



**Status and distribution of
Icelandic-breeding geese: results of
the 2012 international census**

Wildfowl & Wetlands Trust Report

Author

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August 2013

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This publication should be cited as:

Mitchell, C. 2013. *Status and distribution of Icelandic-breeding geese: results of the 2012 international census*. Wildfowl & Wetlands Trust Report, Slimbridge.

This report was produced under the Goose & Swan Monitoring Programme (GSMP). This programme monitors numbers and breeding success 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 Northern Ireland Environment Agency (NIEA) and Scottish Natural Heritage (SNH).

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Goose & Swan Monitoring

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Summary

The 53rd consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2012. 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 breeding grounds in Iceland. 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 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. Weather conditions were generally considered favourable during the census periods with very few sites reporting underestimated counts.

Maxima of 353,840 Pink-footed Geese and 128,250 Greylag Geese were counted in October and November, 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 359,175 Pink-footed Geese and 104,632 Iceland Greylag Geese. Compared to the previous year, the 2012 figures represent an increase of 37.9% in the Pink-footed Goose population (based on a revision of the 2011 population estimate) and a decrease of 12.7% in the Greylag Goose population.

The breeding success of Pink-footed Geese was higher than the mean for the previous decade at 21.1% young (mean percent young 2002–2011: 18.5%). The mean brood size of successful pairs was 2.30 goslings, which was also higher than the mean recorded during the preceding ten years (2.08). The breeding success of Iceland Greylag Geese was similar to the mean for the previous decade with flocks containing 21.7% young (mean percent young 2002–2011: 21.9%), and the mean brood size of 2.36 goslings per successful pair was also similar to that of the most recent ten year mean (2.37) 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 2002), while Greylag Geese *Anser anser* breeding in Iceland principally winter in Britain, with small numbers in 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 in 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 53rd consecutive census and an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2012 breeding season.

2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 13/14 October, 10/11 November, 8/9 December 2012. 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 (29 October, 28 November and 28 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, counts from 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 the 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 2012 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 (2007–2011). 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 British Greylag Geese made during August/September, and in some cases early October, 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 late 2012 was good, especially in October and November. The number of sites covered in each month is shown in Table 1.

	October	November	December
Number of Pink-footed Goose sites counted	121	127	125
Total number of sites holding Pink-footed Geese	61	64	50
Number of Greylag Goose sites counted	102	120	113
Total number of sites holding Greylag Geese	46	55	58

Table 1. The number of sites counted and the number of sites holding Pink-footed and Greylag Geese in October, November and December 2012.

Outwith Britain, a combination of road based survey and information from hunters provided an estimate of goose numbers in Iceland in autumn 2012 (see Discussion). Data were also received from several sites in Southwest Norway in January. In Ireland, full coverage of sites was not possible (as had been carried out in autumn 2007) but counts from six sites thought to hold Iceland Greylag Geese were provided for November. No counts were received from the Faroe Islands.

One site met the criteria for the calculation of an estimated count due to lack of coverage. Horsey Mere (Norfolk) was not counted in October and an estimated count of 5,335 was used, based on the mean count there of the last five years. In Ireland, six sites were counted in November. No counts were undertaken there during the December count weekend and the November total count (2,574 Iceland Greylag Geese) was therefore used as an estimated count in December. No counts of Iceland Greylag Geese were undertaken during any of the census periods in Southwest Norway, however, 385 birds (the number counted there in January 2013) was used as an estimated count for the November and December census periods.

An attempt was made to account 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.* 5,000), Orkney (*c.* 18,000 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 also been deducted.

Weather conditions were reported as good or reasonable for most sites in all three census periods, with three sites reporting counts being affected by disturbance in October and November and one in December. Poor visibility affected counting at one site in October, four in November and two in December. Overall, neither disturbance nor poor visibility were thought to have adversely affected the counts at principal sites.

3.2 Total numbers

3.2.1 Pink-footed Goose

Totals of 353,840 and 314,828 Pink-footed Geese were counted in October and November, respectively (Figure 1, Table 2). These represent increases of 117.7% and 28.6%, respectively, compared to the unadjusted total counts in the same months in the preceding year. Coverage was good and, for October, only one estimated count needed to be added to the unadjusted total and so the peak winter total in October 2012 was used to derive a population estimate of **359,175** geese. This represents an increase of 37.9% compared to November 2011, when a revised total of 260,325 individuals was estimated (see section 4.1, page 17 and Discussion). In 2012, 89.0% of the October count (unadjusted) was counted in November, and 68.9% in December (Table 3).

3.2.2 Greylag Goose

Totals of 128,250 and 109,146 Greylag Geese were counted in November and December, respectively (Figure 1, Table 2). The November count was 0.5% lower than that recorded in November 2011, whereas the December 2012 count was 5.9% lower than the unadjusted total count 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 2012 was used to derive a population estimate of **104,632** Iceland Greylag Geese. This represents a decrease of 12.7% compared to the previous estimate of 119,915 geese recorded in 2011 (see Section 4). In 2012, 85.1% of the total November count (unadjusted) was counted in December (Table 3).

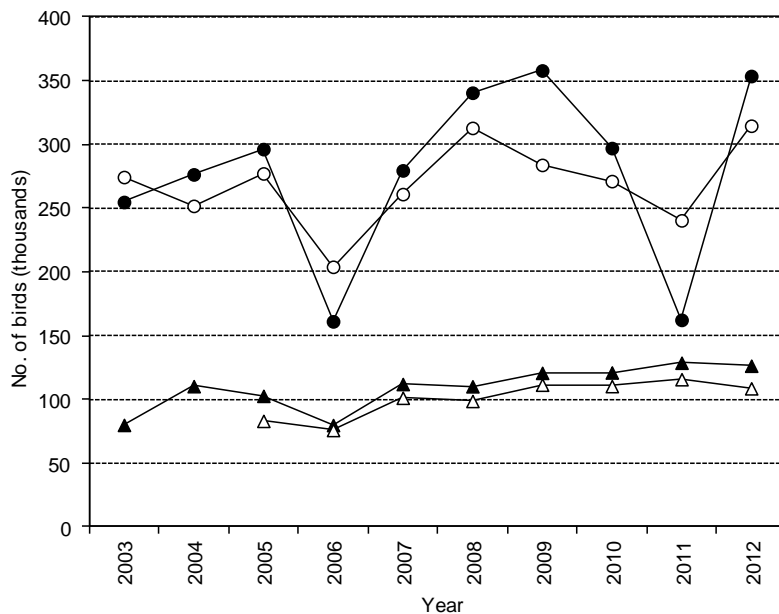


Figure 1. Peak (unadjusted) counts of Pink-footed Geese (circles) in October (filled) and November (open) and Iceland Greylag Geese (triangles) in November (filled) and December (open) counted during the Icelandic-breeding Goose Census, 2003 to 2012.

