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Canna seabird studies 2010

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Summary

- 1.1 Three summer visits were made to Canna during 2010 to count and ring seabirds, monitor their breeding success and collect food samples.
- 1.2 Following several years of late breeding seasons the timing of the 2010 breeding season for all species was more typical of that seen in the 1980-2000 period and around two weeks earlier than the 2009 season.
- 1.3 Counts showed that the breeding populations of many seabird species on Canna remain at low levels, in comparison to the peak counts of the 1980s. Northern fulmar, great black-backed gull, lesser black-backed gull and herring gull showed small increases from historically low levels. Black-legged kittiwake numbers remained stable. European shags, common guillemots and razorbills declined in numbers (though early fledging may have led to underestimates in counts). For the former two species, this is part of a long term continuing decline. Mew gull and great skua numbers remained high at historically high levels.
- 1.4 There was a continued improvement in breeding success for most monitored species and several had above average breeding success. Great black-backed gulls recorded their highest productivity since monitoring began in 1997 and herring gull their second best since 1977. Northern fulmar, European shag and black-legged kittiwake all had productivity higher than that recorded in the poor years of 2005-08. Observations suggested that common guillemots also had good breeding success and guillemot chicks were significantly heavier than the 2005-08 cohorts.
- 1.5 A total of 201 fully grown seabirds and 865 seabird chicks were ringed with BTO metal rings and 358 fully grown birds were retrapped in breeding colonies.
- 1.6 Retrapping of adult common guillemots resulted in 57 birds ringed as chicks being located back in colonies for the first time. Nine razorbills and eight European shags that had been ringed as chicks were retrapped in colonies for the first time. It was noticeable that fewer 'young' auks are now being retrapped as breeders in the colonies.
- 1.7 Only 10 fish being carried adult common guillemots were collected and identified. The sample was dominated by sandeels (80%). The diet of European shags was mostly dominated by 1+ group sandeels, whilst both black-legged kittiwakes samples contained gadidae.

Contents

1	Introduction and objectives	1
2	Methods	2
2.1	General.....	2
2.2	Counts.....	2
	Manx shearwaters.....	2
	Common guillemot and razorbill.....	2
	Black guillemot.....	2
	Other seabirds.....	2
2.3	Monitoring breeding success.....	3
	Northern fulmar.....	3
	European shag.....	3
	Herring gull.....	3
	Great black-backed gull.....	3
	Black-legged kittiwake.....	3
3	Count results	4
	Northern fulmar.....	5
	Manx shearwater.....	5
	European shag.....	5
	Great skua.....	6
	Mew gull.....	6
	Lesser black-backed gull.....	6
	Herring gull.....	7
	Great black-backed gull.....	7
	Black-legged kittiwake.....	8
	Common tern.....	8
	Common guillemot.....	9
	Razorbill.....	10
	Black guillemot.....	10
	Atlantic puffin.....	10
4	Timing of breeding results	11
5	Breeding success results	12
	Northern fulmar.....	12
	Manx shearwater.....	12
	European shag.....	13
	Great skua.....	13
	Herring gull.....	13
	Great black-backed gull.....	13
	Black-legged kittiwake.....	14
	Common tern.....	14
	Common guillemot.....	14
6	Ringling studies	15
6.1	Ringling totals.....	15

7	Return and survival rates results	16
	Common guillemot.....	16
	Razorbill.....	16
	European shag	16
8	Feeding studies	17
	Common guillemot.....	17
	European shag	18
	Black-legged Kittiwake.....	18
9	References	19
10	Appendices	20
	Appendix 1. Common guillemot chick weights	20
	Appendix 2. Diet samples	21

List of tables

Table 1. Counts of breeding seabirds on Isle of Canna 2002-2010.	4
Table 2. Breeding success of selected seabirds on Canna 2001-2010.	12
Table 3. Northern fulmar breeding success on Canna in 2010.	12
Table 4. European shag fledging success on Canna in 2010.	13
Table 5. Herring Gull productivity on Canna in 2010.	13
Table 6. Number of occupied black-legged kittiwake nests and number of large young per nest in study plots in 2010.	14
Table 7. Weights of guillemot chicks (g.) with wing-length >60mm.	14
Table 8. Number of birds ringed and adults retrapped on Canna in 2010.	15
Table 9. Recovery rates and return rates of common guillemot chicks ringed on Canna.	16
Table 10. Number of otoliths and other contents of regurgitations from young European shags and shag pellets.	18

List of figures

Figure 1. Number of apparently occupied Northern fulmar sites on Canna 1973-2010.	5
Figure 2. Number of apparently occupied European shag nests on Canna 1974-2010.	5
Figure 3. Number of apparently occupied Lesser Black-backed Gull territories on Canna 1971-2010.	6
Figure 4. Number of apparently occupied herring gull territories on Canna 1971-2010.	7
Figure 5. Number of apparently occupied great black-backed gull territories on Canna 1969 - 2010.	7
Figure 6. Number of apparently occupied black-legged kittiwake nests on Canna 1971-2010. ...	8
Figure 7. Number of common guillemot 'nests' in all study plots on Canna 1974-2010.	9
Figure 8. Number of razorbill 'nests' at Geugasgor and at all other sites on the island 1974-2010.	10
Figure 9. Proportion of fish species taken by common guillemots on Canna 1982-2010.	17

1 Introduction and objectives

The Joint Nature Conservation Committee (JNCC) has a responsibility to advise on the condition of the natural marine environment. Seabirds are an important component of this environment and Britain has internationally important populations of several species. The JNCC's Seabird Monitoring Programme has been designed to assess population changes and breeding success of selected species of seabird at a range of colonies. In addition, selected 'key site' colonies have been targeted for more detailed monitoring of breeding performance, annual survival rates and feeding ecology. These sites are geographically spread in order to give as full coverage as possible of British waters. Canna is a very suitable site off north-west Britain, situated in the Sea of the Hebrides.

