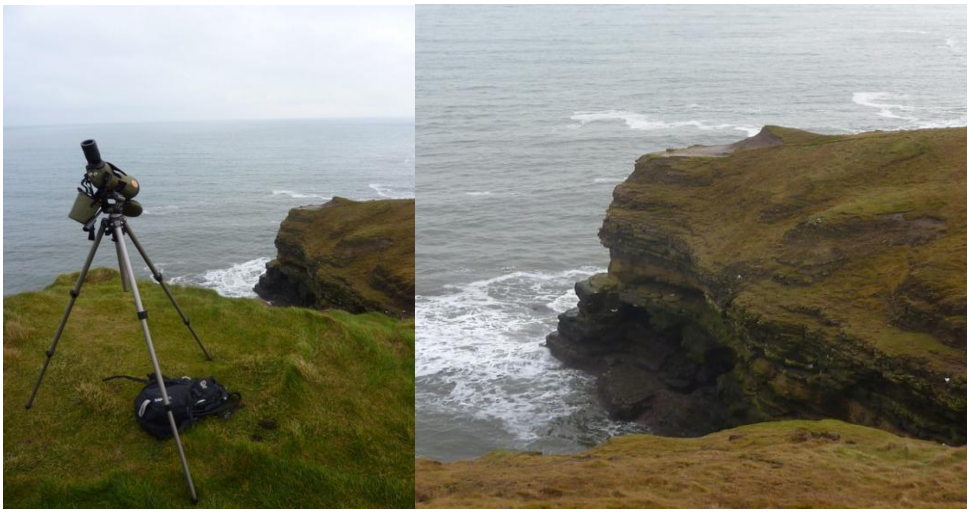
Mitchell, P.I, Newton, S.N., Ratcliffe, N., and T.D. Dunn (2004) Seabird Populations of Britain and Ireland, T&A.D. Poyser, London

Walsh, P.M., Halley, D.J., Harris, M.J., del Nevo, A., Sim, I.M.W., and M.L. Tasker (1995) Seabird Monitoring Handbook for Britain Handbook, JNCC / RSPB / ITE / Seabird Group, Peterborough, ISBN 1 873701 73 X

