



**Status and distribution of
Icelandic-breeding geese: results of
the 2010 international census**

Wildfowl & Wetlands Trust Report

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August 2011

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This publication should be cited as:

Mitchell, C. 2011. *Status and distribution of Icelandic-breeding geese: results of the 2010 international census*. Wildfowl & Wetlands Trust Report, Slimbridge.

This report was produced under the Goose & Swan Monitoring Programme (GSMP). This programme monitors numbers and productivity of geese and swans in the UK during the non-breeding season. GSMP is organised by the Wildfowl & Wetlands Trust (WWT) in partnership with the Joint Nature Conservation Committee (JNCC, on behalf of the Countryside Council for Wales (CCW), Natural England (NE) and the Council for Nature Conservation and the Countryside (CNCC)) and Scottish Natural Heritage (SNH).

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Goose & Swan Monitoring

Contents

Summary	iv
1 Introduction	1
2 Methods	1
3 Results	2
3.1 Coverage and conditions	2
3.2 Total numbers	3
3.2.1 Pink-footed Goose	3
3.2.2 Greylag Goose	3
3.3 Regional Distribution	6
3.3.1 Pink-footed Goose	6
3.3.2 Greylag Goose	6
3.4 Principal concentrations	9
3.4.1 Pink-footed Goose	9
3.4.2 Greylag Goose	9
3.5 Breeding success	13
4 Discussion	15
5 Acknowledgements	17
6 References	18

Summary

The 51st consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2010. Sites holding Pink-footed Geese were primarily checked in October and November, whilst those holding Greylag Geese were checked primarily in November and December. The staggering of counts has become necessary due to later departures of Greylag Geese from their Iceland breeding grounds. Some sites in the UK were also counted during late August and September in order to estimate the numbers of Greylag Geese from the British (formerly the separate Northwest Scotland and Re-established populations) population present prior to the arrival of Icelandic migrants. Coverage in Britain was good, with the majority of the key sites covered. Count data were also received from Southwest Norway, Ireland and Iceland, the latter based on ground counts only. Weather conditions were generally considered favourable during the counts in October and November with very few sites reporting underestimated counts. The count weekend in early December was badly affected by snow and freezing temperatures affecting both the distribution of the birds (many inland waterbodies were frozen) and the ability of counters to travel to count sites.

Maxima of 297,798 Pink-footed Geese and 121,280 Greylag Geese were counted in October and November 2010, respectively. These figures were adjusted to account for major sites that were not counted and for the number of British Greylag Geese counted prior to this census, resulting in population estimates of 297,798 Pink-footed Geese and 110,962 Iceland Greylag Geese. Compared to population estimates in 2009, the 2010 figures represent a decrease of 18.2% in the Pink-footed Goose population and a very small increase of 1.3% in the Greylag Goose population.

The breeding success of Pink-footed Geese was similar to the mean for the previous decade at 19.9% young (mean percent young 2000–2009: 19.3%, \pm 0.54 SE). The mean brood size of successful pairs was 2.32 goslings, which was slightly higher than the mean recorded during the preceding ten years (2.12, \pm 0.06 SE). The breeding success of Iceland Greylag Geese was slightly higher than the mean for the previous decade with flocks containing 22.4% young (mean percent young 2000–2009: 21.7%, \pm 1.0 SE), though the mean brood size of 2.11 goslings per successful pair was slightly lower than that of the most recent ten year mean (2.49, \pm 0.09 SE) although the latter measure was based on a small sample size.

1 Introduction

The Pink-footed Goose *Anser brachyrhynchus* population which breeds in Iceland and east Greenland winters almost exclusively in Britain (Mitchell 2009), while Greylag Geese *Anser anser* breeding in Iceland principally winter in Britain, Ireland and Southwest Norway (Swann & Brockway 2002). Large concentrations of both species occur in autumn, particularly in East Central Scotland, Southwest Lancashire and Norfolk (Pink-footed Goose) and North Scotland (Greylag Goose), notably on Orkney. As winter progresses, redistribution to other parts of the wintering range occurs and, hence, an estimation of the size of these populations is most effective in autumn (Mitchell & Hearn 2004, Hearn & Mitchell 2004).

The Icelandic-breeding Goose Census (IGC) is undertaken annually and aims to assess the size, distribution and breeding success of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese. Two coordinated counts have been undertaken since 1990, the first in October and the second in November. These are timed to coincide with periods when these geese are most concentrated after their arrival in Britain. Pink-footed Geese arrive earlier than Greylag Geese and are therefore usually best counted in October. The November count allows for the later migration of Greylag Geese to be completed. However, due to the late departure of both species from Iceland in some years (*e.g.* Worden 2006) a third coordinated count in December was introduced in 2005. Special emphasis is now placed on counting sites holding Pink-footed Geese in October and November, and sites holding Greylag Geese in November and December.

This report presents an overview of the 51st consecutive census and an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2010 breeding season.

2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 9/10 October, 6/7 November and 4/5 December 2010. In some cases, counts made close to these dates were included in the coordinated census if there was no reason to suspect they duplicated other counts. Most counts were of roosting geese, made either at dusk, when the birds were flying in, or at dawn, as they departed to feeding areas. Dates of the coordinated counts were chosen to avoid periods of full moon as far as possible (23 October, 21 November and 21 December), thus minimising the likelihood of geese remaining in feeding areas overnight. In a small number of areas where roost sites were poorly known, inaccessible or infrequently used, daytime counts of feeding birds were made. Consequently, in this report the term 'site' is applied to a range of geographical areas. Most are individual waterbodies where a goose roost occurs, whilst some are feeding areas around known roosts, and others are a mixture of these two. All sites are, however, areas to which an individual count can be attributed. For the purpose of analysis, Caithness, the Solway Firth, Orkney, Shetland, Southwest Lancashire, Southwest Norway, Faroe Islands and Iceland are treated as consolidated sites.

Three types of adjustment were applied to the count totals in order to generate population estimates. In some cases, where a count was not undertaken, an estimate of the number of geese present was provided by local counters. For regularly monitored sites (those counted in at least three of the previous five years) that were not counted during the 2010 census, and no estimate was provided by a local counter, numbers were estimated from the mean of the counts made during the relevant month during the previous five years (2005–2009). Estimated numbers (from either source) that exceeded 0.5% of the current IGC peak count total were added to this peak count to give the adjusted population estimate.