Table 2. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2012. 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 counted.

Region/Area	October 2012		November 2012		December 2012	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Iceland*	6,200 (1)	nc	nc	15,250 (1)	nc	3,944 (1)
Norway*	nc	nc	nc	nc	nc	nc
				[+385]		[+385]
Faroe Islands*	nc	nc	nc	nc	nc	nc
Ireland	nc	nc	0	3,474 (6)	nc	nc
				[-950]		[+2,524]
Shetland*	nc	nc	nc	nc	0	2,106 (1)
						[-2,106]
Orkney*	nc	nc	944 (1)	74,913 (1)	999 (1)	75,686 (1)
				[-18,000]		[-18,000]
Caithness*	nc	nc	1,155 (1)	16,324 (1)	2,380 (1)	12,920 (1)
				[-1,000]		[-1,000]
Highland	18,165 (12)	3,242 (10)	18,468 (15)	12,065 (15)	15,505 (12)	7,125 (12)
		[-750]		[-750]		[-750]
Moray	6,000 (1)	nc	0 (1)	0 (1)	10,000 (2)	9 (1)
Aberdeenshire	49,855 (6)	363 (7)	71,815 (5)	589 (5)	22,800 (6)	490 (7)
Angus/Dundee	48,325 (2)	nc	31,180 (1)	nc	22,708 (1)	nc
Perth & Kinross	35,117 (13)	330 (13)	30,357 (13)	930 (16)	22,660 (13)	2,265 (16)
		[-300]		[-300]		[-300]
Stirling/Falkirk/Clackmannan	16,237 (4)	840 (4)	6,975 (4)	640 (4)	2,445 (3)	144 (3)
		[-640]		[-640]		[-144]
Fife	10,759 (20)	751 (21)	16,574 (20)	1,706 (20)	8,167 (19)	873 (21)
		[-750]		[-750]		[-750]
Argyll & Bute	0	600 (1)	0	990 (1)	0	1,930 (1)
		[-500]		[-500]		[-500]
Clyde	nc	nc	nc	nc	nc	nc
Ayrshire	nc	nc	nc	nc	nc	nc
Dumfries & Galloway **	6,385 (5)	189 (6)	2,622 (5)	79 (6)	7,060 (5)	118 (5)
		[-189]		[-79]		[-118]
Cumbria **	7,738 (5)	218 (5)	6,185 (5)	103 (5)	5,518 (5)	0 (5)
		[-218]		[-103]		

Region/Area	October 2012		November 2012		December 2012	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Lothians	10,266 (15)	943 (15)	6,023 (19)	1,006 (19)	8,427 (20)	1,360 (20)
		[-750]		[-750]		[-750]
Borders	19,750 (13)	45 (13)	16,550 (13)	58 (13)	10,310 (14)	65 (14)
		[-45]		[-58]		[-65]
Northumberland	2,200 (7)	202 (7)	2,200 (6)	123 (6)	450 (5)	111 (5)
		[-202]		[-123]		[-111]
Lancashire & Merseyside*	77,683 (7)		62,890 (8)		39,697 (9)	
North Wales/Dee Estuary	180 (1)		1,350 (1)		1,400 (1)	
Humberside	7,200 (2)		5,360 (2)		3,050 (1)	
Lincolnshire						
Norfolk	31,780 (7)		34,180 (7)		60,535 (7)	
	[+5,335]					
<i>Raw total counts</i>	353,840	7,723	314,828	128,250	244,111	109,146
<i>Adjustment for non-Icelandic birds</i>	n/a	[-4,344]	n/a	[-24,003]	n/a	[-24,594]
<i>Estimated counts</i>	[+5,335]			[+385]		[+2,909]
Population Estimate	359,175			104,632		

* 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 applicable

3.3 Regional Distribution

3.3.1 Pink-footed Goose

It would appear that the mass arrival of Pink-footed Geese into Britain occurred just before the October 2012 count weekend (see Discussion). Nearly one third of the population had arrived in East Central Scotland, just over a fifth in Southwest Lancashire and a tenth in Norfolk by the middle of the month. By November, the proportion found in Northeast Scotland had increased perhaps reflecting the arrival of birds from Iceland and a redistribution of geese from East Central Scotland (notably Montrose Basin). By December, a wave of Pink-footed Geese had moved through Scotland and larger numbers could be found in Norfolk.

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. It is doubtful now that any Greylag Geese encountered south-east of the Moray Firth in October are Icelandic (see Discussion). During November, only 10% of the population was still in Iceland and four fifths were present in North Scotland, principally in Orkney (Table 3, Figure 3). The distribution in December was similar to November, although nearly 4,000 birds still remained in Iceland (see Discussion).

Table 3. National and, within Britain, regional distribution of Pink-footed Geese and Iceland Greylag Geese counted during October, November and December 2012, expressed as a percentage of the maximum count for each species. Estimated counts not included.

Country/region	Pink-footed Goose			Greylag Goose		
	Oct	Nov	Dec	Oct	Nov	Dec
Iceland	1.8	0	0	nc	10.0	2.6
Ireland	0	0	0	nc	2.9	nc
North Scotland	5.1	5.8	5.3	2.6	80.8	78.6
Northeast Scotland	15.8	20.3	9.3	0.2	0.4	0.3
East Central Scotland	31.2	24.0	15.8	2.4	3.3	2.9
Southwest Scotland/ Northwest England	4.0	2.5	3.6	1.3	1.2	1.8
Southeast Scotland/ Northeast England	9.1	7.0	5.4	1.4	1.4	1.6
West England	22.0	18.2	11.6	0	0	0
East England	11.0	11.2	18.0	0	0	0
Total	100	89.0	69.0	7.9	100	87.8