This report covers seabird monitoring work on Canna during 2010, the 42nd year of the Highland Ringing Group's long-term seabird studies on the island. Since 1986, the Group has received funding support from JNCC (formerly NCC) for its seabird monitoring work on Canna.

During the period covered by this report the main aims were as follows:

- to continue seabird counts on the island;
- to monitor the breeding success of selected seabird species (Northern fulmar *Fulmaris glacialis*, European shag *Phalacrocorax aristotelis*, herring gull *Larus argentatus*, great black-backed gull *Larus marinus* and black-legged kittiwake *Rissa tridactyla*);
- to continue the ringing programme in order to establish dispersal patterns from the island, survival rates and causes of mortality, and ages of return to the island and of first breeding;
- to collect biometric data (wing length and weight) from young common guillemots *Uria aalge*; and
- to collect, identify and measure diet samples from auks, black-legged kittiwakes, other gulls *Larus* spp. and European shags.

2 Methods

2.1 General

Three visits were made to Canna during 2010 to cover the seabird breeding season: 25-28 May, 2-10 July, 29 July - 6 August.

Visits to Canna are designed to conduct monitoring work at the optimum time and to give a degree of continuity from year to year. As there has been a trend in recent years for seabirds to start breeding later we have been visiting a week later than we did in the 1980s and 90s. In 2010 we got caught out as many species had reverted to their 'normal' breeding pattern so that by the time of our early July visit many young shags and auks had fledged prior to our arrival on the island. This had an impact on some of our counts and breeding productivity plots. The location of the study sites named in the text is shown in Figure 1.

2.2 Counts

Manx shearwaters

During late May, using tape playback methods (Walsh *et al.* 1995) three observers checked the known traditional Manx shearwater *Puffinus puffinus* breeding areas along the Tarbert Road and between the Nunnery and Garrisdale Point.

Common guillemot and razorbill

Counts were made of the number of occupied sites in accessible colonies at Geugasgor. Occupied common guillemot sites were recognised by the presence of an egg or chick. Occupied razorbill sites were recognised by an egg or eggshell, chick or dense mass of droppings in a crack or under a boulder.

Black guillemot

Black guillemots *Cephus grylle* were counted on various sections of the island on different days during the second visit. Counts were made in the late afternoon or evening. All birds seen on land or adjacent areas of sea were counted. This method is known to underestimate the true number of birds present.

Other seabirds

Whole island counts were conducted between 2 and 9 July. All counts were made from land with the exception of fulmars at Tialasgor and Geugasgor and kittiwakes at Geugasgor, which were made by boat. The units used differ from species to species and are indicated in the results section.

2.3 Monitoring breeding success

Northern fulmar

At the Sanday study plots the position of apparently occupied sites (AOS) were marked on a photograph in late May and the number of large chicks at these sites noted in early August. At Buidhe Sgor, the number of birds that had laid was noted in late May and the number of large chicks produced from these eggs was recorded in early August.

European shag

Due to the decline in numbers of this species on Canna most of our original study nests are now abandoned. We have adapted our methodology in order to continue monitoring breeding success of European shag. At Tallabric and Dun Mor area of Sanday and Rubha Langanais, where birds have shifted to nesting on narrow ledges on the present sea cliff, the position of all nests was mapped on a sketch map in late May. All nests were checked a second time, in early July, to record nest contents including the number and ages of young that had hatched. In early August the nests were again checked so that the number of young actually fledging could be calculated.

Herring gull

Due to the decline in herring gull numbers we have had to adapt our methodology to calculate breeding success. Swann 2004 gives details of the original methodology. Since 2007 a sample of nesting pairs were plotted on a map in late May. The sites were revisited in early and late July/early August to count the number of large young present.

Great black-backed gull

A sample of accessible pairs were plotted on a map in late May. The sites were revisited in early and late July/early August to count the number of large young present.

Black-legged kittiwake

In late May, apparently occupied nests (AON) at the study plots were marked on photographs. These were checked again in early July and late July/early August to see how many had eggs or chicks. The size and number of chicks was also noted.

3 Count results

A summary of the 2010 counts for each species and comparisons with past years are shown in Table 1. Further long-term analyses are detailed in Swann (2000).

Table 1. Counts of breeding seabirds on Isle of Canna 2002-2010.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	Peak (year)
Norther fulmar ¹	406	434	436	439	349	346	223	324	327	669 (1977)
European shag ²	638	603	495	327	349	361	375	324	305	1,753 (1984)
Great Skua ⁴	2	2	2	3	3	5	6	6	6	(2008)
Mew gull ⁴	8	5	6	9	7	13	13	21	20	21 (2009)
LBB gull ⁴	42	31	13	4	7	9	6	9	11	69 (1975)
Herring gull ⁴	862	587	372	112	96	74	70	66	70	1,525 (1988)
GBB gull ⁴	68	60	44	29	20	24	25	17	18	93 (1997)
Black-legged kittiwake ²	1,264	1,290	1,340	968	905	1,018	739	960	960	1,340 (2004)
Common tern ³	0	3	1	3	3	2	2	0	0	18 (1992)
Common guillemot ⁵	-	(881)	906	(79)	697	587	337	459	(291)	1,249 (2001)
Razorbill ⁵	-	-	169	(27)	273	288	170	288	209	520 (1985)
Black guillemot ⁶	35	36	44	47	49	68	68	63	78	137 (1986)

Notes: Units used are as follows:

1. Apparently occupied site for norther fulmar
2. Apparently occupied nests for European shag and black-legged kittiwake
3. Nest with egg or chick for common tern or herring gull (nest)
4. Apparently occupied territory for gulls and skuas
5. Egg or chick in study plot for common guillemot and razorbill
6. Individual bird for black guillemot

Counts in brackets are known to be underestimates.