In addition, counts of Greylag Geese breeding in Britain made during August/September, before the arrival of Icelandic migrants, were subtracted from the IGC count at some sites to improve the estimate of the number of Iceland Greylag Geese present at that time.

To assess breeding success, experienced observers made assessments of the proportion of young (first-winter birds are separable from older birds by differences in plumage characteristics) in goose flocks and of brood size during the autumn. Data collected during late September to early November were used to determine the proportion of young and the mean brood size of successful pairs.

3 Results

3.1 Coverage and conditions

Coverage in Britain and Ireland during 2010 was good, especially for Pink-footed Geese in October and for Greylag Geese in November. The number of sites covered in each month is shown in Table 1.

Table 1. The number of sites counted and the number of sites holding Pink-footed and Greylag Geese in October, November and December 2010. The highest number of sites covered in any month is highlighted.

	October	November	December
Number of Pink-footed Goose sites counted	111	98	68
Number of sites holding Pink-footed Geese	57	52	31
Number of Greylag Goose sites counted	89	110	59
Number of sites holding Greylag Geese	29	55	30

Outside Britain and Ireland, estimates of the number of geese in Iceland were determined through ground counts and contact with local birdwatchers and hunters (see Discussion). No aerial survey was undertaken in Iceland in autumn 2010. Data were also received from several sites in Southwest Norway. In Ireland, full coverage of sites was not possible (as had been carried out in autumn 2007) but counts from nine sites thought to hold Iceland Greylag Geese were provided for November. No counts were received from the Faroe Islands in autumn 2010.

Two sites met the criteria for the calculation of an estimated count due to lack of coverage. Caithness was not counted in December, due to extensive snow cover and an estimate of 4,662 was added. In Ireland, nine sites were counted in November. No counts were undertaken there during the December count weekend and the November total count (2,944 birds) was therefore used as an estimated count in December. No count was made in Shetland during November and 3,799 Greylag Geese (the number counted in December) were added (but see Discussion).

An attempt was made to allow for the presence of British Greylag Geese in areas where Iceland Greylag Geese were also known to winter. Treatment of the principal locations was discussed in the 2009 IGC report (Mitchell 2010) and involves Lough Swilly (*c.* 950), Shetland (*c.* 500), Orkney (*c.* 10,000 birds, but see Discussion), Caithness (*c.* 1,000), Loch Fleet (*c.* 500) and Badenoch & Strathspey (*c.* 250). Small numbers of British Greylag Geese occur throughout south Scotland and north England and where counts were thought to involve summering birds these have been deducted.

Weather conditions were reported as good for most sites in October and November, with two sites reporting counts being affected by disturbance in October, and one in November. Poor visibility due to failing light affected counting at one site in October and one in November. However, extensive snow cover and freezing temperatures throughout the country severely hampered attempts to count geese during December. Some counters elected to count their site on the following the weekend (11/12 December) when conditions for travelling had improved a little. However, the severe weather had a pronounced affect on the distribution of the geese and the counts in December probably underestimate the number of geese present and their distribution.

3.2 Total numbers

3.2.1 Pink-footed Goose

Totals of 297,798 and 271,394 Pink-footed Geese were counted in October and November, respectively (Figure 1, Table 2). These represent a decrease of 16.9% and a decrease of 4.5%, respectively, compared to the unadjusted total counts in the same months in the preceding year. Coverage was excellent and no estimated counts needed to be added to the unadjusted total and so the peak winter total in October 2010 was used to derive a population estimate of 297,798 geese. This represents a decrease of 18.2% compared to 2009, when 364,212 individuals were estimated. In 2009, 79.3% of the total October count (unadjusted) was counted in November but in 2010 the corresponding figure was higher at 91.1% (Table 3).

3.2.2 Greylag Goose

Totals of 121,280 and 100,589 Greylag Geese were counted in November and December, respectively (Figure 1, Table 2). The November count was very similar to that recorded in November 2009, whereas the December 2010 count represents a decrease of 9.9% compared to the unadjusted total counts in the same month in the preceding year. Following adjustments for British Greylag Geese and the addition of estimated counts, the peak winter total in November 2010 was used to derive a population estimate of 110,962 Iceland Greylag Geese. This represents a minor increase of 1.3% compared to the previous estimate of 109,496 geese recorded in 2009 (see Section 4). In 2009, 93.0% of the total November count (unadjusted) was counted in December but in 2010 the corresponding figure was lower at 83.0% (Table 3).

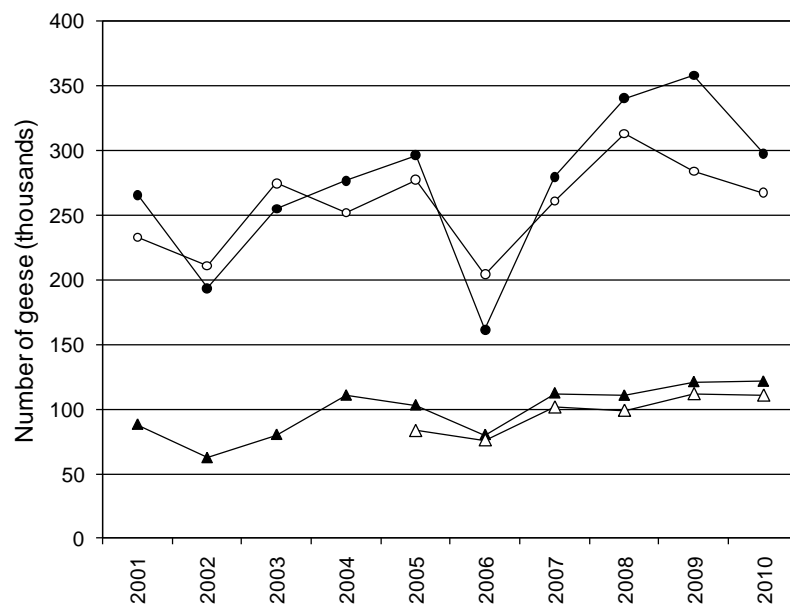


Figure 1. Peak (unadjusted) counts of Pink-footed Geese (circles) in October (filled) and November (open) and Iceland Greylag Geese (triangles) in November (filled) and December (open) counted during the Icelandic-breeding Goose Census, 2001 to 2010.

Table 2. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2010. Raw counts are shown with adjustments for non-Icelandic birds [-x] and estimated counts given in brackets [+x]. Figures in parentheses indicate the number of sites visited.