Appendix 1

Plot 1 Productivity Monitoring Site

Plot 2 Productivity Monitoring Site



Plot 3 Productivity Monitoring Site

Plot 4 Productivity Monitoring Site


Plot 5 Productivity Monitoring Site


Plot 6 Productivity Monitoring Site


Plot 7 Productivity Monitoring Site


Plot 8 Productivity Monitoring Site


Plot 9 Productivity Monitoring Site

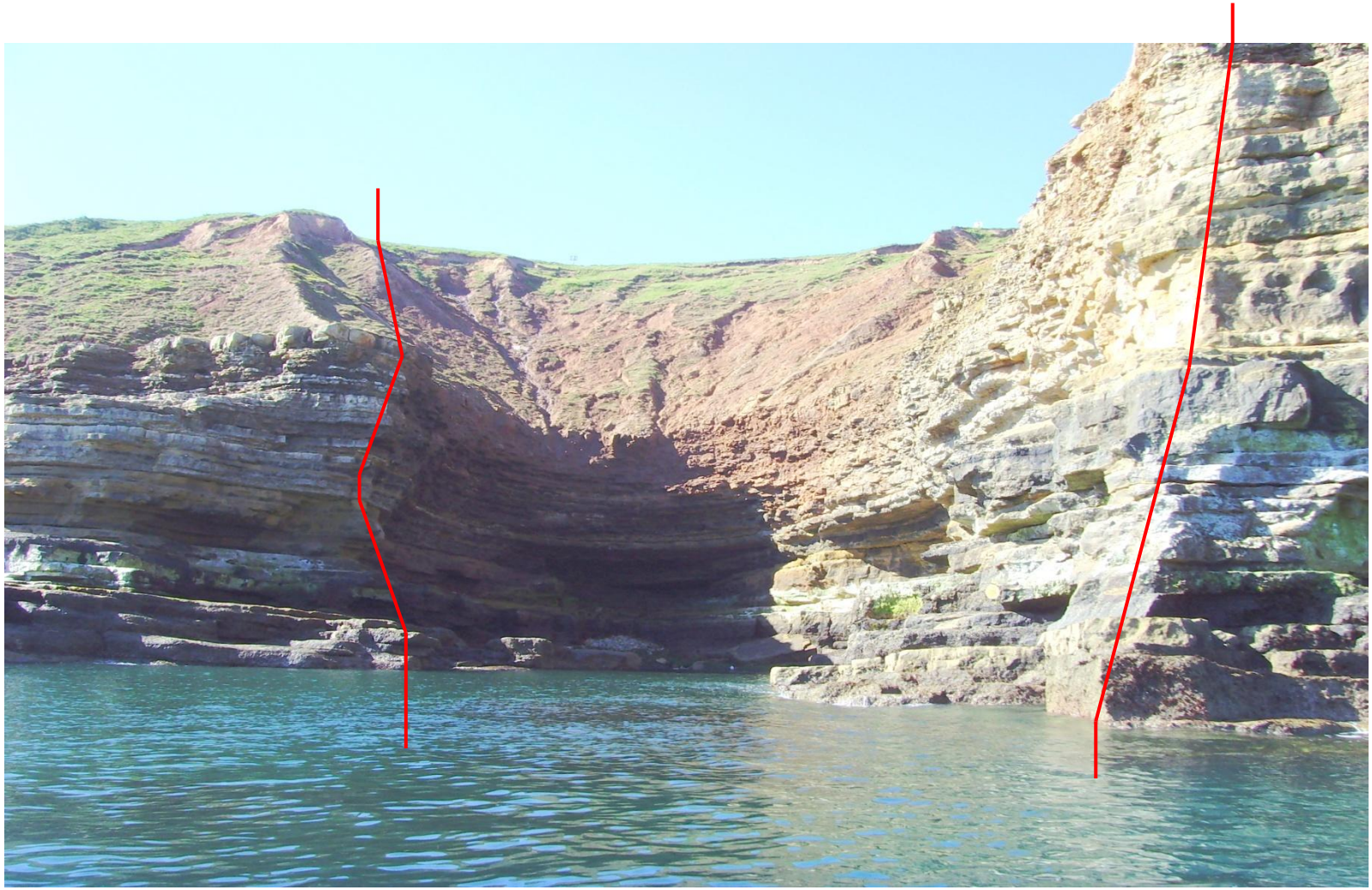

Plot 10 Productivity Monitoring Site

Appendix 2

SMP Location: Filey 3 - Plot 1

SMP Location: Filey 3 - Plot 2

SMP Location: Filey 3 - Plot 3



SMP Location: Filey 3 - Plot 4

SPM Location: Filey 3 - Plot 5

SPM Location: Filey 3 - Plot 6

SMP Location: Filey 3 - Plot 7

SMP Location: Filey 3 - Plot 8

SMP Location: Filey 3 - Plot 9

SMP Location: Filey 3 - Plot 10

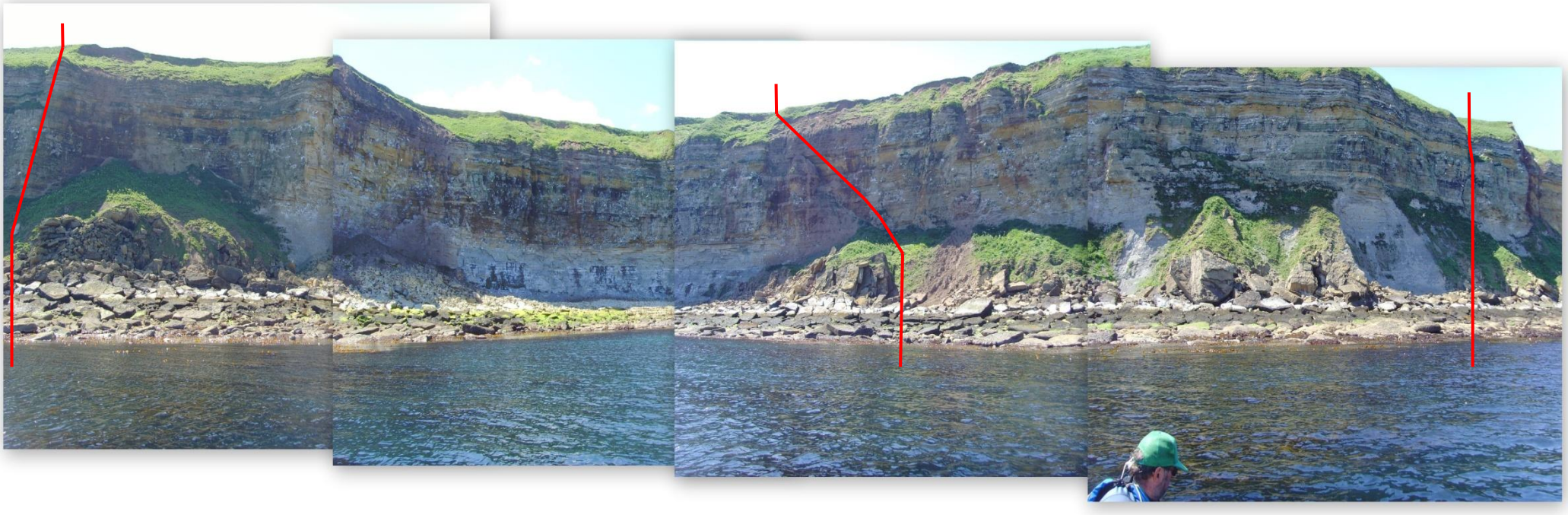
SMP Location: Filey 3 - Plot 11

SMP Location: Filey 3 - Plot 12

SMP Location: Filey 2 - Plot 1

SMP Location: Filey 2 - Plot 2

Plot 3 **Plot 4**



SMP Location: Filey 2 - Plot 3 & 4

Appendix 3

Seabird Monitoring Handbook for Britain and Ireland 1995

General techniques for counting cliff colonies

Whole-colony counts

Some of the advice given in sub-section on *Plot counts* below is also relevant here. See also the section on *Counts from the sea, from the air or from photographs*.

Make sure that colony boundaries used for counts are the same as in previous counts, or can be directly related to previous boundaries. This information may be available in Seabird Colony Register files, and in reports on previous counts at a colony. Always refer to available documentation of previous counts at a colony, especially if you have not counted it previously.

Before attempting a count, it is essential to gain some familiarity with the colony. Visit the colony with someone who has counted it previously and can provide advice. This will help in identifying count positions, or difficult sections to count, and in estimating the time required for the count. It will also help improve accuracy of counts, and reduce the time required. The latter can be important, as optimum count-dates for most species span only a two- to four-week interval, poor weather may prevent fieldwork on some days; and other colonies may need to be counted in the same period.

Make use of all suitable, safe, potential vantage points. Document their positions if possible, for example by marking them on 1: 10,000 Ordnance Survey maps of the relevant coastline, and by photographing (or, less accurately, sketching) cliff-faces as viewed from the vantage points.

Photographs of count positions with an observer *in situ* are also useful. Deposit copies of maps/photos with relevant organisations / offices.