Northern fulmar

A total of 327 apparently occupied sites were counted, close to the 2009 count (Figure 1), but still well below the numbers counted up to 2005.

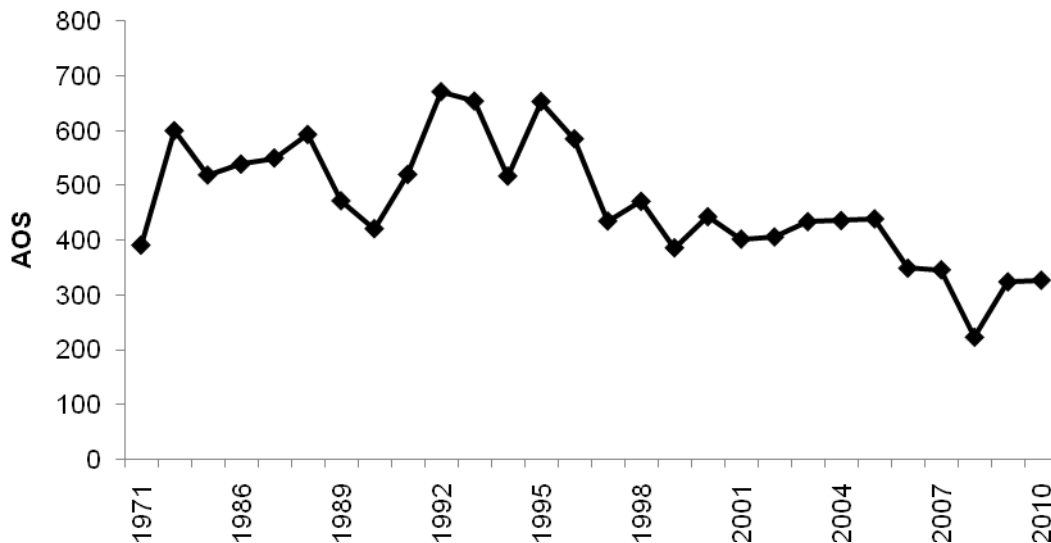


Figure 1. Number of apparently occupied Northern fulmar sites on Canna 1973-2010.

Manx shearwater

At the former Tarbert Road colony two birds responded to taped calls from over 400 burrows checked in late May. At the Nunnery 50 burrows were checked, with no responses. Between Bresgor and Garrisdale Point 50 burrows were checked with no responses.

European shag

Numbers remain very low with only 305 AONs counted (Figure 2). Many birds have started to nest early and it is possible that our July counts missed some early nesters that failed, but did not relay.

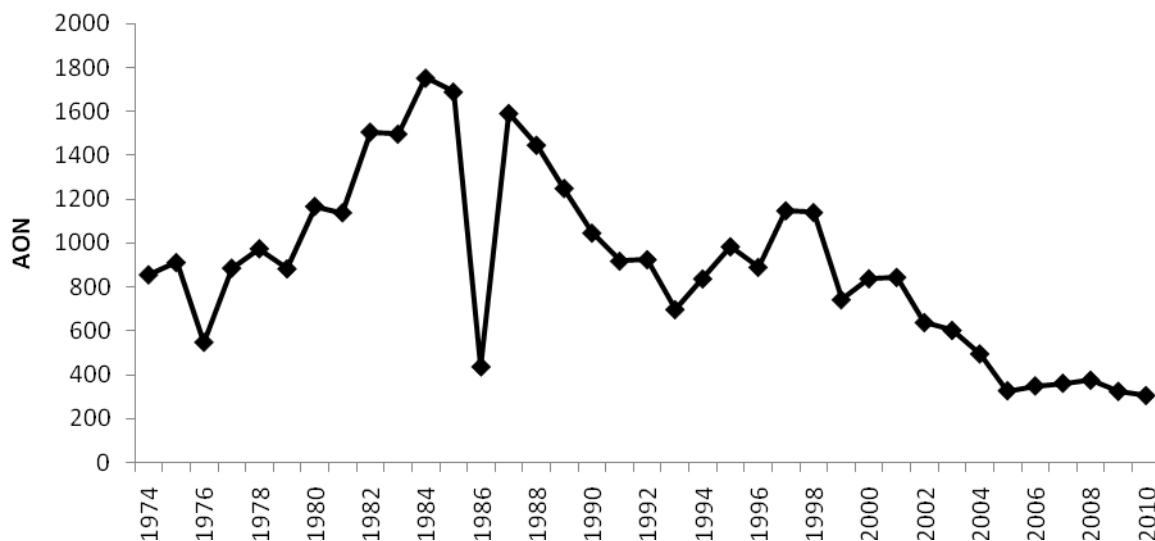


Figure 2. Number of apparently occupied European shag nests on Canna 1974-2010.

Great skua

Six pairs of great skua *Catharacta skua* were present on Sanday and five pairs laid eggs.

Mew gull

The number of mew gulls *Larus canus* remained high with 20 Apparently Occupied Territories (AOT) counted (Table 1).

Lesser black-backed gull

The number of lesser black-backed gulls *Larus fuscus* has declined dramatically since 2002 from about 40 AOTs to 4 in 2005. Numbers have since increased slightly with 11 AOTs in 2010 (Figure 3).