Region/Area	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Iceland*	9,000 (1)	nc	0	16,000 (1)	0	2,250 (1)
Norway*	nc	39 (1)	nc	530 (1)	0	166 (1)
Faroe Islands*	nc	nc	nc	nc	nc	nc
Ireland	nc	nc	0	2,944 (12) [-950]	nc	nc [+2,901] [-950]
Shetland*	nc	nc	nc	nc [+3,799] [-500]	3 (1)	3,799 (1) [-500]
Orkney*	939 (1)	nc	1,077 (1)	75,353 (1) [-10,000]	1,409 (1)	80,744 (1) [-10,000]
Caithness*	nc	nc	0	7,334 [-1,000]	nc	nc [+4,662] [-1,000]
Highland	10,289 (11)	786 (10) [-500]	8,955 (10)	13,231 (14) [-750]	2,322 (9)	4,998 (11) [-250]
Moray	6,300 (2)	0 (2)	4,800 (2)	137 (1)	0 (1)	37 (1)
Aberdeenshire	42,571 (6)	192 (4)	48,268 (6)	1,017 (5)	300 (4)	0 (2)
Angus/Dundee	59,502 (2)	0 (1)	41,575 (2)	120 (1)	12,259 (2)	126 (1)
Perth & Kinross	23,076 (10)	86 (8)	8,400 (7)	655 (10)	183 (2)	34 (2)
Stirling/Falkirk/Clackmannan	7,966 (6)	630 (3)	2,789 (5)	230 (3)	1,450 (2)	380 (2)
Fife	2,001 (17)	48 (17)	8,130 (17)	355 (17)	8,844 (9)	359 (9)
Argyll & Bute	29 (1)	430 (1)	nc	1,610 (1)	5 (1)	6,070 (1)
Clyde	1,012 (1)	424 (1)	nc	438 (2)	nc	35 (1)
Ayrshire	nc	nc	nc	nc	nc	nc
Dumfries & Galloway **	6,629 (7)	695 (6)	7,284 (6)	388 (6)	47,491 (7)	464 (5)
Cumbria **	1,467 (4)	135 (3)	1,094 (3)	21 (3)	2688 (5)	2 (3)
Lothians	13,810 (13)	761 (16) [-761]	5,998 (13)	525 (16) [-525]	1,611 (7)	1,017 (10) [-500]
Borders	17,593 (12)	82 (12) [-82]	17,152 (12)	122 (12) [-122]	0 (6)	0 (6)

Region/Area	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Northumberland	3,735 (4)	32 (3)	910 (2)	270 (3)	16 (1)	108 (1)
		[-32]		[-270]		[-108]
Lancashire & Merseyside*	69,510 (1)	0 (1)	53,690 (1)	0 (1)	57,923 (1)	0 (1)
N Wales/Dee Estuary	450 (1)	0 (1)	nc	0 (1)	nc	nc
Humber side	6,674 (2)	0 (2)	7,060 (2)	0 (2)	122 (2)	0 (2)
Norfolk	15,245 (9)	0 (9)	54,212 (9)	0 (8)	88,595 (8)	0 (8)
<i>Raw total counts</i>	297,798	4,340	271,394	121,280	225,211	100,589
<i>Adjustment for non-Icelandic birds</i>	n/a	-1,375	n/a	-14,117	n/a	-13,232
<i>Estimated counts</i>				+3,799		+7,563
Population Estimate	297,798		110,962			

* several feeding sites consolidated

** counts from the Solway Firth have been split between birds counted in Dumfries & Galloway and Cumbria

nc no count received

n/a adjustment not necessary

3.3 Regional Distribution

3.3.1 Pink-footed Goose

East Central Scotland held the highest number of birds in October with a high percentage also present in Northeast Scotland and West England (Table 3, Figure 2). By November, a large movement of birds into East England (Norfolk) had occurred and, by December, due to the severe weather, many more had moved to Southwest Scotland/Northwest England, where 50,184 were counted and East England, where 88,717 were counted. The prolonged spell of cold weather in early December caused many inland waterbodies to freeze and lying snow meant that many inland areas were vacated by Pink-footed Geese and the geese presumably headed south. However, the poor weather also meant some waterbodies could not be checked by counters.

3.3.2 Greylag Goose

The autumn distribution of Greylag Geese was typical, with a very low proportion present in Britain during October, though this partly reflects the emphasis on November and December counts for this population and the consequent lack of counts submitted for October. By November, 11.8% of the population was still in Iceland and 79.9% present in North Scotland, principally on Orkney. The distribution in December was similar to November and, although no systematic count was made in Iceland during this month, no more than 2,000-2,500 birds were thought to be there (Table 3, Figure 3).

Table 3. National and, within Britain, regional distribution of Pink-footed Geese and Iceland Greylag Geese counted during October, November and December 2010, expressed as a percentage of the maximum count for each species. Estimated counts not included.

	Pink-footed Goose			Greylag Goose		
	October	November	December	October	November	December
Iceland	3.0	0.0	0.0	0.0	11.8	1.7
Southwest Norway	0.0	0.0	0.0	0.0	0.4	0.1
Faroe Islands	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	0.0	0.0	0.0	0.0	2.9	0.7
North Scotland	3.8	3.4	1.3	0.9	79.9	74.8
Northeast Scotland	16.4	17.8	0.1	0.1	0.9	0.0
East Central Scotland	31.1	20.4	7.6	0.6	1.0	0.7
Southwest Scotland/ Northwest England	3.1	2.8	16.9	1.2	1.8	4.9
Southeast Scotland/ Northeast England	11.8	8.1	0.5	1.3	1.4	1.2
West England	23.5	18.0	19.5	0.0	0.0	0.0
East England	7.4	20.6	39.8	0.0	0.0	0.0
Total	100.0	91.1	75.6	4.2	100.0	84.1



Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a), November (b) and December 2010 (c). Estimated counts are not shown.



Figure 3. Distribution of Iceland Greylag Geese in Britain and Ireland in October (a), November (b) and December 2010 (c). Estimated counts are not shown.

3.4 Principal concentrations

3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 57 sites in October, 52 in November and only 31 in December (this includes consolidated sites) (Table 1). The number of sites holding more than 1% of the 2010 population estimate (2,978 birds) was 24 in October, 20 in November and decreased to 11 in December. Six sites held over 10,000 birds in October, six in November and seven in December. The October count suggests a more dispersed distribution than in 2009 when only 17 sites held more than 1% of that years population estimate. Combined counts from the 24 sites exceeding 1% of the population estimate in October accounted for 92.6% of the total October count and numbers at the top five sites alone held 58.3% of the population estimate (Table 4). The most recent peak IGC counts from the top two sites in October 2010 (Southwest Lancashire and Montrose Basin) are shown in Figure 4.

