



Status and distribution of
Icelandic-breeding geese: results of
the 2013 international census

Wildfowl & Wetlands Trust Report

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Goose & Swan Monitoring

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Summary

The 54th consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2013. 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 very good, with the majority of the key sites covered. Count data were also received from Southwest Norway, Ireland and Iceland, the latter based on both aerial survey and ground counts. Weather conditions were generally considered favourable during the census periods with very few sites reporting underestimated counts.

Maxima of 372,074 Pink-footed Geese and 117,432 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 **372,074** Pink-footed Geese and **88,577** Iceland Greylag Geese. Compared to the previous year, the 2013 figures represent an increase of 3.6% in the Pink-footed Goose population and a decrease of 15.3% in the Greylag Goose population.

The breeding success of Pink-footed Geese was slightly lower than the mean for the previous decade at 17.1% young (mean percent young 2003–2012: 18.6%). The mean brood size of successful pairs was 2.16 goslings, which was slightly higher than the mean recorded during the preceding ten years (2.08). The breeding success of Iceland Greylag Geese was also similar to the mean for the previous decade with flocks containing 22.2% young (mean percent young 2003–2012: 22.4%), and the mean brood size of 2.23 goslings per successful pair was also similar to that of the most recent ten year mean (2.33) 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 54th consecutive census and an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2013 breeding season.

2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 12/13 October, 9/10 November, 7/8 December 2013. 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 (18 October, 17 November and 17 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 could be 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 2013 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 (2008–2012). 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 2013 was very good, especially in October and 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 2013.

	October	November	December
Number of Pink-footed Goose sites counted	131	151	142
Total number of sites holding Pink-footed Geese	70	72	55
Number of Greylag Goose sites counted	102	135	112
Total number of sites holding Greylag Geese	43	65	50

Outwith Britain, a combination of aerial survey and information from hunters provided an estimate of goose numbers in Iceland in autumn 2013 (see Discussion). Data were also received from several sites in Southwest Norway in January 2014. In Ireland, full coverage of sites was not possible (as had been carried out in autumn 2007) but counts from 13 sites thought to hold Iceland Greylag Geese were provided for November. No counts were received from the Faroe Islands.

No sites met the criteria for the calculation of an estimated count due to lack of coverage. In Ireland, 13 sites were counted in November. No counts were undertaken there during the December count weekend and the November total count (1,086 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, 900 birds (the number counted there in January 2014) 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. 16,600 birds, see Discussion), Caithness (c. 1,000) and Highland (c. 750). British Greylag Geese also occur throughout south Scotland and north England and where counts were thought to involve summering birds these have also been deducted (see Discussion).

Weather conditions were reported as good or reasonable for most sites in all three census periods, although on Orkney, strong winds and rain hampered counts in December and may have led to an underestimate there. At sites holding Pink-footed Geese, two were affected by disturbance in October and in November. Poor visibility affected counting at one site in November and in December. For sites holding Greylag Geese, two were affected by disturbance in October and three in November. Poor visibility affected counting at two sites in November and 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 372,074 and 279,441 Pink-footed Geese were counted in October and November, respectively (Figure 1, Table 2). These represent an increase of 5.2% and a decrease of 11.2%, respectively, compared to the unadjusted total counts in the same months in the preceding year. Coverage was good and no estimated counts needed to be added to the unadjusted total and so the peak winter total in October 2013 was used to derive a population estimate of **372,074** geese. This represents an increase of 3.6% compared to October 2012, when a total of 359,175 individuals was estimated. In autumn 2013, 75.1% of the October count (unadjusted) was counted in November, and 73.5% in December (Table 3).

3.2.2 Greylag Goose

Totals of 117,430 and 84,246 Greylag Geese were counted in November and December, respectively (Figure 1, Table 2). The November count was 8.9% lower than that recorded in November 2012, whereas the December 2013 count was 27.4% 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 2013 was used to derive a population estimate of **88,577** Iceland Greylag Geese. This represents a decrease of 15.3% compared to the previous estimate of 104,632 geese recorded in 2012. In 2013, 75.1% of the total November count (unadjusted) was counted in December (Table 3).