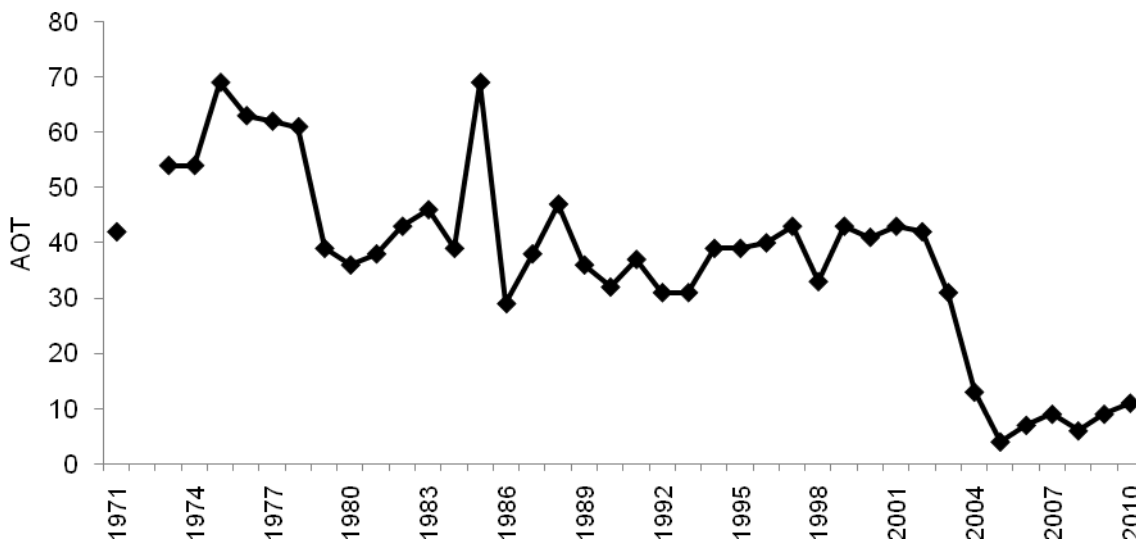


Figure 3. Number of apparently occupied Lesser Black-backed Gull territories on Canna 1971-2010.

Herring gull

There has been a notable decline in the number of AOTs on Canna since 2000. Numbers remain low with only 70 AOTs in 2010 (Figure 4). Most traditional herring gull colonies on the island have now been abandoned, in particular there are now none left on the western half of the island. Over the last few years many of the remaining gulls have switched to new nesting sites, particularly the scree slopes above the Tarbert road and cliff and moorland sites on Sanday and above Rubha Langanais. Only the small colonies at Rubha Langanais and Geugasgor occupy traditional sites.

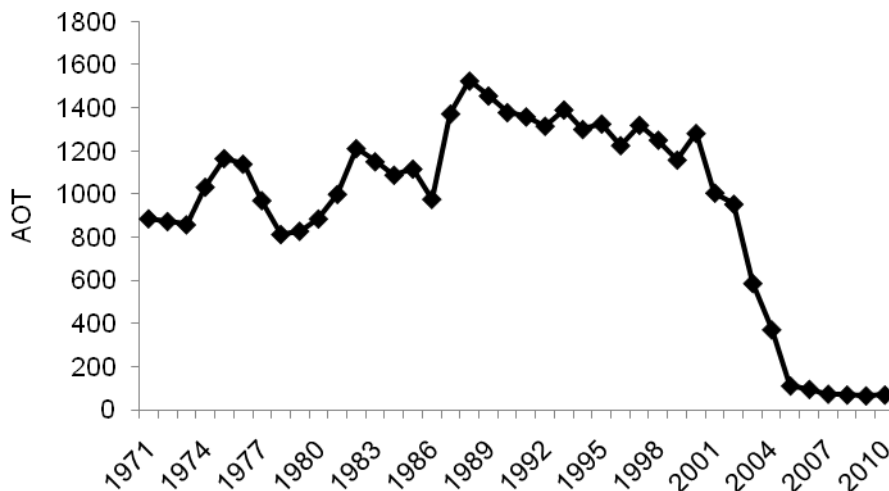


Figure 4. Number of apparently occupied herring gull territories on Canna 1971-2010.

Great black-backed gull

There has been a substantial decline in numbers on Canna since 2000. The count of only 18 AOTs in 2010 is the second lowest we have recorded (Figure 5).

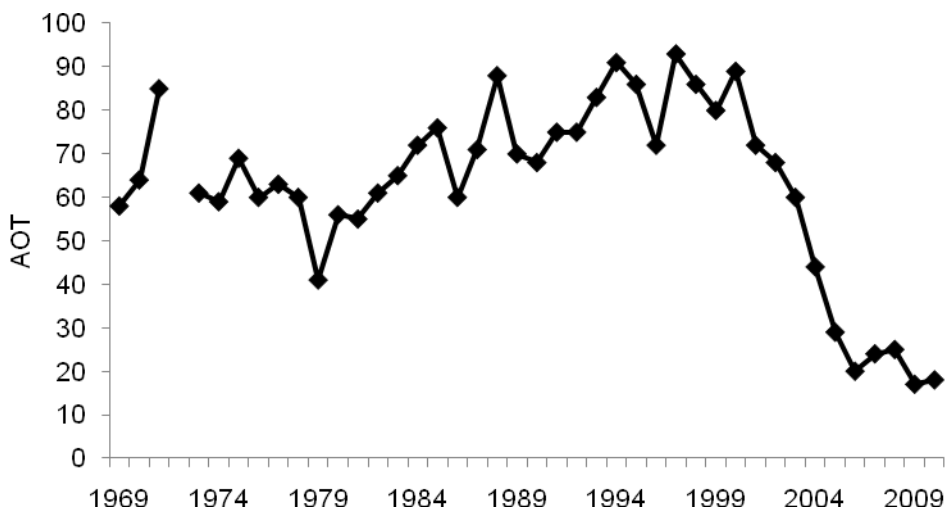


Figure 5. Number of apparently occupied great black-backed gull territories on Canna 1969 - 2010.

Black-legged kittiwake

Following the rise to the record count of 1,340 AONs in 2004, numbers decreased drastically in 2005. Since then numbers have fluctuated (Figure 6). In 2009 and 2010 numbers remained stable at 960 AONs.