Particularly high numbers were recorded at Southwest Lancashire, with 23.3% of the population estimate, and Montrose Basin, Angus, with 20.0%. The count of 59,502 Pink-footed Geese at Montrose Basin in October is the largest IGC count recorded at this site. However, an even higher count (65,060), the highest ever for the site, was recorded there on 1 October, a week before the IGC October count weekend (see Discussion). Likewise, at Loch of Strathbeg, Aberdeenshire, an early count of 32,882 Pink-footed Geese was recorded on 15 September. It appears, therefore, that there was an early influx of large numbers of Pink-footed Geese into northern Britain at the end of September, however, counts on the IGC weekend were some 60,000 fewer than the early October count in 2009. The December cold period caused an unprecedented movement of Pink-footed Geese from frozen fields and waterbodies in north and central Scotland to the Solway Estuary. A record 49,942 geese were counted on the morning flight (5 December) including 26,570 at Brow Well. This was, by far, the largest ever count on the estuary.

Higher than recent (2005 to 2009) average numbers in October 2010 were also recorded at: Cromarty Firth: Udale Bay, Loch Eye, Munloch Bay (all Highland), Middlemuir (Aberdeenshire), Tay Estuary: Tentsmuir Point (Fife) and Loch Lomond: Endrick Mouth (Argyll). Lower than recent average numbers were recorded during October 2010 at: Loch of Strathbeg (Aberdeenshire), Aberlady Bay, Harperrig Reservoir (both Lothians), Dowlaw Dam (Borders), East Chevington Pools (Northumberland), Forth Estuary: Skinflats (Stirling, Falkirk and Clackmannanshire), Kilconquhar Loch (Fife), Loch Leven, River Tay: Bloody Inches (both Perth & Kinross), Loch of Lintrathen (Angus), West Water Reservoir (Borders), Holkham, Burnham Norton, Scolt Head and Wells (all Norfolk).

3.4.2 Greylag Goose

By November, 55 sites held Iceland Greylag Geese (Table 1), ten of which held numbers exceeding 1% of the population estimate (1,110 birds) (this considers Orkney and Iceland as single sites). Excluding summering birds, Orkney held 59.0% of the population during this month (Table 2). Greylag Geese were recorded at only 30 sites in December, attributed to the poor weather at the time of the count; those with counts exceeding 1% of the population estimate decreased to six. The total unadjusted count of 80,744 Greylag Geese on Orkney was the highest ever recorded on the islands and reflects the continued marked shift in the distribution of Iceland Greylag Geese to these northern isles and the increase there in British Greylag Geese. The severe weather in early December appears not to have affected the count on Orkney, although a movement to Bute, where conditions were less severe than in many mainland areas, was apparent. Numbers increased there from 1,610 to 6,070 between November and December.

Higher than recent average numbers (2005 to 2009) in November 2010 were recorded at: Orkney, Bute (Argyll & Bute), Dornoch Firth and Loch Fleet (both Highland). Lower than recent average numbers (2005 to 2009) were recorded at: Caithness, Cromarty Firth (Highland), Haddo House Lakes, Loch of Skene, Meikle Loch (all Aberdeenshire), Kilconquhar Loch (Fife), Lindisfarne (Northumberland), Loch Leven, River Tay: Bloody Inches (both Perth & Kinross), Loch of Lintrathen (Angus) and Marlee Loch (Perth & Kinross). Fewer geese are now wintering in Scotland south of the Moray Firth, reflecting the continuing movement of Iceland Greylag Geese to wintering sites in North Scotland.

For the purpose of analysis, Orkney is treated as a consolidated site, although Table 5 shows the individual totals for the islands. Nine of the count areas on Orkney held numbers exceeding 1% of the population estimate in

November and 13 did so in December, although these individual counts are not adjusted for the presence of Greylag Geese breeding on Orkney (thought to number at least *c.* 10,000 birds, but see Discussion) since such data are only available for Orkney as a whole. As in 2009, only on East Mainland and West Mainland were more than 10,000 birds recorded, which equates to 66.6% of the unadjusted Orkney total in November and 52.4% in December.

Table 4. Sites that supported >1% of the (a) Pink-footed Goose (>2,978) and (b) Iceland Greylag Goose (>1,110) population estimates in October and November 2010, respectively. Note that these values are not the same as the internationally accepted threshold values for these populations that are used to identify sites of national and international importance; currently 2,700 for Pink-footed Goose and 870 for Iceland Greylag Goose (Wetlands International 2006). Greylag Goose counts are unadjusted (*i.e.* British birds have not been deducted).

a) Pink-footed Goose

Site	October count	Percentage of population estimate	Five-year peak mean 2005–2009 (1)
Southwest Lancashire	69,510	23.3	55,432
Montrose Basin, Angus	59,502	20.0	31,924
Loch of Strathbeg, Aberdeenshire	17,186	5.8	44,740
Carsebreck & Rhynd Lochs, Perth & Kinross	16,550	5.6	13,446
Meikle Loch, Slains, Aberdeenshire	10,900	3.7	14,332
West Water Reservoir, Borders	10,260	3.4	40,471
Iceland	9,000	3.0	2,200
Middlemuir, Aberdeenshire	9,000	3.0	4,132 (2)
Aberlady Bay, Lothians	8,654	2.9	19,165
Findhorn Bay, Moray	6,300	2.1	9,070
Solway Estuary (consolidated)	6,059	2.0	10,792
Loch of Skene, Aberdeenshire	5,485	1.8	19,000
Horsey Mere, Norfolk	5,260	1.8	6,381
Loch Leven, Perth & Kinross	5,168	1.7	17,853
Fala Flow, Lothians	5,003	1.7	3,266
Letham Area, Stirling, Falkirk & Clackmannanshire	4,650	1.6	n/a
Snettisham, Norfolk	4,150	1.4	42,255
Hule Moss, Borders	4,100	1.4	6,140
Whitton Sand, Yorkshire	3,500	1.2	2,380 (3)
Beaully Firth (consolidated), Highland	3,370	1.1	3,387
Read's Island Flats, Yorkshire	3,174	1.1	4,553
Cromarty Firth: Udale Bay, Highland	3,000	1.0	850
Whitrig Bog, Borders	3,000	1.0	n/a
Lake of Menteith, Stirling	2,989	1.0	2,442 (4)

(1) Mean derived from any IGC count (*i.e.* from any month, October, November or December).