The accuracy with which a colony is will depend on any physical difficulties involved, and on the time allocated. Where time is limited, it may be necessary to prioritise colonies or species to be counted, to optimise the usefulness of the data collected. Arriving at a balance of priorities for whole-colony counts can be difficult, but is worth attempting when planning (or reviewing) fieldwork activities. For example, the optimum approach may be to concentrate on obtaining accurate, regular counts of fewer colonies or species, and to survey a wider spread of colonies or species less frequently.

Quantifying the degree of inaccuracy involved in a whole-colony count is usually difficult, even where all seabirds can be safely viewed from land. Replicate counts of the colony or parts of the colony can provide useful supporting information. This can be important, particularly if a whole-colony (or section) count differs markedly from previous counts. If several observers take part in a count, it is particularly useful for them to cross-check some of their counts.

Plot counts

Before counting seabirds in study plots, it is important to be completely familiar with the precise boundaries of the plots or, at least, to be able to make accurate use of the photographs on which plot boundaries are delineated. This will help ensure that you don't make simple mistakes when identifying the parts of cliff to be included. If possible, someone who has previous experience of the plots (preferably someone who has counted them in previous years) should guide you through them, clarifying any uncertainties about boundaries (e.g. 'is this nest in or out?'). If you need to, add further annotations to the boundary photograph as a reminder (with your initials and date, in case you make a mistake which might mislead other observers).

Even when you are familiar with the precise boundaries of each plot, it is easy to make mistakes once you are actually counting a plot, especially when focusing on small parts of the plot at a time if using a telescope. You may start scanning the correctly defined corner or edge of a plot only to find that you have overshot the far boundary (or not reached it). Practice-counts of each plot before the main counting period begins are *essential,* and will help you identify the best pattern or direction of scans for counting a particular plot. For example, some plots may have obvious ledges or other horizontal cliff features that allow scanning back and forth while gradually moving up or down through the plot. Other plots might require counts of several discrete sub-sections, with further checks for more scattered birds or nests in between.