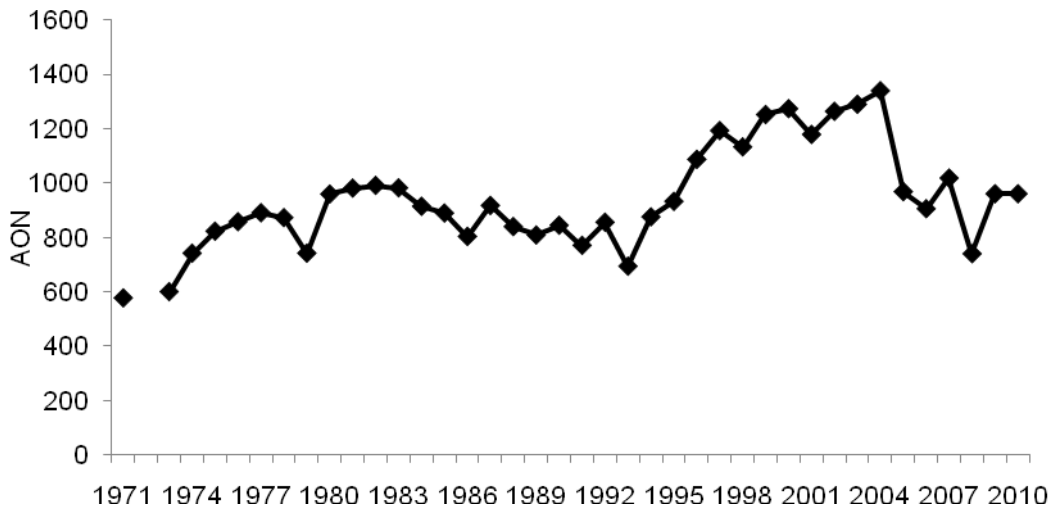


Figure 6. Number of apparently occupied black-legged kittiwake nests on Canna 1971-2010.

Common tern

No common terns *Sterna hirundo* nested in 2010.

Common guillemot

Common guillemot numbers peaked in 2001 when 1249 'nests' were counted in our studies areas. In 2005 there was a dramatic decline with only 79 'nests' counted. Numbers increased in 2006 to 697 'nests' and thereafter numbers declined to only 291 'nests' in 2010 (Figure 7). These figures underestimate the actual number of birds attempting to breed as many of the more open colonies are subject to severe egg predation from common ravens *Corvus corax* and gulls, and in some cases have been virtually abandoned by the time of our July visits. An additional complication in 2010 was that it was an early breeding season and an unknown number of chicks may have had already fledged prior to our visit.

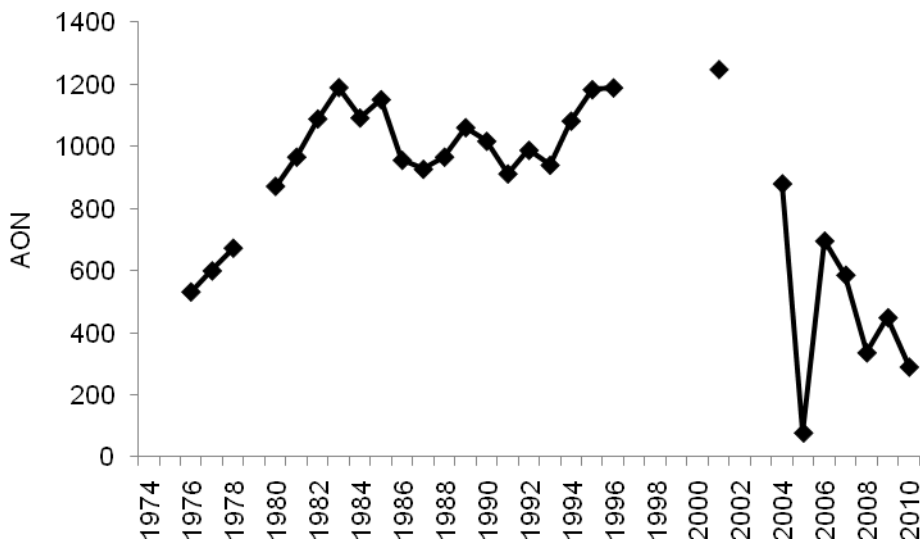


Figure 7. Number of common guillemot 'nests' in all study plots on Canna 1974-2010.

Razorbill

Razorbill numbers on Canna have undergone a long term decline since the early 1990s (Figure 8). In 2006 and 2007, numbers increased following the successful rat eradication campaign over winter 2005/06, with numbers back up to 2001 levels at Geugasgor (Bell et al 2006). In 2008 this was reversed with only 170 'nests' being counted in our study plots (probably as a result of high levels of non-breeding). In 2009 numbers increased to 288 'nests', the highest since the eradication project. In 2010, however, it dropped back down to 209 'nests'.

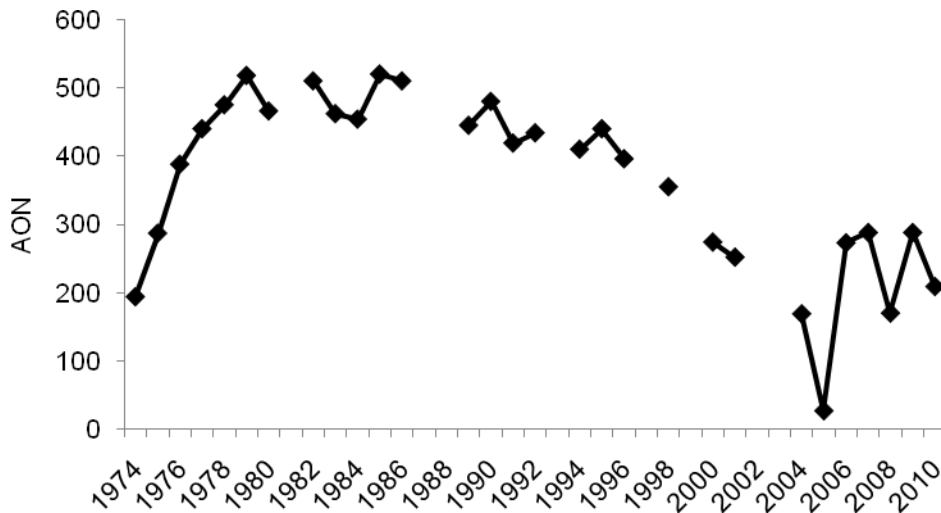


Figure 8. Number of razorbill 'nests' at Geugasgor and at all other sites on the island 1974-2010.