(2) Mean derived from 2006–2009 only.

(3) Mean derived from 2008–2009 only.

(4) Mean derived from 2005, 2006 and 2009 only.

b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2005–2009 (1)
Orkney Islands (all sites)	75,353 (2)	67.9	63,099
Iceland (lowlands)	16,000	14.4	13,165
Caithness	7,334	6.6	9,105
Dornoch Firth (consolidated), Highland	3,596	3.2	2,426
Loch Eye, Highland	2,269	2.0	5,084
Loch Fleet, Highland	2,255	2.0	1,789
Lough Swilly, Donegal	2,006	1.8	2,442 (3)
Bute, Argyll & Bute	1,610	1.5	1,788
Beaully Firth (consolidated), Highland	1,500	1.4	1,560
Loch Garten/Strathspey, Highland	1,500	1.4	947

(1) Mean derived from any IGC count (ie from any month, October, November or December).

(2) Unadjusted counts (see text and Table 2).

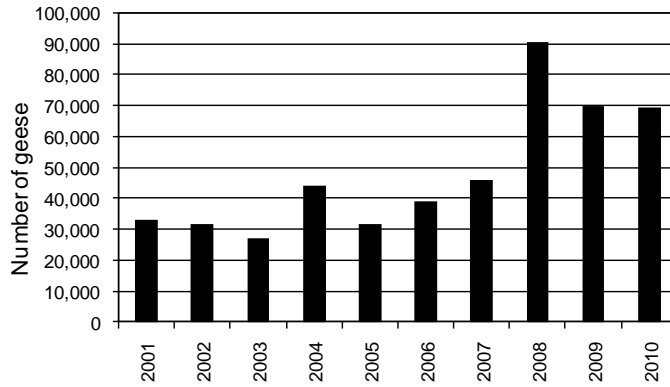
(3) Mean derived from 2007–2009 only

Table 5. Greylag Goose counts at individual sites on Orkney in November and December 2010 (counts have not been adjusted to take into account the number of Greylag Geese summering on Orkney since data on their numbers are only available for Orkney as a whole). Five year peak mean derived from December counts from 2005 to 2009.

	November count	% of population estimate	December count	% of population estimate	Five-year peak mean
West Mainland	36,235	32.7	24,878	22.4	28,904
East Mainland	14,025	12.6	17,440	15.7	12,565
Stronsay	6,295	5.7	7,221	6.5	4,266
Shapinsay	3,772	3.4	7,895	7.1	4,173
South Ronaldsay	4,550	4.1	7,400	6.7	3,478
Sanday	3,035	2.7	3,830	3.5	2,868
Eday	1,860	1.7	1,135	1.0	1,183
Papa Westray	1,684	1.5	1,504	1.4	1,095
Rousay	1,300	1.2	1,198	1.1	889
Egilsay	760	0.7	864	0.8	776
Westray	570	0.5	1,520	1.4	751
North Ronaldsay	497	0.4	1,244	1.1	484
Hoy and Walls	408	0.4	2,045	1.8	437
Wyre	272	0.2	532	0.5	378
Burray	0	0.0	1,637	1.5	198
Flotta	90	0.1	401	0.4	125 (1)
Total	75,353	54.5	80,744	72.6	62,470

(1) Mean derived from 2009 only

a) Southwest Lancashire



b) Montrose Basin

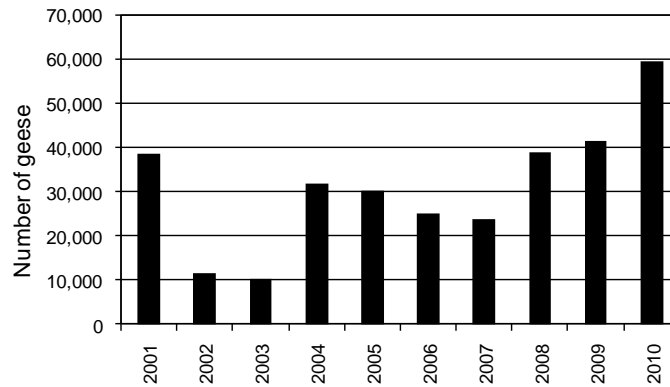
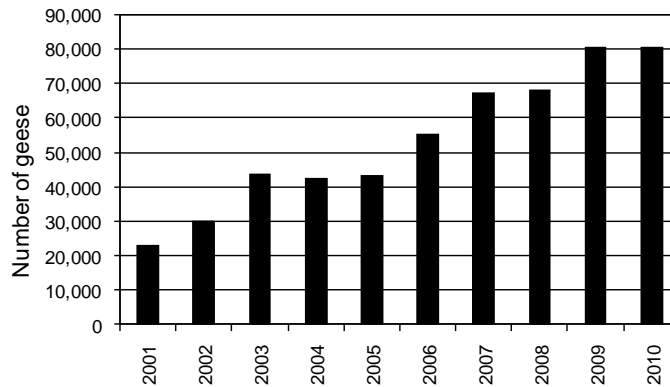


Figure 4. Peak IGC counts of Pink-footed Geese at a) Southwest Lancashire and b) Montrose Basin, 2001 to 2010.

a) Orkney



b) Iceland

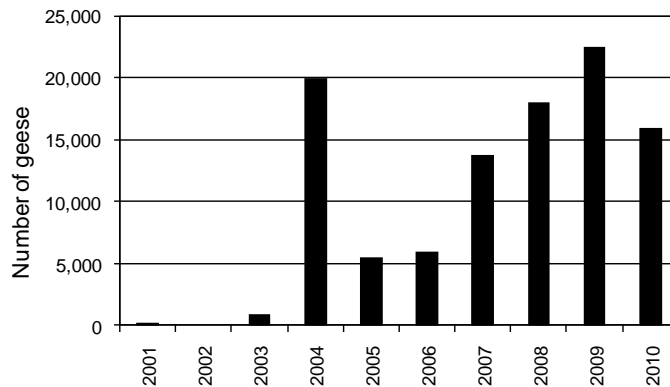


Figure 5. Peak IGC counts of Iceland Greylag Geese at a) Orkney (includes summering birds) and b) Iceland, 2001 to 2010.