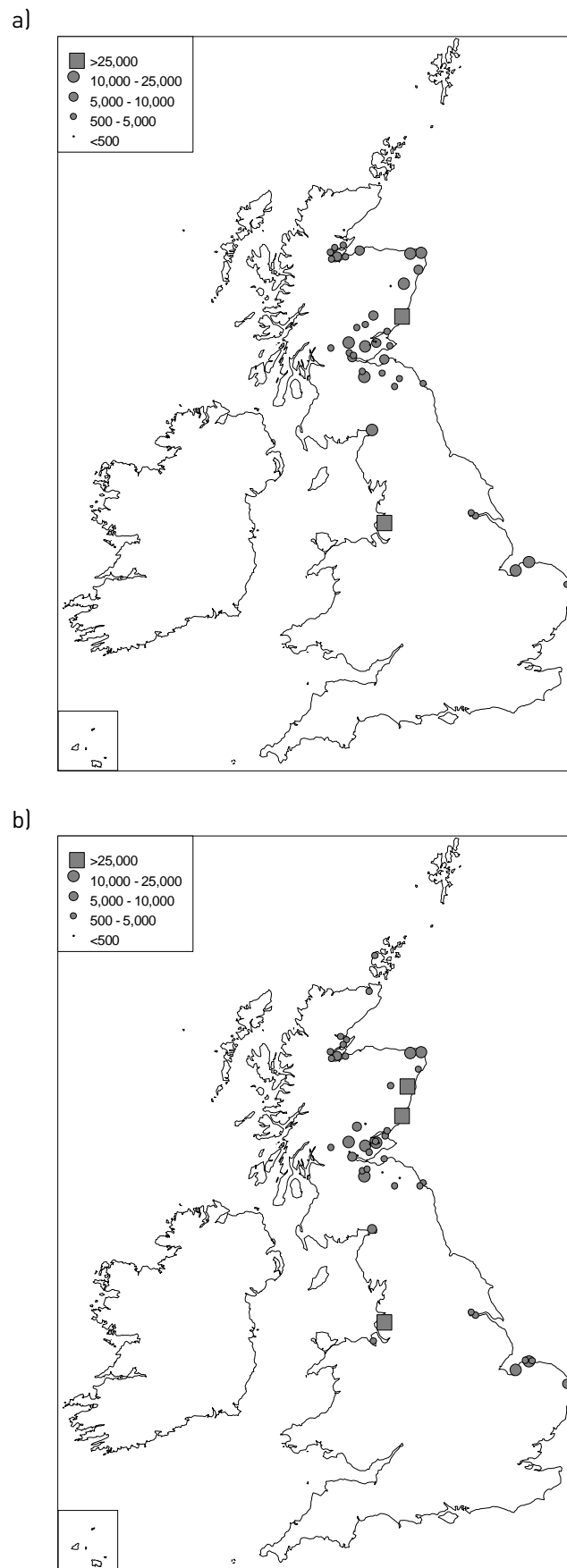


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a) and November (b) 2012. Estimated counts are not shown.

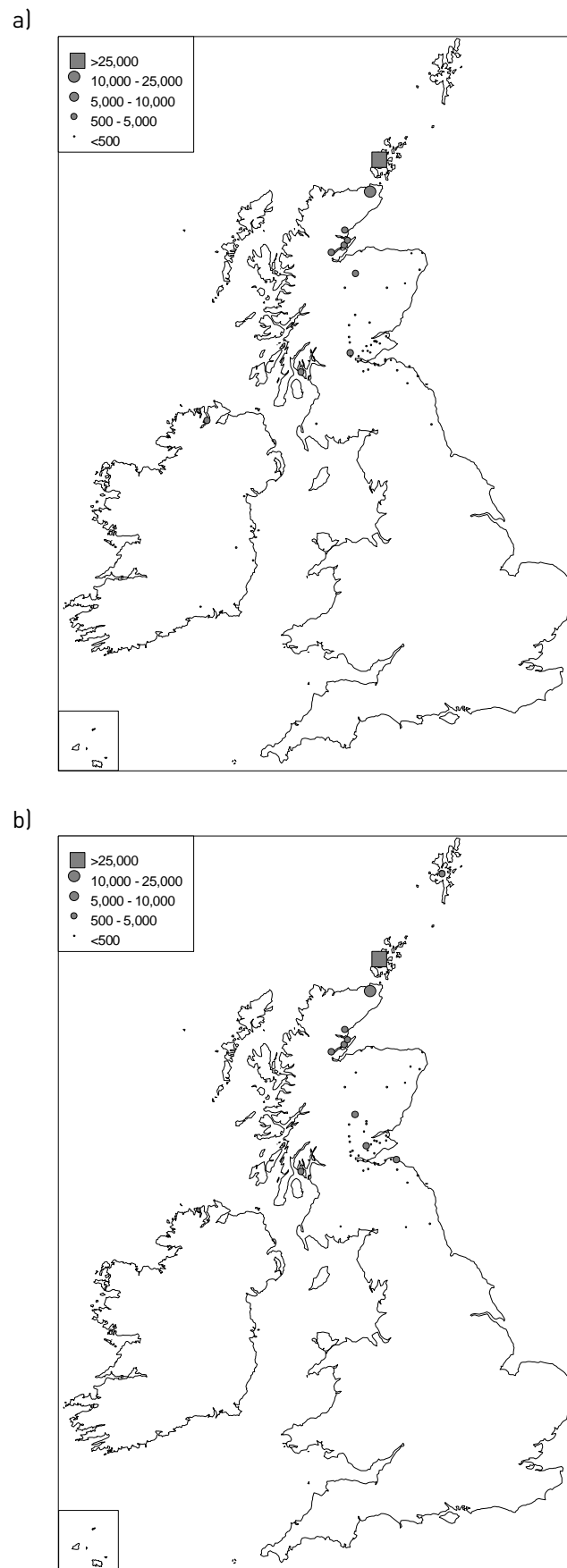


Figure 3. Distribution of Iceland Greylag Geese in Britain and Ireland in November (a) and December (b) 2012. Estimated counts are not shown.

3.4 Principal concentrations

3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 61 sites in October, 64 in November and 50 in December (Table 1). The number of sites holding more than 1% of the 2012 population estimate (3,592 birds) was 25 in October, 19 in November, and 17 in December. Eleven sites held over 10,000 birds in October and November and 10 in December. Combined counts from the 25 sites exceeding 1% of the population estimate accounted for 90.7% of the total October count and numbers at the top five sites alone held a half of the population estimate (Table 4). The most recent peak IGC counts from the two sites holding the highest mean peak counts in 2008 to 2012 (Southwest Lancashire and Montrose Basin) are shown in Figure 4.

In October, high numbers were recorded in Southwest Lancashire which held 21.6% of the population estimate, Montrose Basin, Angus (11.3%), Carsebreck & Rhynd Lochs, Perth & Kinross (5.8%), Loch of Strathbeg, Aberdeenshire (4.6%) and Holkham, Norfolk (4.5%). The highest count recorded for the IGC was 63,844 Pink-footed Geese on 21 September at Montrose Basin, three weeks before the October census weekend. It appears, therefore, that there was an influx of large numbers of Pink-footed Geese into northern Britain at the end of September, unlike in autumn 2011 when many sites held peak numbers after the October census that year (see Discussion).

Higher than recent (2007 to 2011) average numbers in October 2012 were recorded at: Alloa Inch (Upper Forth), Cromarty Firth: Nigg Bay (Highland), Skinflats (Upper Forth), Holkham Bay (Norfolk), Inner Cromarty Firth: Dingwall (Highland), Lake of Menteith (Stirling), Loch Flemington (Highland), Loch of Skene (Aberdeenshire), Loch Tullybelton (Perth & Kinross), Middlemuir (Aberdeenshire), Munloch Bay (Highland), Peppermill Dam (Fife), Snettisham (Norfolk), Solway Firth and Southwest Lancashire. Lower than recent average numbers (2007 to 2011) were recorded in October 2012 at: Aberlady Bay (Lothians), Hule Moss (Borders), Loch of Strathbeg (Aberdeenshire), Meikle Loch (Aberdeenshire), Burnham Norton (Norfolk), Scolt Head (Norfolk), Wells (Norfolk) and West Water Reservoir (Borders).