Note gaps in data correspond with years when large number of chicks had fledged prior to our arrival on the island.

Black guillemot

Numbers increased to 78 individual adult birds counted in 2010 (Table 1). As noted under Methods this under-estimates the true number present.

Atlantic puffin

This species tends to nest on off shore stacks or inaccessible grassy slopes on steep cliffs and is therefore difficult to monitor on Canna. There has, however, been a notable apparent increase in numbers at Geugasgor, following the rat eradication in winter 2005/06 (Bell et al 2006). New burrows are appearing at several locations on the Geugasgor slopes.

4 Timing of breeding results

Weather data for the Canna area was extracted from Meteorological office anomaly maps (<http://www.metoffice.gov.uk/climate/uk/anomacts/#>) comparing 2010 data to the 1970-2000 mean. This showed that January and February were 2°C colder than average, with well below average rainfall (33-50% of average). March was just as dry, but with average temperatures. April had average rainfall but was 1°C warmer than average. May and June were again very dry, 33-50% of average and although May had average temperatures, June was 1°C warmer than average. July had average temperatures but slightly above average rainfall (125-150%).

Unlike much of the latter 2000s when late breeding was the norm, 2010 reverted back to more typical laying dates. In early July European shag and common guillemot had large chicks with only a small number still on eggs. There was evidence that many chicks of these two species had fledged prior to our visit. Gull chicks were also large and close to fledging by the early July visit. Black-legged Kittiwake nests mostly contained half grown young. Razorbills, traditionally an early nesting species and often laying up to two weeks before common guillemots on Canna, were unusual in that in our sample plots 69% were still on eggs in early July and most chicks were less than half grown.

5 Breeding success results

A summary of the 2010 results for each species and comparisons with past years are shown in Table 2. Further long-term analyses are given in Swann (2000).

Table 2. Breeding success of selected seabirds on Canna 2001-2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Northern fulmar	0.48	0.45	0.46	0.56	0.28	0.47	0.27	0.23	0.36	0.42
European shag ^a	0.10	0.26	0.16	0.01	0.7*	1.2*	1.4*	1.5*	1.8*	
European shag ^b				1.4	0.7	0.7	1.0	0.3	0.7	1.5
Herring Gull		0.07	0.05	0.16	0.13	0.24	1.8	0.5	0.7	1.8
Great b-b gull	0.3	0.1	0.3	0.3	0.1	0.2	0.8	0.5	0.9	1.6
Blk-legged Kittiwake	0.8	0.6	1.0	0.8	0	0.45	0.3	0	1.1	0.8

Notes:

1. For northern fulmar and black-legged kittiwake, figures are overall breeding success across all plots, not means of individual plot figures.
2. Figures are large young per apparently occupied site or egg for northern fulmars, chicks fledged per nest in which eggs were laid for European shags, large chicks per occupied territory for great black-backed gulls and since 2006 for herring gull and chicks fledged per apparently occupied nest for black-legged kittiwakes.
3. For herring gull figure gives an all-island estimate of chicks per nest, based on various sub-colonies, up to 2006.
4. For European shag ^a refers to number of young fledged per marked nest in the boulder colonies, whilst ^b refers to number of young fledged per marked nest on sub-colonies on cliff ledges. * From 2005 onwards the boulder colonies surveyed were Lamasgor and/or Geugasgor, prior to that it was Garrisdale and the Nunnery.

Northern fulmar

Table 3 shows the breeding success from three study plots. This gives an overall success rate across all sites combined of 0.42 chicks per apparently occupied site, with big variations between study plots. It also represents a continued improvement in productivity from the low recorded in 2008.

Table 3. Northern fulmar breeding success on Canna in 2010.

<i>Study site</i>	<i>No. sites</i>	<i>No. young</i>	<i>Young per site</i>
Sanday A	24	4	0.17
Sanday B (Dun Mor)	17	6	0.35
Buidhe Sgor	35	22	0.62
Total	76	32	0.42

Manx shearwater

Two occupied burrows that both contained an egg in late May both subsequently produced a large chick.

European shag

As stated in the methods section we have adapted our methods of monitoring European shag breeding performance. Early fledging in 2010 meant we had incomplete data from Lamasgor, Garrisdale and Nunnery, so these colonies are omitted from Table 4.

Table 4. European shag fledging success on Canna in 2010.

<i>Young fledged per nest laid in</i>	<i>Rubha Langanais*</i>	<i>Tallabric Sanday*</i>	<i>Dun Mor area, Sanday*</i>
<i>No. nests</i>	7	17	12
0	4	6	1
1	0	1	2
2	1	8	7
3	1	2	2
4	1		
Av young/AON	1.3	1.4	1.8

* = nests located on narrow cliff ledges.

Overall breeding success was high with 1.5 young per AON. This was the highest recorded on cliff sites since 2004.

Great skua

Of the five pairs that nested one pair reared two chicks, two pairs a single chick and two pairs failed. Another pair was present but did not nest.