3.5 Breeding success

Totals of 11,765 Pink-footed Geese (from 39 flocks) and 2,521 Greylag Geese (43 flocks) were aged at various localities throughout Scotland and in southern Iceland between 15 September and 18 November. The percentage of birds aged in relation to the estimated size of the population in 2010 was 4.0% for Pink-footed Geese and 2.3% for Greylag Geese. Information on the brood sizes of 148 families of Pink-footed Geese and 27 families of Greylag Geese was also collected during this period.

The breeding success of Pink-footed Geese was similar to the mean for the previous decade at 19.9% young (mean proportion of young 2000–2009: 19.3%, \pm 0.54 SE). The mean brood size of successful pairs was 2.32 goslings, slightly above the mean recorded during the preceding ten years (2.12, \pm 0.06 SE) (Table 6, Figure 6).

There was evidence of modest regional variation in the percentage of young Pink-footed Geese, which varied from 17.9% in East Central Scotland to 22.0% in Northeast Scotland (Table 6). Similarly, mean brood size varied from 2.28 goslings in Northeast Scotland to 2.67 in Southeast Scotland. The percentage young was highest in late September and typically quickly declined to late October (Figure 7) suggesting that successful families arrived early on the winter quarters (see Patterson & Hearn 2006).

The breeding success of Iceland Greylag Geese was slightly higher than the mean for the previous decade, with flocks containing 22.4% young (mean 2000–2009: 21.7%, \pm 1.0 SE). The mean brood size of 2.11 goslings per successful pair was slightly lower than that of the recent ten year mean (2.49, \pm 0.09 SE) (Table 6, Figure 6), however, the brood size figures were based on a small sample size. Due to their later migration and more limited range, the temporal and spatial distribution of Greylag Geese was limited and age counts were only collected in two regions (southern Iceland and North Scotland) during late October and early November.

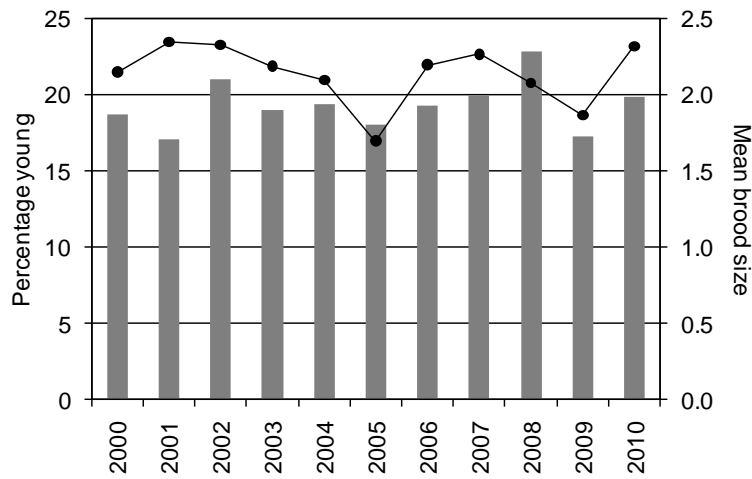
Table 6. The percentage of young and mean brood size of Pink-footed and Greylag Geese in 2010.

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose ¹	Northeast Scotland	4,857	22.0	117	2.28
	East Central Scotland	4,675	17.9	25	2.44
	Southeast Scotland	1,856	19.3	6	2.67
	West England	377	20.4	na	na
	Total	11,765	19.9	148	2.32
Greylag Goose ²	South Iceland	423	20.3	11	2.09
	North Scotland	2,098	22.8	16	2.13
	Total	2,521	22.4	27	2.11

¹ Pink-footed Geese aged between 15 September and 27 October 2010.

² Greylag Geese aged between 30 October and 18 November 2010.

a) Pink-footed Goose



b) Greylag Geese

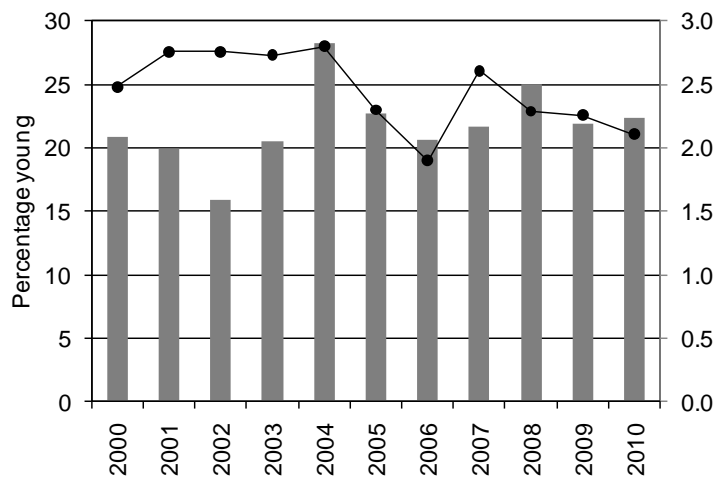


Figure 6. The percentage young (column) and mean brood size (line) found in flocks of (a) Pink-footed Goose and (b) Iceland Greylag Goose, 2000 to 2010.

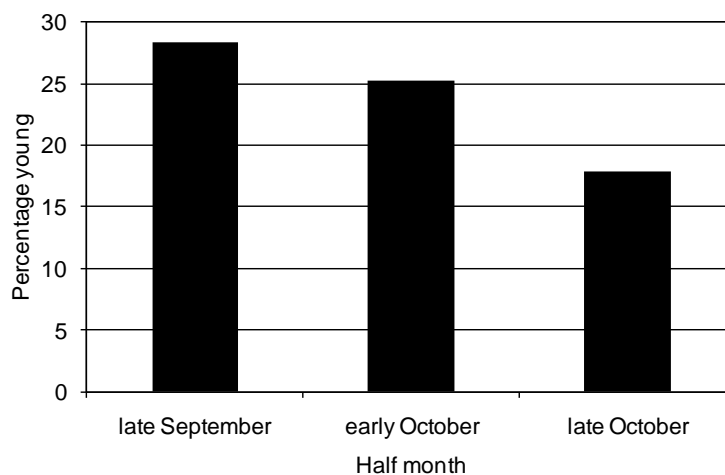


Figure 7. Mean percentage young of Pink-footed Geese during half-monthly periods of autumn 2010.