Traditionally, counts of Pink-footed Geese in Southwest Lancashire have been reported as a single consolidated site. This was partly because some counts were being undertaken during the day in feeding areas. However, since 2010, efforts have been made to count the geese using the roosts in Southwest Lancashire (Table 5).

3.4.2 Greylag Goose

By November, 55 sites held Iceland Greylag Geese (Table 1), only eight of which held numbers exceeding 1% of the population estimate (1,046 birds) (this considers Orkney and Iceland as single consolidated sites). Excluding an estimated 18,000 summering birds (but see Discussion), Orkney held 54.4% of the total population estimate. The total unadjusted count of 74,913 Greylag Geese in Orkney in November was 13.7% higher than that counted in the same month in 2011. Greylag Geese were recorded at 58 sites in December, with eight sites exceeding 1% of the population estimate.

Higher than recent average numbers (2007 to 2011) were recorded in November 2012 in Caithness and Cromarty Firth: Nigg Bay (Highland). Lower than recent average numbers (2007 to 2011) were recorded in November 2012 at: Beaully Firth (Highland), Bute (Argyll & Bute) and Dornoch Firth (Highland).

Fewer Iceland Greylag Geese are now wintering in Scotland south of the Moray Firth, reflecting the recent movement to wintering sites in North Scotland (see Discussion).

Table 4. Sites that supported >1% of the (a) Pink-footed Goose (>3,592) and (b) Iceland Greylag Goose (>1,046) population estimates in October and November 2012, 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 3,500 for Pink-footed Goose and 980 for Iceland Greylag Goose (Wetlands International 2012). 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 2007–2011 ¹
Southwest Lancashire	77,683	21.6	65,044
Montrose Basin, Angus	40,715	11.3	37,867
Carsebreck & Rhynd Lochs, Perth & Kinross	20,700	5.8	14,690
Loch of Strathbeg, Aberdeenshire	16,700	4.6	30,491
Holkham, Norfolk	16,300	4.5	19,529
West Water Reservoir, Borders	15,800	4.4	25,318
Middlemuir, Aberdeenshire	14,800	4.1	8,840
Solway Estuary	14,123	3.9	15,689
Snettisham, Norfolk	12,650	3.5	28,540
Loch of Skene, Aberdeenshire	11,940	3.3	14,765
Loch Leven, Perth & Kinross	10,217	2.8	11,532
Loch of Lintrathen, Angus	7,610	2.1	4,541
Skinflats, Upper Forth	6,950	1.9	2,456
Meikle Loch, Aberdeenshire	6,290	1.8	13,740
Findhorn Bay, Moray	6,000	1.7	8,890
Aberlady Bay, Lothians	5,577	1.6	16,562
Ramorie/Balmalcolm area, Fife	5,250	1.5	n/a
Munlochy Bay, Highland	5,000	1.4	1,940
Lake of Menteith, Stirling	4,987	1.4	1,828
Read's Island Flats, Yorkshire	4,400	1.2	4,066
Alloa Inch, Upper Forth	4,300	1.1	990
Inner Cromarty Firth: Dingwall Bay, Highland	4,000	1.1	556
Fala Flow, Lothians	3,779	1.1	4,817
Loch Tullybelton, Perth & Kinross	3,700	1.0	1,390

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

b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2007–2011 ¹
Orkney Islands (all sites) ²	74,913	71.6	73,581
Caithness	16,324	15.6	8,796
Iceland (lowlands)	15,250	14.6	23,024
Cromarty Firth: Nigg Bay, Highland	3,900	3.7	228
Ireland (all sites)	3,474	3.3	2,998
Loch Eye, Highland	2,378	2.3	2,359
Loch Fleet, Highland	2,200	2.1	1,692
Lower Strathspey, Highland	1,764	1.7	766

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

²Unadjusted counts (see text and Table 2).

Table 5. Counts of Pink-footed Geese at roost sites in Southwest Lancashire in October 2012.

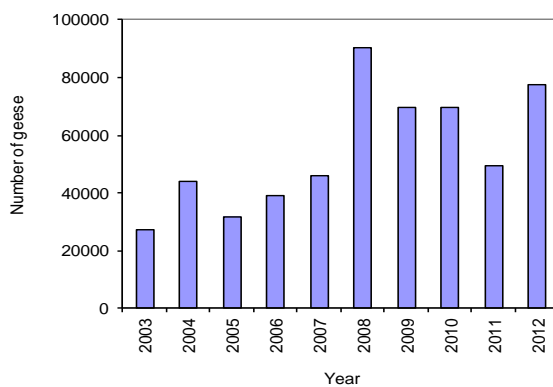
Count site	SPA	October 2012
Pilling to Cockerham	Morecambe Bay SPA	29,082
Alt Estuary	Ribble/Alt Estuaries SPA	20,200
Ribble Estuary	Ribble/Alt Estuaries SPA	8,801
Wyre Estuary	Morecambe Bay SPA	7,300
Martin Mere	Martin Mere SPA	6,150
Simonswood Peat Moss		3,500
Cocker's Dyke	Morecambe Bay SPA	2,650
Total		77,683

For the purpose of analysis, Orkney is treated as a consolidated site, although Table 6 shows the individual totals for the islands. Nine of the count areas in Orkney held numbers exceeding 1% of the population estimate in November, although these individual counts are not adjusted for the presence of Greylag Geese breeding in Orkney (thought to number *c.* 18,000 birds, but see Discussion) since such data are only available for Orkney as a whole. As in 2009 to 2011, only on East Mainland and West Mainland were more than 10,000 birds recorded.

Table 6. Greylag Goose counts at individual sites in Orkney in November and December 2012 (counts have not been adjusted to take into account the number of Greylag Geese summering in Orkney since data on their numbers are only available for Orkney as a whole). Five year peak mean derived from counts from 2007 to 2011.