Herring gull

In total 17 pairs of Herring Gull were monitored. The results are shown in Table 5.

Table 5. Herring Gull productivity on Canna in 2010.

	<i>Dun Mor, Sanday</i>	<i>Tarbert Road</i>	<i>Tallabric</i>
<i>Number of nests</i>	4	9	4
Failed	0	1	3
One young	0	1	0
Two young	1	5	0
Three young	3	2	1
Average young/pair	2.8	1.9	0.8

This gives an overall average productivity of 1.8 young per pair, similar to that recorded in 2007 and higher than the last two years.

Great black-backed gull

Fourteen pairs of great black-backed gull were monitored, four failed, two produced one young, four produced two young and four produced three young, giving an overall average productivity of 1.6 young per pair, the highest figure recorded since we began monitoring this species in 1997.

Black-legged kittiwake

The results obtained from the four Sanday study plots are detailed in Table 6.

Table 6. Number of occupied black-legged kittiwake nests and number of large young per nest in study plots in 2010.

	<i>Sanday, K1</i>	<i>Sanday, K2</i>	<i>Sanday, K3</i>	<i>Sanday, K4</i>
<i>No. nests</i>	38	37	29	28
Empty	8	14	19	17
1 young	17	12	8	7
2 young	13	11	2	4
av. young per nest	1.1	0.9	0.4	0.5

On Sanday 132 monitored nests produced 104 young giving an overall average breeding success of 0.8 young per AON, lower than the 2009 figure, but higher than the poor seasons of 2005-08. Productivity could have been much higher were it not for a week of severe south westerly gales in early July which washed out a lot of the lower nests in plots K3 and K4. Productivity appeared very high on the more sheltered colonies on the north side of the island. Unfortunately unfavourable tides delayed access to the Cave study plot in late July/ early August. It was evident that many chicks had fledged prior to the visit, making nest counts meaningless.

Common tern

No Common terns nested on Canna in 2010.

Common guillemot

Sixty four guillemot chicks were found with a wing length greater than 60mm, all were weighed (Appendix 1). The mean weight of 264.1g was not significantly different from the 2009 sample ($t=1.662$, $df=103$, $p>0.05$). They were significantly heavier than birds of similar size weighed in 2005-08 ($z=7.41$, $p<0.01$), which had a mean weight of 229.8g. They were, however, still significantly lighter than the pre 2005 birds, which had a median weight of 272g ($z= -2.06$, $p<0.05$).

Table 7. Weights of guillemot chicks (g.) with wing-length >60mm.

	1999	2000	2001	2002	2003	2004	2005	2007	2008	2009	2010
mean	275	274	250	258	274	270	238	239	213	255	264
n	60	60	56	54	50	50	30	17	25	25	77

The above accounts compare breeding output in 2010 with that recorded in the previous 2-4 years. Longer term trends in breeding output of the main study species on Canna are given in Table 7.

6 Ringing studies

6.1 Ringing totals

Table 8 shows the number of adults and chicks ringed during 2010 and the number of fully-grown birds that were re-trapped.

Table 8. Number of birds ringed and adults re-trapped on Canna in 2010.

	<i>Adults ringed</i>	<i>Chicks ringed</i>	<i>Full-grown re-trapped</i>
Northern fulmar	12	22	7
Manx shearwater	1	2	1
European shag	2	276	10
Great skua	0	4	0
Mew gull	0	7	0
LBB Gull	0	3	0
Herring gull	0	70	0
GBB gull	0	12	0
Black-legged kittiwake	18	79	9
Common tern	0	0	0
Common guillemot	94	310	286
Razorbill	64	72	45
Atlantic puffin	10	8	0
Total	201	865	358

7 Return and survival rates results

Common guillemot

Two hundred and eighty-six adult common guillemots were retrapped in 2010, of which 57 were birds that had been ringed as chicks on Canna and were retrapped on the island for the first time. These included: one 5-year old, one 6-year old, seven 7-year olds, four 8-year olds, seven 9-year olds and six 10-year olds. Swann (2000) showed a negative correlation between the recovery rate of pullus guillemots ringed on Canna and found dead in their first year of life and subsequent return rates of surviving birds to the colony.

Table 9. Recovery rates and return rates of common guillemot chicks ringed on Canna.

<i>Year</i>	<i>No. ringed</i>	<i>% recovered in 1st year</i>	<i>% back by 5th year</i>	<i>% back by 6th year</i>	<i>% back by 7th year</i>
1984	1,843	2.5	1.5	2.6	4.6
1985	2,224	3.6	0.6	1.3	2.1
1986	1,913	0.3	2.4	5.0	6.7
1987	1,080	2.4	0.7	1.2	2.6
1988	2,423	1.9	0.8	1.8	2.8
1989	2,392	2.8	0.6	1.0	1.4
1990	2,334	1.7	1.4	2.4	3.3
1991	2,299	0.3	2.0	3.1	6.0
1992	2,458	0.9	1.9	3.8	5.9
1993	1,947	0.7	1.8	3.7	7.0
1994	2,671	0.7	1.8	4.4	6.6
1995	2,843	1.4	1.3	2.5	3.9
1996	2,423	0.6	2.3	3.9	6.6
1997	819	1.0	1.0	2.3	3.9
1998	2,221	0.5	2.0	4.0	4.4
1999	2,157	1.3	1.5	2.4	4.0
2000	2,166	1.8	0.6	2.3	3.2
2001	2,217	0.5	1.1	2.3	2.4
2002	1,201	1.6	0.7	0.7	2.1
2003	1,911	0.5	0.4	2.0	2.4
2004	1,895	0.5	0.5	0.6	
2005	550	0.4	0.2		

Recent high post-fledging mortality will likely disrupt this pattern in the future as will the increased tendency to non-breeding by many adults. This latter effect may explain why there has been a decline in the return rate in recent years.