4 Discussion

As in 2008 and 2009, Pink-footed Geese were early in reaching Britain in autumn 2010 with 23 birds recorded at Loch Leven on 31 August and 50 at Hule Moss on 9 September. There then followed arrivals of large numbers at several important sites, notably on the east coast of Scotland – Loch of Strathbeg recorded 32,882 birds on 15 September and Montrose Basin held 10,000 birds on 20 September. This quickly increased to 65,060 Pink-footed Geese at Montrose Basin on 1 October – a record for the site.

Despite the apparent early arrival, good coverage of the main sites in Britain in October and November and counts being undertaken in reasonable conditions, the 2010 population estimate for Pink-footed Goose was nearly a fifth lower than the previous year. Breeding success in summer 2010 was average compared to the 2000–2009 mean (19.3%, Figure 6a) and it might have been expected that annual recruitment would have balanced annual losses though hunting and natural mortality. It is therefore highly surprising that the 2010 population estimate was *c.* 60,000 birds fewer than in the previous two years. Counts from 2006, and possibly 2007, were regarded as underestimates (Newth 2007, Mitchell 2008) but there is less evidence of an undercount in 2010.

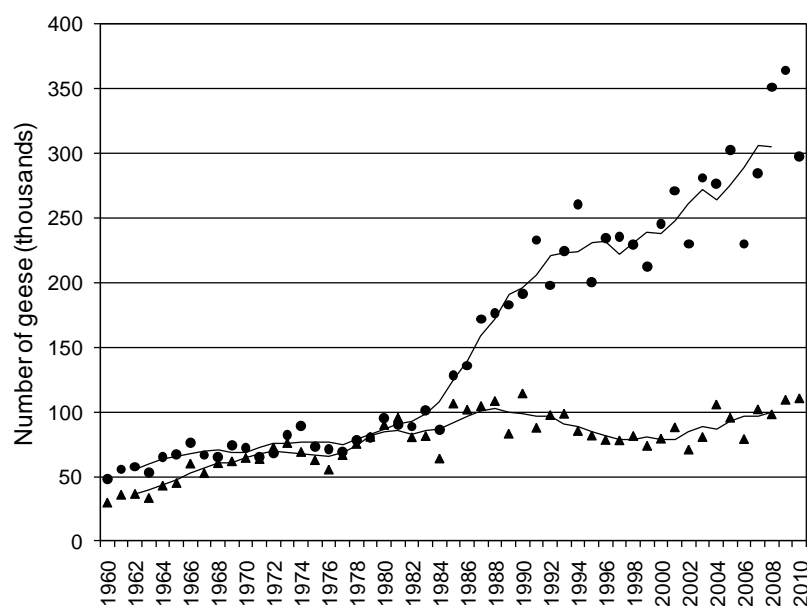


Figure 8. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2010. The 5-year running means (*e.g.* mean for 2008 is from population estimates for 2006 to 2010) are shown as lines.

Examining the twenty population estimates between 1991 and 2010, there have been between year declines in eight years ranging from decreases of 4,354 Pink-footed Geese (between 2003 and 2004) to 72,651 (between 2005 and 2006). However, in only two years after each between year decline has the subsequent population estimate been larger than the estimate two years previously. This indicates that in the year(s) following a decline, counts don't typically simply 'bounce back' to previous high counts. For example, in 1994, a then record of 260,500 Pink-footed Geese was counted. The following year, the population estimate fell to 200,300 (a decline of *c.* 60,000 geese). Numbers did not reach 260,500 until seven years later, when 274,600 was counted in 2003. Given this, it therefore seems possible that the occasional observed population declines of tens of thousands of birds may be real, and should not be simply treated as suspected underestimates. Winter 2009/10 was particularly harsh during January and early February (notably so in Scotland) with prolonged snow cover and freezing temperatures. Over winter mortality may be increased during prolonged periods of severe weather – a feature of winter 2010/11 too. Time will tell how quickly, if at all, the population takes to recover to *c.* 350,000 and thus whether the 2010 population estimate contains an element of undercounting or not.

Bag statistics from Iceland for 2010 suggest that *c.* 17,114 Pink-footed Geese were shot there during the autumn, a slight increase on the mean for the last five years (*c.* 15,284 geese, data from Wildlife Management Institute, Akureyri, Iceland). This suggests that it is unlikely that autumn hunting in Iceland accounted for the apparent low count in 2010. Unfortunately, meaningful bag statistics remain unavailable from Britain and Ireland. This makes interpreting changes in population dynamics all the more complicated.

More Pink-footed Geese were recorded in Iceland at the time of the October IGC count than normal (9,000; Arnór Sigfússon pers. comm.), however, the completeness of counts from Iceland remains difficult to ascertain as this species can remain dispersed at inaccessible areas at this time. Peak counts of Pink-footed Geese have occurred in November in one of the previous five years (in 2006, Figure 1), so the timing of the departure of the species from Iceland clearly varies year to year. It is possible, therefore, that in years when underestimates are recorded, such as 2006, large numbers may still be residing at inaccessible and uncounted areas of Iceland. However, whilst in 2006 the count total increased between October and November, suggesting a late departure of birds from Iceland and therefore a probable underestimate, in 2010 there was no such increase between census months, which supports the suggestion that the decrease in total numbers was real, at least to some extent. Given the unpredictability over the timing of departure from Iceland, it is essential that coverage of sites holding Pink-footed Geese needs to be maintained in both October and November.

The severe weather at the time of the early December count weekend clearly affected the mid winter distribution of Pink-footed Geese in Britain. The Solway Firth experienced a huge influx of nearly 50,000 geese as birds escaped the frozen waterbodies and extensive snow cover further north.

The count of Iceland Greylag Geese was thought to be reasonably comprehensive with sites being covered throughout most of the winter range, although the Faroe Islands were not counted in autumn 2010. Coverage in Ireland in autumn 2010 was not complete (compared with an extensive survey carried out there in autumn 2007) and it is possible that the number of geese in Ireland is greater than that reported here.