Site	November count	% of population estimate	December count	Five-year peak mean
West Mainland	31,871	30.5	31,427	31,382
East Mainland	15,476	14.8	13,984	15,423
Stronsay	5,068	4.8	6,181	5,979
Shapinsay	5,649	5.4	4,106	6,180
South Ronaldsay	4,731	4.5	6,620	6,555
Sanday	4,494	4.3	4,500	5,326
Eday	933	0.9	1,707	1,673
Papa Westray	1,401	1.3	1,258	1,298
Rousay	693	0.7	637	2,043
Egilsay	92	0.1	375	607
Westray	1,670	1.6	2,816	2,370
North Ronaldsay	664	0.6	898	1,267
Hoy and Walls	316	0.3	547	1,025
Wyre	325	0.3	52	270
Burray	1,243	1.2	250	479
Flotta	217	0.2	328	263
Graemsay	70	0.1	0	0
Total	74,913	71.6	75,686	

a) Southwest Lancashire



b) Montrose Basin, Angus

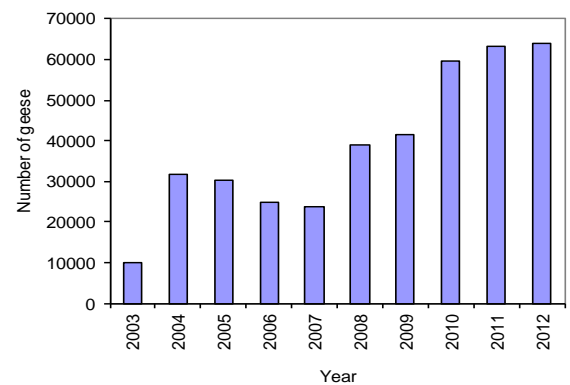


Figure 4. Peak IGC counts of Pink-footed Geese at a) Southwest Lancashire and b) Montrose Basin, Angus 2003 to 2012.

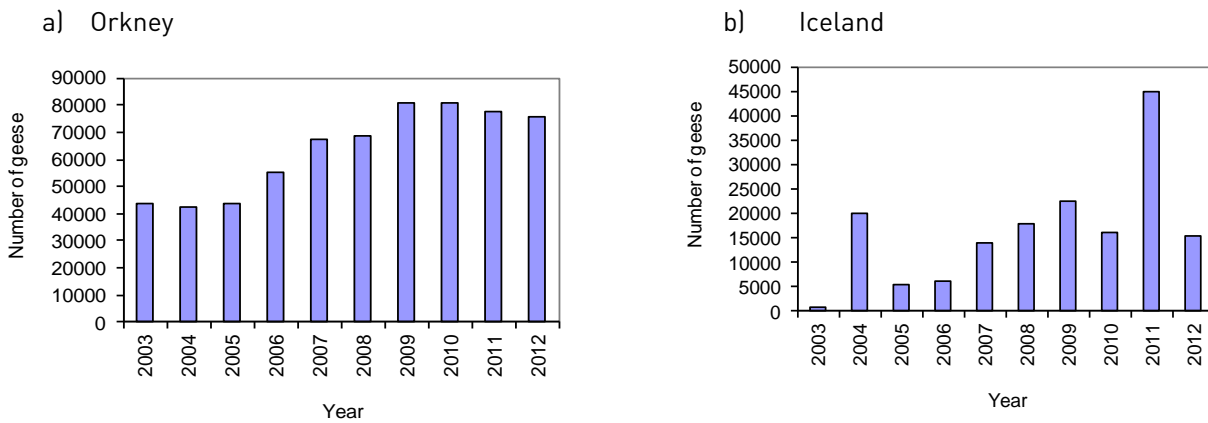


Figure 5. Peak IGC counts of Iceland Greylag Geese at a) Orkney (includes summering birds) and b) Iceland, 2003 to 2012.

3.5 Breeding success

Totals of 10,441 Pink-footed Geese (from 32 flocks) and 2,580 Greylag Geese (27 flocks) were aged at various localities primarily in Scotland between 19 September and 15 November. The percentage of birds aged in relation to the estimated size of the population in 2012 was 2.9% for Pink-footed Geese and 2.5% for Greylag Geese. Information on the brood sizes of 88 families of Pink-footed Goose and 28 families of Greylag Goose was also collected during this period.

The breeding success of Pink-footed Goose was higher than the mean for the previous decade at 21.1% young (mean proportion of young 2002–2011: 18.5%, ± 1.22 SE). The mean brood size of successful pairs was 2.3 goslings, higher than the mean recorded during the preceding ten years (2.08, ± 0.07 SE) (Table 7, Figure 6).

There was evidence of modest regional variation in the percentage of young Pink-footed Geese, which varied from 19.9% in East Central Scotland to 23.4% in North East Scotland (Table 7). Similarly, mean brood size varied from 2.24 goslings in North East Scotland to 2.66 in South East Scotland. The percentage young was highest in late September and typically 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 similar to the mean for the previous decade, with flocks containing 21.7% young (mean 2002–2011: 21.9%, ± 1.03 SE). The mean brood size of 2.36 goslings per successful pair was also similar to that of the recent ten year mean (2.37, ± 0.11 SE) (Table 7, 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 one region (North Scotland) during November.

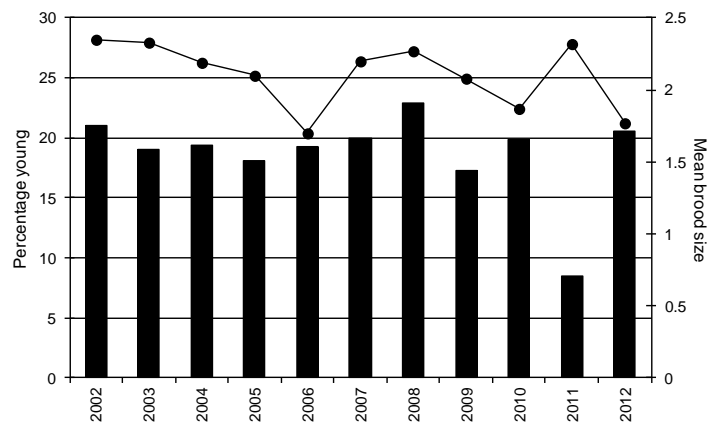
Table 7. The percentage of young and mean brood size of Pink-footed and Greylag Geese in 2012.

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose ¹	Northeast Scotland	3,061	23.4	72	2.24
	East Central Scotland	6,412	19.9	13	2.62
	Southeast Scotland	928	21.4	3	2.66
	East England	40	20.6		
	Total	10,441	21.1	88	2.30
Greylag Goose ²	North Scotland	2,580	21.7	28	2.36
	Total	2,580	21.7	28	2.36

¹Pink-footed Geese aged between 19 September and 30 October 2012.