Razorbill

Nine razorbills that had been ringed as chicks were re-trapped on the island for the first time in 2010. These included an 8-year old, a 9-year old and 10-year old birds. The lack of younger birds is likely a reflection of recent levels of low productivity combined with poor post fledging chick survival.

European shag

In 2010 eight shags, which had been ringed as chicks, were retrapped on the island for the first time. All were breeders, being caught on nests, and composed one 4-year old, one 6-year old and six over 10 years old.

8 Feeding studies

Common guillemot

Ten fish were collected from adult common guillemots on their return to the colony from fishing trips, eight (80%) were sandeels *Ammodytes* spp with a single sprat and single unidentified gadid. Details of the fish sampled are given in Appendix 2.

The mean length of the sandeels was 154.6mm (sd 28.4) significantly larger than the 2009 average (142.7mm, sd 17.9, $z = 2.61$, $p < 0.01$).

Figure 9 shows that since 2002 there has been a significant decline in the percentage of sprats (*Sprattus sprattus*). Since 2005 common guillemot chick diet has been dominated by sandeels, with smaller numbers of gadids and very few sprats.

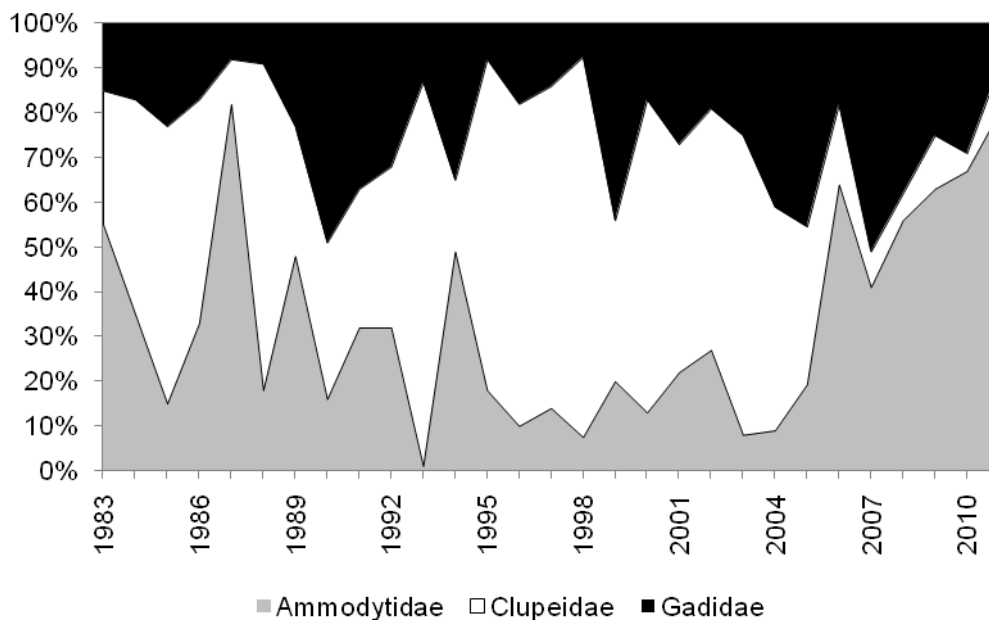


Figure 9. Proportion of fish species taken by common guillemots on Canna 1982-2010.

European shag

Nine regurgitations from young European shags, were collected on 5th July. The main prey species in these were 1+ age group sandeels (7 samples) and dragonet (5 samples). In addition, single samples contained otoliths of flatfish, wrasse, goby, a mollusc and an octopus beak (Table 10). Only three pellets regurgitated by European shags were collected, all on 1st August. These mostly contained sandeel and gadidae otoliths (Table 10).

Table 10. Number of otoliths and other contents of regurgitations from young European shags and shag pellets.

Sample number	Sample type	sandeel otoliths '0', 1+ group	Gadid otoliths Whiting, rockling	Other gadid otoliths	REMARKS + details of 'other' fish
1	Regurgitation	0,25		0	2 dragonet
2	Regurgitation	0,9			
3	Regurgitation	0,20			
4	Regurgitation				<i>clupeidae</i> bones
5	Regurgitation	0,16			dragonet bones
6	Regurgitation	0,9			
7	Regurgitation	0,2			88 dragonet, 3 goby
8	Regurgitation	0,7			1 dragonet
9	Regurgitation	0,0			38 dragonet, 14 flatfish, mollusc
10	Pellet	7,0	0,2	9	
11	Pellet	10,5	15,4	58	mollusc
12	Pellet	8,23	0,9	64	5 wrasse, crustacea, octopus beak

Black-legged Kittiwake

Only two food samples were analysed from regurgitations collected from black-legged kittiwake chicks on 3rd July, both contained unidentified gadids.

9 References

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10 Appendices

Appendix 1. Common guillemot chick weights

Weights in grammes									
208	210	215	225	230	232	235	235	235	235
235	235	236	236	236	238	242	242	245	245
245	245	245	245	246	250	250	251	252	252
254	256	259	260	262	264	265	265	265	265
265	265	265	265	269	270	270	272	273	274
275	277	278	278	280	280	282	282	282	283
284	286	291	292	295	295	295	295	296	298
300	300	310	310	320	320	320			

Note: Weights taken only from chicks with a wing length of >60mm. Mean weight was 264.1g.

Appendix 2. Diet samples

Common guillemot

Details are given of the size (mm) of fish caught by adult guillemots on Canna in 2010.

Unidentified gadid: 1 measured

<i>Length</i>	58
No. of fish	1

Sprat: 1 measured

<i>Length</i>	117
No. of fish	1

Sandeel: 8 measured

<i>Length</i>	116	125	136	150	162	165	188	195
No. of fish	1	1	1	1	1	1	1	1