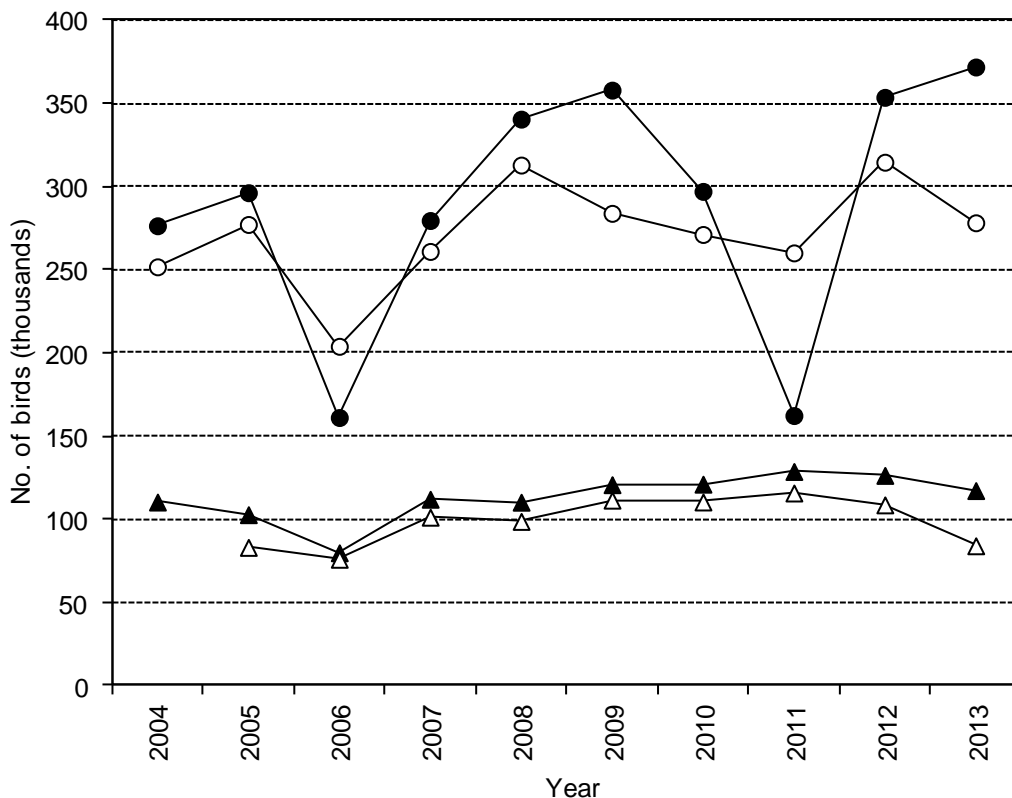


Figure 1. Peak (unadjusted) counts of Pink-footed Geese (circles) in October (filled) and November (open) and Iceland Greylag Geese (triangles) in November (filled) and December (open) counted during the Icelandic-breeding Goose Census, 2004 to 2013.

Table 2. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2013. 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 2013		November 2013		December 2013	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Iceland*	5,000 (1)	nc	nc	21,266 (1)	nc	2,024 (1)
Norway*	nc	nc	nc	nc [+900]	nc	nc [+900]
Faroe Islands*	nc	nc	nc	nc	nc	nc
Ireland	nc	nc	0 (13)	2,036 (13) [-950]	0 (13)	nc [+1,086]
Shetland*	nc	nc	nc	6,045 (1) [-5,000]	nc	nc [+1,045]
Orkney*	90 (1)	nc	684 (1)	63,665 (1) [-16,600]	608 (1)	63,483 (1) [-15,500]
Caithness	nc	nc	331 (14)	11,064 (14) [-1,000]	20 (14)	6,177 (14) [-1,000]
Highland	29,987 (15)	3,317 (17) [-750]	22,570 (15)	6,224 (19) [-750]	13,936 (15)	6,285 (17) [-750]
Moray	nc	nc	0 (1)	0 (1)	nc	nc
Aberdeenshire	56,635 (6)	513 (6)	56,502 (7)	677 (6)	45,750 (6)	418 (5)
Angus/Dundee	39,461 (2)	40 (1) [-40]	27,804 (2)	236 (1) [-236]	7,404 (1)	nc
Perth & Kinross	47,798 (9)	959 (6) [-959]	19,763 (9)	825 (9) [-825]	14,742 (12)	1,732 (12) [-825]
Stirling/Falkirk/Clackmannan	2,660 (3)	48 (3) [-48]	2,564 (3)	218 (3) [-218]	4,570 (4)	460 (3) [-218]
Fife	1,711 (21)	403 (21) [-403]	7,515 (22)	484 (20) [-484]	7,245 (24)	230 (22) [-230]
Argyll & Bute	nc	nc	nc	1,500 (1) [-500]	nc	1,450 (1) [-500]
Clyde	nc	nc	nc	nc	nc	nc
Ayrshire	nc	nc	nc	nc	nc	nc
Dumfries & Galloway **	3,773 (5)	0 (4)	8,930 (6)	120 (4) [-120]	3,580 (5)	2 (4) [-2]
Cumbria **	12,250 (5)	0 (3)	5,192 (5)	0 (4)	12,730 (4)	385 (5)