The increasing concentration of the population on Orkney continued, with another record total count (unadjusted) of 80,744 Greylag Geese in December 2010. The survey of the summering stock, carried out in summer 2008, estimated 10,000 birds, but no survey has been made since. It is likely, however, that the number of birds summering on Orkney continues to increase – this is borne out by an increase in the number of broods recorded during annual monitoring carried out by RSPB (Alan Leitch pers. comm.). Trinder *et al.* (2010) used existing counts to back calculate and improve estimates of the number of summering Greylag Geese on Orkney. This gave revised estimates of the number of Iceland Greylag Geese there too, and consequently revised population estimates. Projecting forward, and assuming a similar rate of increase year on year, gives an estimate of *c.* 15,000 birds in summer 2010 – although this urgently needs to be confirmed by counts. The adjustment for summering birds on Orkney given in Table 2 (10,000 birds) may, therefore, be an underestimate and both the number of Iceland Greylag Geese counted on Orkney, and the number given for the total population estimate may be over-estimated by several thousand birds.

The situation on Shetland also remains complicated. A survey in August 2009 found *c.* 5,000 summering Greylag Geese. However, local counters suggest that fewer birds are present in September (Paul Harvey pers. comm.). There has been no ringing of Greylag Geese on Shetland during the summer, so it is not known if any birds leave the islands after the breeding season. During autumn 2010, no IGC counts were made in October or November, but *c.* 3800 Greylag Geese were counted in December (with an additional 209 geese previously present in areas not counted at the time of the IGC count). This is the largest count from the archipelago but it is still not known if this comprises entirely summer residents, Iceland winter visitors, or a mixture of the two. The situation can only be resolved through ringing of summering birds to examine post breeding movements from the islands and annual assessments of summering numbers; the latter being particularly problematic given the high costs involved.

As highlighted by Mitchell (2010), the presence of increasing numbers of British Greylag Geese, notably in Shetland, Orkney, Caithness, east Sutherland and Badenoch & Strathspey, where Iceland birds winter in large numbers, and smaller numbers in Southeast and East Central Scotland, make estimating the abundance of winter migrants a complex task. Continued and regular counting during the summer and ringing, especially of British-breeding birds, will help in determining the provenance and movements of birds counted in the winter.

The November goose counts in Iceland are based on a mixture of dedicated ground survey undertaken by the Icelandic Institute of Natural History in two of three main Greylag Goose areas in the southern lowlands together with non-systematic information provided by hunters and local birdwatchers around the country. This suggested that *c.* 16,000 birds were present (Arnór Sigfússon pers. comm.). Once again, *c.* 2,000-2,500 Greylag Geese were also thought to have overwintered in southern Iceland – the third winter in succession that such high numbers have been present (Arnór Sigfússon pers. comm.) and a situation that would well be worth watching more closely.

Peak counts of Greylag Geese have occurred in November in each of the five years 2006 to 2010, but due to the varying time of arrival from the breeding grounds and given the shifts in winter distribution, it would appear prudent that coverage of sites holding Greylag Geese needs to be maintained in both November and December.

5 Acknowledgements

This census is part of the long-term Goose & Swan Monitoring Programme organised by the Wildfowl & Wetlands Trust and funded by WWT and the Joint Nature Conservation Committee, in partnership with Scottish Natural Heritage. The financial support of JNCC for this important monitoring work is gratefully acknowledged.

This census would not be possible without the support of a large number of dedicated goose enthusiasts. Enormous thanks go to them and the regional coordinators for all their hard work and effort, advice and comments on their local goose situations. These include (with apologies for any omissions or mis-spellings):

D Abbott, G M Adam, H Addlesee, R Anderson, R Averiss, A Baker, S Barratt, B Bates, A Bedford, H Bell, M V Bell, S Benn, A & G Best, H & E Bickerstaff, R Blackey, G Bowman, A Bramhall, J Branscombe, I Brockway, S Brogan, D Brown, A W Brown, J C Burrow, C Bushell, J Calladine, E Cameron, G P Catley, N C Chambers, H Chisholm, E Christie, T Clare, G Clarkson, M Cockram, D Coombes, R C Cooper, C Corse, A Craggs, O Crowe, P Culley, L Cunningham, T Cunningham, N Currie, I S Davidson, J Davidson, L Dennis, M Devine, T Dodman, L Dow, S Dunstan, H Edwards, S Elliott, P Ellis, J English, B Etheridge, D Fairlamb, A Finlayson, A Fitzpatrick, P C Fletcher, P Flint, A Follestad, A Forsyth, S Foster, I S Francis, C Francis, D F Funnell, A Gear, R Gemmell, M Ginns, N Godden, A Graham, DK Graham, R & S Graham, H Gray, A Grieve, L Griffin, S R Hacker, W Hargreaves, H Harrop, P Harvey, J Harrison, S J Hayhow, R Haywood, M Henderson, M Heubeck, F Hewlett, P Higson, D Hill, P Hollinrake, N Holton, I Hopkins, J Huntley, E Hurley, M Hutcheson, H G Huxley, H Insley, R Jaffray, M Jamieson, D Jardine, G Johnson, M Kenny, K Kirk, M Kitching, A Knight, D Law, A J Lawrence, S Laybourne, A Leitch, L Lenehan, A Leonard, S Longster, J D Lough, R McAskill, D McCullough, D Mallett, A Marland, B Marshall, P R Massey, D Matson, F J Mawby, C Mawby, A McClure, J & B McCutcheon, E Meek, D Mercer, P Miller, N Mitchell, P Moore, C Moses, R Murray, J Nadin, S Newton, E Nixon, R Noble-Nesbit, North Ronaldsay Bird Observatory, B & R O'Dowd, S O'Hara, E Ogston, D Okill, J Palfery, D Parkinson, S Paterson, I J Patterson, M Pennington, G Petrie, A Piggott, T Plant, K Redgrave, C Reid, T Rendall, B Ribbands, A Riches, A J Robertson, K Robeson, M C Robinson, M Ross, J Rowe, J Scott, D Shaw, D Shepherd, W Shepherd, R Sheppard, L Shields, A Sigfusson, A Smart, M Smith, R Smith, T Smith, J Smith, A-M Smout, A Speer, J Squire, A Steel, G Stirzaker, L Strachan, R Strachan, J Swale, F L Symonds, R Tallack, P Tapsell, N W Taylor, A Thiel, M Thompson, C Tomlinson, H Towll, A Upton, P Walsh, S Welch, R Weston, B Weston, B Wilkie, D Wilkins, T Williams, J Williams, J M Wills, T Wilson, M Youdale and B Zonfrillo.

Additional age counts were provided by Alan Leitch, Ian Patterson and Chris Tomlinson.

Support was also provided by Jacqueline Reed and Colette Hall at WWT Slimbridge. Thanks also to Richard Hearn and Christine Urquhart for comments on an earlier draft of this report.

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