Birds or nests in study-plots should be counted as accurately as possible, as the use of sample plot counts is intended to increase the precision with which population changes can be detected. Plot counts should never be hurried (although greater speed will come with practice and experience, including familiarity with the plots). Do *not* simply estimate numbers or attempt to count rapidly in groups of five or ten birds or nests (although this may be acceptable for a whole-colony count if time is limited). If you find it difficult to count a particular plot (especially of guillemots), for example if birds are so dense that you lose track, attempt several counts, and report the individual counts and their average. Occasionally, even this may prove impossible, and if you need to resort to a rougher estimate, such as one based on tens of birds, or if you are totally confused, please note this when reporting your data. In some cases, it may be that a plot is no longer (or was never) suitable for accurate counting, and its use may need to be discontinued.

Many study-plots can be counted using binoculars only (10x magnification is recommended, and no higher unless a supporting tripod is used). One advantage of being able to use binoculars is that the wide field of view makes it less easy to become 'lost' while scanning through a large plot. If you have any difficult in picking out individual birds or nests clearly when using binoculars, for example if a plot is too distant or a ledge is too crowded, you should use a telescope, firmly mounted on a tripod, instead. The most suitable magnifications are 25x-30x (a wide-angle lens is best, for improved field of view); at higher magnifications, there is usually a significant loss of clarity and of light-gathering power. Some species in a plot (e.g. densely-crowded guillemots, or razorbills part-hidden in small crevices) may need to be counted using a telescope whereas others (e.g. fulmars) may be more easily counted using binoculars. Even within the same plot, some dense ledges may need the use of a telescope.

If you are counting individual birds (e.g. guillemots) in a study-plot, birds arriving or departing during the count may cause confusion. In such cases, ignore any birds which land behind or which take off ahead of the immediate position you have reached in your count, i.e. only count birds present at the 'correct' position as you scan from bird to bird.

Where population monitoring of a particular species (especially guillemot, razorbill, and fulmar) is based on replicated counts of sample plots within a cliff colony, it is important that all study-plots are counted on each date. If this is not done, it becomes much more difficult to combine the plot data for statistical assessments of change. Year-to-year population changes in individual plots can be assessed regardless of whether or not the same numbers of counts are available for each plot, but trends shown by individual plots are likely to be of little importance. It is the assessment of change in all plots combined that is crucial.

Counts from the sea, from the air, or from photographs

The use of photographic methods to count seabirds has been tested for a number of species but, in most cases, accuracy has been found to be low (e.g. Harris & Lloyd 1977). However, photographic counts of large species nesting on discrete sites have proved effective; it is the standard method for many gannet colonies (Wanless 1986), and has proved effective for counting breeding cormorants at some colonies (Reynolds & Booth 1987). Photographs are also an invaluable permanent record of the boundaries and/or density of seabird colonies in a particular year.

Counts from the sea are often needed, especially where the terrain is such that most of the birds are not visible from the cliff-top. It is important, when combining land- and boat-based counts, to record counts accurately onto large-scale maps, to avoid duplication and to highlight hidden sections.

If boat-based counts are not possible, but sections of a colony are thought to be hidden, please note this. If possible, attempt estimates from the cliff-top, based on apparent amount of 'dead ground', numbers on visible sections, or on experience of previous boat-based counts. Express such estimates as a range of figures. However, in reporting these estimates be very clear that their reliability is unknown and that they may not be directly comparable with other counts. Such estimates may also be made before attempting boat counts, as some degree of check on both methods.

Accurate counts from a boat are difficult. Calm weather, ideally flat calm, is needed. Views from too close in or at oblique angles to the breeding ledges on a cliff can produce serious under-counts. Nests may be difficult to see clearly (or their state of construction may not be obvious, which is important in some counting methods). In general, sea counts magnify the problems associated with counting, for example, densely-packed guillemot ledges or seabirds breeding over large areas of apparently featureless cliff. However, boat counts are useful for checking caves, covering lengths of sparsely populated coast (e.g. for black guillemots, shags, and, in some regions, kittiwakes), and checking rapidly for new colonies.