²Greylag Geese aged between 12 and 15 November 2012.

a) Pink-footed Goose



b) Greylag Goose

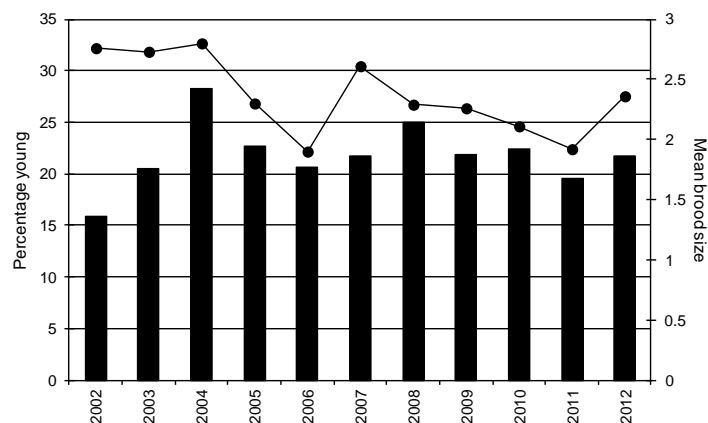


Figure 6. The percentage young (column) and mean brood size (line) found in flocks of (a) Pink-footed Goose and (b) Iceland Greylag Goose, 2002 to 2012.

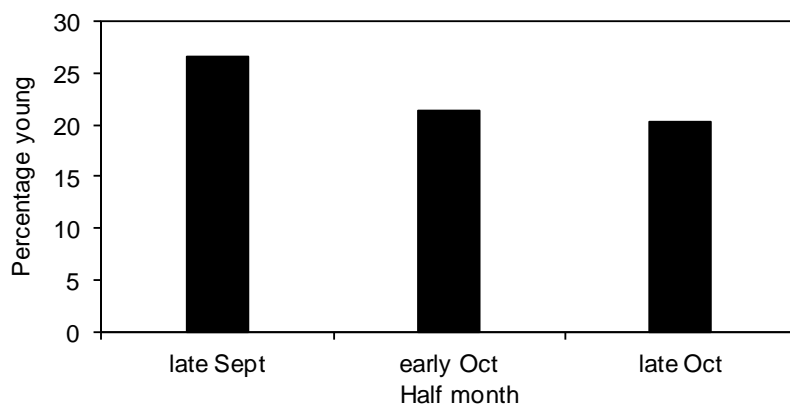


Figure 7. Mean percentage young of Pink-footed Geese during half-monthly periods of autumn 2011.

4 Revised population estimates

4.1 2011 Census (Mitchell 2012)

Late count data were received from one site in Perth & Kinross, and affects the Pink-footed Goose population estimate for 2011 given in Mitchell (2012) (Table 8).

Table 8. Revised Pink-footed Goose count and population estimate for 2011.

Region/Area	October	November	December	February
Perth & Kinross	19,256 (9)	26,987 (18)	12,094 (14)	10,118 (15)
Raw total counts	166,298	258,325	207,783	178,146
Estimated	+5,000	+2,000		
Population Estimate		260,325		

Due to late submission of data and a small number of errors, there have been five revisions to the Pink-footed Goose population estimates over the last eight years. It is proposed that these revised population estimates (Table 9) are adopted and will appear in future analyses and publications.

Table 9. Revised Pink-footed Goose population estimates for 2004 to 2011.

Year	Previous published Pink-footed Goose population estimate ¹	Revised Pink-footed Goose population estimate
2004	292,154	276,644
2005	268,650	302,774
2006	229,123	230,123 ²
2007	287,563	284,405
2008		351,188
2009		364,212
2010		297,798 ²
2011	246,725	260,325 ²

¹ given where the population estimate has subsequently been revised.

² considered an underestimate (see text in corresponding annual IGC report).

4.2 Iceland Greylag Geese

The Icelandic Greylag Goose population estimates were revised by Trinder *et al.* (2010) based on adjustments being made to the number of British Greylag Geese in Orkney. A census in summer 2008 found *c.*10,000 Greylag Geese on the archipelago and, based on projections of population growth, the number of summering geese expected to be resident there was calculated. These projected values were then deducted from the winter counts. In late August 2012, a second summer census found 21,367 Greylag Geese in Orkney (Mitchell *et al.* 2012). However, by the time of the November IGC count at least 3,191 Greylag Geese were known to have been shot as part of a pilot management programme managed by Scottish Natural Heritage (SNH). Thus, the total number of British Greylag Geese thought to be present in Orkney in November was rounded down to 18,000. It was then possible to revise the Icelandic Greylag Goose population estimates for the period 2009 to 2011, and update the table in Trinder *et al.* (2010) (Table 10).

It is proposed that these revised population estimates are adopted and will appear in future analyses and publications.

Table 10. Revised Greylag Goose population estimates for 1985 to 2012.

Year	Previous total Icelandic Greylag goose population estimate	Previous adjustment to allow for numbers resident in Orkney ¹	Projected numbers resident in Orkney ²	Difference between old and new adjustments	Revised total Icelandic Greylag goose population estimate
1985	106,670	0	100	100	106,570
1986	102,000	0	123	123	101,877
1987	104,790	0	152	152	104,638
1988	108,700	0	187	187	108,513
1989	83,577	0	231	231	83,346
1990	114,678	0	285	285	114,393
1991	88,272	0	351	351	87,921
1992	98,144	0	433	433	97,711
1993	99,253	0	534	534	98,719
1994	86,132	0	658	658	85,474
1995	82,722	0	811	811	81,911
1996	79,576	0	1,000	1,000	78,576
1997	79,477	0	1,233	1,233	78,244
1998	83,096	0	1,520	1,520	81,576
1999	75,866	0	1,874	1,874	73,992
2000	80,324	1,500	2,310	810	79,514
2001	89,628	1,500	2,848	1,348	88,280
2002	73,115	1,500	3,511	2,011	71,104
2003	81,131	4,000	4,329	329	80,802
2004	107,207	4,000	5,337	1,337	105,870
2005	98,243	4,000	6,579	2,579	95,664
2006	82,339	5,000	8,111	3,111	79,228
2007	105,630 ³	5,000	10,000	5,000	100,630
2008	98,291	10,000	11,640	1,640	96,651
2009	109,496	10,000	13,549	3,549	105,947
2010	110,962	10,000	15,771	5,771	105,191
2011	119,915	10,000	18,357	8,357	111,558
2012	104,632	18,000	18,000 ⁴	0	104,632

¹WWT adjustment applied to figures reported each year since 2000.

²Growth of resident population modelled by Trinder *et al.* (2010) as an exponential increase, based on the increase of reported breeding pairs (Meek 2008). From 2008 to 2011, the exponential increase was continued.

³Revised from a previous estimate of 107,137 published in Trinder *et al.* (2010) in Mitchell (2009).

⁴The summer survey found 21,367 Greylag Geese in Orkney but, by the time of the November IGC count, at least 3,191 Greylag Geese were known to have been shot as part of a pilot management programme managed by SNH. Thus, the total number of British Greylag Geese thought to be present in Orkney in November 2012 was rounded down to 18,000.

5 Errata for 2012 report

Due to an error in coding the location of Pink-footed Goose age counts in 2011, the numbers presented in Table 6 in Mitchell (2012) were incorrect. The overall breeding success figures for Pink-footed Goose were unaffected but the correct geographical breakdown of the summary data are given below.