Region/Area	October 2013		November 2013		December 2013	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
						[-385]
Lothians	15,244 (22)	1,422 (22)	9,060 (20)	755 (20)	4,033 (14)	1,012 (14)
		[-1,422]		[-755]		[-755]
Borders	41,640 (13)	0 (9)	17,907 (15)	958 (16)	2,750 (15)	479 (10)
				[-958]		[-479]
Northumberland	6,943 (12)	713 (10)	2,326 (15)	1,359 (15)	2,756 (15)	109 (4)
		[-713]		[-1,359]		[-109]
Lancashire & Merseyside	82,328 (7)	nc	45,659 (7)	nc	41,083 (7)	nc
N Wales/Dee Estuary	70 (1)	nc	800 (1)	nc	3,000 (1)	nc
Humberside	10,580 (2)	nc	3,910 (2)	nc	nc	nc
Lincolnshire	nc	nc	nc	nc	nc	nc
Norfolk	15,904 (7)		47,924 (7)	nc	109,109 (6)	nc
<i>Raw total counts</i>	372,074	7,415	279,441	117,432	273,316	84,246
<i>Adjustment for non-Icelandic birds</i>	na	-4,335	na	-29,755	na	-20,753
<i>Estimated counts</i>	na		na	+900	na	+3,031
Population Estimate	372,074			88,577		

* 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

A mass arrival of Pink-footed Geese into Britain occurred just before the November 2013 count weekend (see Discussion). A quarter of the population had arrived in East Central Scotland, just over a fifth in Southwest Lancashire and just under a fifth in Southeast Scotland/Northeast England by the middle of the month. By November, the proportion found in all areas had declined somewhat as the geese moved to Norfolk. By December, over a quarter of the population could be found in Norfolk.

3.3.2 Greylag Goose

Although a very low proportion of the Iceland population was recorded in Britain during October, partly reflecting the emphasis on November and December counts for this population and the consequent lack of counts submitted for October, nearly 3% of the population was thought to be around the Moray Firth at this time and may have indicated an early departure for some birds from Iceland (see Discussion). It is doubtful now that any Greylag Geese encountered south-east of the Moray Firth in October are Icelandic (see Discussion). During November, a quarter of the population was still in Iceland and three quarters were present in North Scotland, principally in Orkney (Table 3, Figure 3). By December, most of the population was in Orkney, although over 2,000 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 2013, expressed as a percentage of the maximum count for each species. Estimated counts not included.

	Pink-footed Goose			Greylag Goose		
	Oct	Nov	Dec	Oct	Nov	Dec
Iceland	1.3	0	0	nc	24.3	2.3
Ireland	0	0	0	nc	1.2	nc
North Scotland	8.1	6.3	3.9	2.9	72.6	66.9
Northeast Scotland	15.2	15.2	12.3	0.6	0.8	0.5
East Central Scotland	24.6	15.5	9.1	0	0	1.3
Southwest Scotland/ Northwest England	4.3	3.8	4.4	0	1.1	1.1
Southeast Scotland/ Northeast England	17.2	7.9	2.6	0	0	0.3
West England	22.1	12.5	11.8	0	0	0
East England	7.1	13.9	29.3	0	0	0
Total	100	75.1	73.9	3.5	100	72.4



Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a) and November (b) 2013. Estimated counts are not shown.

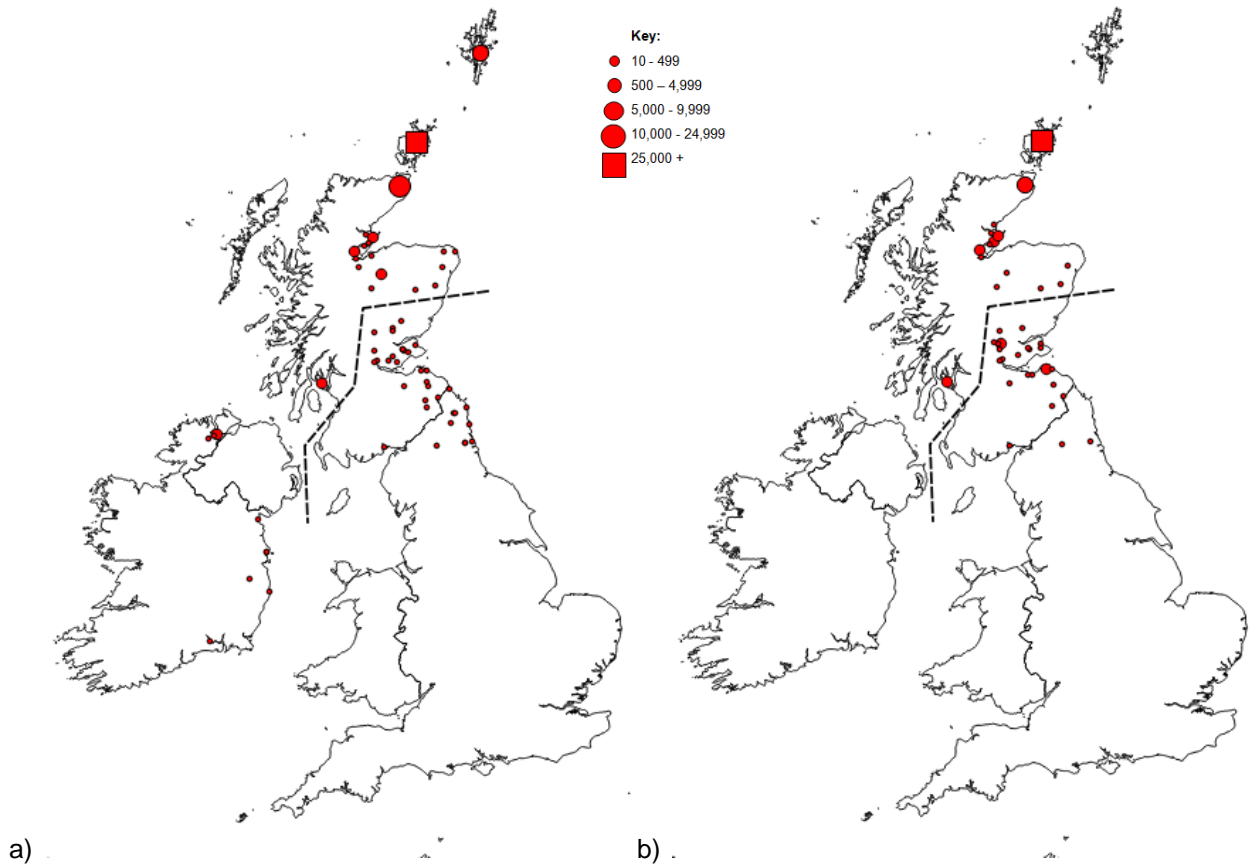


Figure 3. Distribution of Greylag Geese in Britain and Ireland in November (a) and December (b) 2013. Estimated counts are not shown. Where the status is unknown, the mapped counts do not differentiate between Icelandic and British birds. It is unlikely that any Iceland birds are present south and east of the dotted line in November and December (see also Table 2).

3.4 Principal concentrations

3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 70 sites in October, 72 in November and 55 in December (Table 1). The number of sites holding more than 1% of the 2013 population estimate (3,720 birds) was 25 in October, 26 in November, and 18 in December. Twelve sites held over 10,000 birds in October, eight in November and only five in December. Combined counts from the 25 sites exceeding 1% of the population estimate accounted for 88.8% of the total October count and numbers at the top five sites alone held 36.6% of the population estimate (Table 4). The most recent peak IGC counts from the two sites holding the two highest counts in 2013 (Montrose Basin, Angus and Martin Mere, SW Lancashire) are shown in Figure 4.