Table 11. Revised version of Table 6 that was presented in Mitchell (2012); providing corrected Pink-footed Goose age assessment figures for 2011.

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose ¹	Northeast Scotland	4,592	10.1	62	1.89
	East Central Scotland	6,276	8.1	17	1.35
	Northwest England	2,891	6.9	0	-
	Total	13,759	8.5	79	1.77
Greylag Goose ²	South Iceland	717	16.3	8	2.13
	North Scotland	1,546	21.1	31	1.87
	Total	2,263	19.6	39	1.92

¹ Pink-footed Geese aged between 15 September and 1 November 2011.

² Greylag Geese aged between 5 November and 3 December 2011.

6 Discussion

A mass arrival of Pink-footed Geese occurred in early autumn 2012 with large numbers of geese reported at a number of key sites; Montrose Basin, Angus, for example, held 63,844 on 21 September. Allan Brown organised a separate goose count in Fife, Lothians and Borders on 29/30 September 2012. Counters found a total of 57,483 Pink-footed Geese, some 16,708 more than were present at the time of the IGC count in mid October. It is well known that some key wetland sites support higher numbers of geese soon after they arrive in northern Britain, and numbers decline as geese move south within Scotland or onto Lancashire and Norfolk. Unusually heavy snowfall in early to mid September affected many part of Iceland, particularly in the north of the country, and this may have prompted an early migration south.

The 2012 population estimate of 359,175 was 37.9% higher than the revised figure for November 2011 (260,325 in Table 9). This is the second highest population estimate ever recorded, the highest being 364,212 in 2009. Breeding success in 2012 was slightly above average (see below) but cannot alone account for the large increase between years. This confirms that the counts of autumn 2011, and probably in 2010, underestimated the total number of geese in the population in those years. A late, or staggered, departure from Iceland, where large numbers of Pink-footed Geese can remain uncounted (and probably uncountable) can hinder the assessment of the true population size. However, in 2010 the November count was lower than the October count, suggesting that an overall decline in numbers had probably occurred and that mass arrivals did not occur after the October census. In 2011, migration occurred later in the autumn and clearly geese were still in Iceland at the time of the October census since the November count was *c.* 80,000 higher than in October. It is suspected that between 2009 and 2012, the population of Pink-footed Geese did decline, particularly given that the 2011 breeding season was poor (see Mitchell 2012) but the magnitude of the decline is difficult to gauge.

Despite the year on year variation in counts, the long term trend appears to be one of continued increase. The population appears to have bounced back to over 350,000 individuals and is considered to be in favourable conservation status (Figure 8). Given the unpredictability of the timing of departure from Iceland, it would appear prudent to maintain annual coverage of sites holding Pink-footed Geese in both October and November, and, whenever possible, choose weekends dates near the middle of the month for the census.

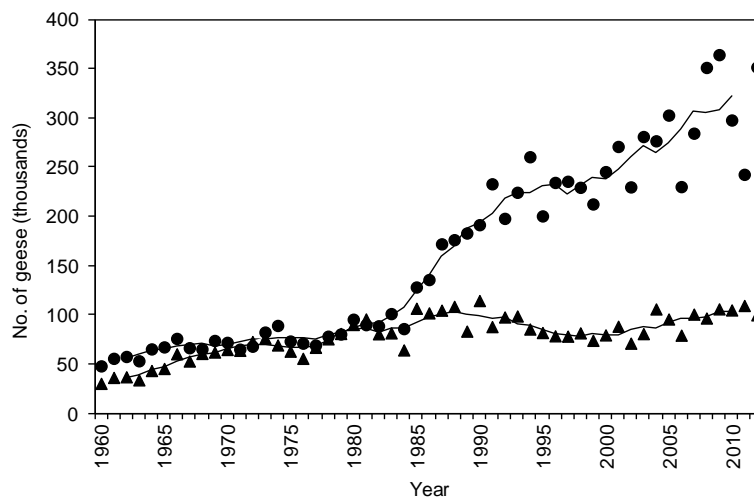


Figure 8. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2012. The 5-year running means (*e.g.* mean for 2010 is from population estimates for 2008 to 2012) are shown as lines. Both population estimates follow revisions set out in Tables 9 and 10.

Pink-footed Goose breeding success in summer 2012, at 21.1%, was slightly higher than the long term average of 18.5%. Reports from Iceland suggest reasonable weather during the spring and summer months with no late snowfall or prolonged rain. The high productivity was also confirmed by the proportion of young in the Iceland bag; at 45%, this was the highest recorded since data was first collected in 1993 (A. Sigfússon *in litt.*). Hunting of Pink-footed Geese in Iceland appears stable with 11,855 shot in 2011 (the year for which the most recent data

are available) compared to a mean of 14,291 for the ten year period 2001 to 2010. Unfortunately, no comparable data exists for the number shot in the UK.

The November 2011 count of Iceland Greylag Geese was thought to be reasonably comprehensive with sites being covered throughout most of the winter range although, once again, no counts were able to be undertaken in the Faroe Islands. Coverage in Ireland 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, particularly in Northern Ireland, is greater than reported here. Counts in southwest Norway were low compared to recent years.

The timing of the census of Iceland Greylag Geese is important in confidently assessing their abundance. In some years, the migration of Greylag Geese from Iceland to Scotland and other winter haunts can be staggered; in other years there can be a mass exodus. The timing of the movement can be as early as late October and as late as the second half of November. In autumn 2012, there appeared to have been an early departure from Iceland with 128,250 birds counted throughout their range mid month, and only *c.* 15,250 remained in Iceland at that time. In comparison, in mid-November 2011, *c.* 43,000 were in Iceland. A new update on the number of Greylag Geese summering in Orkney (21,367 counted in August 2012) meant that alterations to the Iceland population estimates for 2012 and the previous three years could be made (see 4.2 above). This reduces the size of the population estimates for these years (by almost 7% in 2011).

Orkney continues to hold the bulk of the winter stock. After deducting the number of Greylag Geese thought to be resident on the archipelago (based on a summer survey carried out in August 2012), and taking account of those shot under a pilot management programme, an estimate of 57,686 Iceland birds were thought to be present in December. Caithness had unusually high counts in both November (16,324) and December (12,920). It is interesting to speculate whether the increase in shooting in Orkney as part of the pilot management programme displaced birds to the nearby Caithness feeding grounds.

Breeding success in the Iceland Greylag Goose population appeared to be average in 2012 (21.7%), although the figure was based on a small sample size. Due to their later migration and more limited range, age counts were only collected in one region (North Scotland) during November. Monitoring annual breeding success for this population is becoming more difficult because the main wintering areas (Orkney, Caithness and around the Moray Firth) hold ever larger numbers of British Greylag Geese and separating birds from each population is impossible in the field. It is possible that the only way of getting a valid assessment of annual breeding success for this population is by checking birds in Iceland in the autumn. Although that would alter the methodology employed since 1960 of checking the age ratios after the autumn migration.