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 at the roosts in the area (Table 5). Counts from autumn 2013 onwards, therefore, will be reported at the individual site level. However, in order to maintain continuity, the total count for Southwest Lancashire will also continue to be reported. In autumn 2013, the consolidated counts for Southwest Lancashire were 82,328 (October), 45,659 (November) and 41,083 (December).

In October, high numbers were recorded at Montrose Basin, Angus, which held 8.8% of the population estimate, WWT Martin Mere, SW Lancashire, (7.9%), West Water Reservoir, Borders (7.6%), Loch Leven, Perth & Kinross (6.3%) and Loch of Strathbeg, Aberdeenshire (5.6%). The highest count recorded for the IGC was 46,796 Pink-footed Geese on 8 October 2013 at Montrose Basin, a week 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 beginning of October, unlike in autumn 2011 when many sites held peak numbers after the October census that year.

Higher than recent (2008 to 2012) average numbers in October 2013 were recorded at: Beaully Firth (Highland), Cromarty Firth: Nigg Bay (Highland), Dupplin Lochs (Perth & Kinross), Eden Estuary (Fife), Gladhouse Reservoir (Lothians), Harperrig Reservoir (Lothians), Holburn Moss (Northumberland), Hule Moss (Borders), Loch Leven (Perth & Kinross), Loch of Lintrathen (Angus), Loch of Skene (Aberdeenshire), Loch Tullybelton (Perth & Kinross), Meikle Loch (Aberdeenshire), Read's Island Flats (Yorkshire), Solway Firth, South West Lancashire and Whitton Sands (Yorkshire). Lower than recent average numbers (2008 to 2012) were recorded in October 2013 at: Aberlady Bay (Lothians), Berney Marshes (Norfolk), Cromarty Firth: Udale Bay (Highland), Inner Cromarty Firth: Dingwall Bay (Highland), Lake of Menteith (Stirling), Lindisfarne (Northumberland), Loch Mullion (Perth & Kinross), Burnham Norton (Norfolk), Scolt Head (Norfolk), Snettisham (Norfolk) and Wells (Norfolk).

3.4.2 Greylag Goose

In October, 1,020 Greylag Geese at Loch Eye and 671 birds on the Inner Cromarty Firth hinted at an early arrival for some birds from Iceland (see Discussion). By November, Greylag Geese were counted at 65 sites (Table 1), only eight of which held numbers exceeding 1% of the population estimate (886 birds) (this considers Orkney, Iceland, Caithness, Shetland, Ireland and Bute as single consolidated sites). Excluding an estimated 16,600 summering birds, Orkney held 53.1% of the total population estimate. The total unadjusted count of 63,665 Greylag Geese in Orkney in November was 15% lower than that counted in the same month in 2012 – a figure similar to the reduction in the flyway population estimate. Greylag Geese were recorded at 50 sites in December, with seven sites exceeding 1% of the population estimate.

Higher than recent average numbers (2008 to 2012) were recorded in November 2013 at: Cromarty Firth: Udale Bay (Highland), Dornoch Firth (Highland), Loch Eye (Highland), Loch Freuchie (Perth & Kinross), Lochs Davan & Kinord (Aberdeenshire) and Orkney. Lower than recent

average numbers (2008 to 2012) were recorded in November 2013 at: Aberlady Bay (Lothians), Beaully Firth (Highland), Bemersyde Moss (Borders), Cromarty Firth: Nigg Bay (Highland), Loch Fleet (Highland), Loch Garten/Lower Strathspey (Highland), Loch Insh/Insh Marshes (Highland), Loch of Skene (Aberdeenshire) and Loch Ussie (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.