In Shetland, post breeding and winter surveys of Greylag Geese in 2010 and 2011 have revealed a summer population of *c.* 5,000 birds that is joined by up to *c.* 2,000 winter migrants (Harvey *et al.* 2012). Ringing of a small number of British Greylag Geese there in July 2011 and 2012 revealed that that only one bird left the islands, hence it is likely that the summer stock is largely sedentary. The count from December 2012 of 2,106 Greylag Geese was incomplete and well short of the *c.* 5,000 birds thought to be resident on the archipelago. Thus, the count has been treated as referring to British Greylag Geese.

The number and distribution of British Greylag Geese continues to increase and present problems in identification of the provenance of Greylag Geese encountered on the winter quarters. Guidance from IGC counters in other parts of Scotland suggest that at the time of the November IGC count, the number of Iceland Greylag Geese occurring at sites south of the Moray Firth, Badenoch & Strathspey, Aberdeenshire and east of Bute has diminished over the last 15 years. Thus, for many areas, notably, Northumberland, Dumfries & Galloway, the Borders, Lothians, parts of Fife, parts of Angus and parts of Perth & Kinross, the number of Greylag Geese counted in November are similar to those counted in October and probably refer to British Greylag Geese. Several counters from southeast Scotland have suggested that, in late autumn, no Iceland Greylag Geese are likely to occur there at that time. The results of the February 2012 survey (Mitchell 2012) however, indicate that birds from Iceland probably do occur at former important sites later in the winter (e.g. 1,317 at Loch Lomond, Argyll; 1,230 at Loch of Lintrathen, Angus; 1,110 at Loch of Skene, Aberdeenshire). This strengthens the value of the periodic late winter counts, which we hope to repeat every three years.

Bute remains an important area that does attract large numbers of Iceland Greylag Geese from November onwards and ring sightings of marked birds confirm that most of these are from Iceland. However, even here,

the number of British Greylag Geese is increasing, with an estimated 500 birds present in late summer 2012 (I. Hopkins *in litt.*).

Thus, as the abundance and distribution of British Greylag Geese increases, it is getting ever harder to separate, and hence accurately record the abundance of Iceland migrants. Regular summer surveys in key areas (e.g. Orkney) give figures that can be deducted from the IGC counts, but summer surveys of large parts of south and east Scotland would be very difficult to orchestrate on an annual basis. Certainly some key sites in south and east Scotland that formerly held large numbers of Iceland migrants (e.g. Lindisfarne in Northumberland, Drummond Loch, Loch Leven and Carsebreck & Rhynd Lochs in Perth & Kinross, and Loch of Skene, Dinnet Lochs and Haddo Country Park in Aberdeenshire) hold virtually no Iceland migrants at the time of the autumn IGC counts. Any geese that are counted at most of the lochs in south and east Scotland during IGC are now far more likely to be British Greylag Geese.

Peak counts of Iceland Greylag Geese have occurred in November in each year since 2005, but due to the varying arrival time of migrants from Iceland, and given the recent shifts in winter distribution, it would appear prudent to maintain coverage of sites holding these birds in both November and December.

7 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 Adam, H Addelee, B Anderson, R Anderson, V Anderson, I Andrews, K Ashton, S Ashton, J Ballantyne, R Ballinger, S Barratt, B Bates, C Batty, P Batty, A Bedford, MV Bell, B Black, W Braid, A Bramwall, J Branscombe, T Brewis, I Brockway, A Brown, AW Brown, L Brown, D Brown, J Brown, DM Bryant, JC Burrow, C Bushell, P Buskin, J Calladine, E Cameron, G Catley, NC Chambers, G Checkley, A Cheshier, E Christie, T Clare, J Clarke, M Clarke, G Clarkson, M Cockram, I Combe, R Cooper, C Corse, A Cotton, A Craggs, A Cross, P Culley, T Cunningham, JD Daisley, IS Davidson, R Dennis, T Dodman, L Dow, A Duff, K Duncan, J Dunn, S Dunstan, B Edwards, S Elliott, J English, B Etheridge, C Ferries, P Fletcher, A Forsythe, S Foster, IS Francis, M Ginns, N Godden, D Graham, M Graham, R Graham, H Gray, L Griffin, GA Guðmundsson, G Guthrie, SR Hacker, J Hain, N Harper, J Harrison, K Heath, R Heath, A Heavisides, M Henderson, F Hewlett, P Higson, D Hill, P Hollindrake, N Holton, I Hopkins, R Humpidge, J Huntley, M Hutcheson, H Insley, M Jamieson, D Jardine, S Jennings, G Johnston, B Jones, N Keogh, K Kirk, M Kitching, A Knight, M Laurie, D Law, AJ Lawrence, A Leitch, L Lenehen, A Leonard, I Lewis, S Longster, J Lough, D Macaskill, J Mackay, D Mallett, B Martin, S Martinez, P Massey, D Matson, W Mattingley, C Mawby, FJ Mawby, B McCutcheon, J McCutcheon, E Meek, N Mitchell, P Moore, C Moses, R Murray, M Newell, C Nisbet, B O'Dowd, G Ogg, D Otter, L Oxley, J Palfery, D Parkinson, IJ Patterson, A Perkins, A Piggot, S Piner, B Rains, C Rankine, ER Rawling, K Redgrave, C Reid, B Ribbands, J Roberts, D Robertson, K Robeson, A Robinson, North Ronaldsay Bird Observatory, M Rooney, M Ross, J Rowe, J Scott, D Shapley, D Shepherd, R Sheppard, L Shields, KH Skarphéðinsson, A Sigfússon, R Singleton, A Smart, C Smith, J Smith, R Smith, T Smith, A Smout, M Souter, A Speer, Squire, A Steel, G Stürzaker, R Strachan, R Swann, F Symonds, P Tapsell, P Tarling, NW Taylor, CT Teago, A Thiel, M Thompson, R Thorne, M Thornton, C Tomlinson, V Turnbull, A Upton, P Walsh, S Welch, B Weston, R Weston, H White and J Wills.

In Iceland, ground counts were organised by Guðmundur Guðmundsson, Kristinn Haukur Skarphéðinsson and Arnór Sigfússon. Arne Follestad provided counts from Southwest Norway. Olivia Crowe and Helen Boland provided counts from Ireland. Additional age counts were provided by Ian Patterson and David and Pat Wileman. Support was also provided by Kane Brides and Colette Hall at WWT Slimbridge. Thanks also to Richard Hearn and David Stroud for comments on an earlier draft of this report.

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