Table 4. Sites that supported >1% of the (a) Pink-footed Goose (>3,720) and (b) Iceland Greylag Goose (>886) population estimates in October and November 2013, 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 2008–2012 ¹
Montrose Basin, Angus	32,891	8.8	41,221
Martin Mere, SW Lancashire	29,400	7.9	8,830
West Water Reservoir, Borders	28,200	7.6	23,624
Loch Leven, Perth & Kinross	23,270	6.3	13,035
Loch of Strathbeg, Aberdeenshire	22,265	6.0	25,957
Carsebreck & Rhynd Lochs, Perth & Kinross	18,200	4.9	16,810
Morecambe Bay, SW Lancashire	18,140	4.9	19,213
Alt Estuary, SW Lancashire	18,051	4.9	12,982
Beaully Firth, Highland	16,700	4.5	4,197
Solway Firth	16,023	4.3	17,577
Meikle Loch, Aberdeenshire	15,400	4.1	11,738
Holkham (field counts), Norfolk	10,150	2.7	13,509
Loch of Skene, Aberdeenshire	10,000	2.7	13,353
Hule Moss, Borders	9,570	2.6	5,551
Ribble Estuary, SW Lancashire	9,287	2.5	14,849
Middlemuir, Aberdeenshire	8,900	2.4	10,900
Cromarty Firth: Nigg Bay, Highland	8,300	2.2	2,968
Read's Island Flats, Yorkshire	7,800	2.1	4,169
Loch of Lintrathen, Angus	6,570	1.8	6,821
Aberlady Bay, Lothians	5,439	1.5	15,691
Horse Mere, Norfolk	5,340	1.4	6,291
Iceland	5,000	1.3	- ²
Wyre Estuary, SW Lancashire	4,450	1.2	5,085
Fala Flow, Lothians	4,050	1.1	4,842
Holburn Moss, Northumberland	3,800	1.0	229

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

² Counts too infrequent

b) Greylag Goose

Site	November count ¹	Percentage of population estimate	Five year peak mean 2008–2012 ²
Orkney Islands (all sites)	63,665	71.9	75,210
Iceland (lowlands)	21,266	24.0	23,309
Caithness	11,064	12.5	10,701
Shetland	6,045	6.8	- ³
Loch Eye, Highland	2,526	2.9	1,632
Ireland (all sites)	2,036	2.3	2,580
Inner Cromarty Firth, Highland	1,645	1.9	- ³
Bute	1,500	1.7	1,542

¹ Unadjusted counts (see text and Table 2)

² Mean derived from any IGC count (*i.e.* from any month, October, November or December)

³ Counts too infrequent

Table 5. Counts of Pink-footed Geese at roost sites in Southwest Lancashire in October 2013.

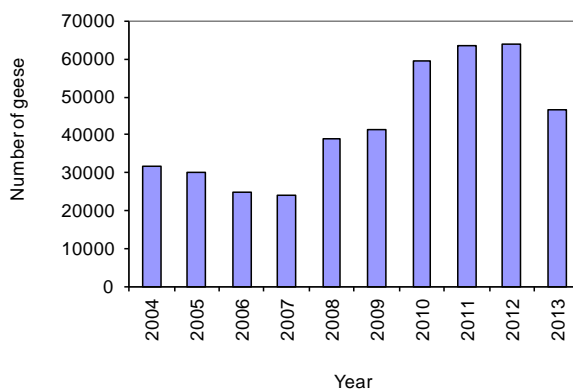
Count site	SPA	October 2013
Martin Mere	Martin Mere SPA	29,400
Morecambe Bay	Morecambe Bay SPA	18,140
Alt Estuary	Ribble/Alt Estuaries SPA	18,051
Ribble Estuary	Ribble/Alt Estuaries SPA	9,287
Wyre Estuary	Morecambe Bay SPA	4,450
Simonswood Peat Moss		3,000
Total		82,328

For the purposes of this report, Orkney is treated as a consolidated site, although Table 6 shows the individual totals for the islands. Twelve of the count areas in Orkney held numbers exceeding 1% of the population estimate in November (886 birds), although these individual counts are not adjusted for the presence of British Greylag Geese breeding in Orkney (thought to number c. 16,600 birds, but see Discussion). As in 2009 to 2012, East Mainland and West Mainland held more than 10,000 birds.

Table 6. Greylag Goose counts at individual sites in Orkney in November and December 2013 (counts have not been adjusted to take into account the number of British Greylag Geese in Orkney). Five year peak mean derived from counts from 2008 to 2012.

Site	November count	% of population estimate	December count	Five-year peak mean
West Mainland	26,527	29.9	24,605	29,422
East Mainland	10,095	11.4	11,285	14,601
Stronsay	5,354	6.0	4,559	5,065
Shapinsay	4,224	4.8	4,567	3,660
South Ronaldsay	4,984	5.6	7,376	3,660
Sanday	4,020	4.5	2,610	3,437
Eday	1,240	1.4	925	1,472
Papa Westray	1,382	1.6	973	1,175
Rousay	1,044	1.2	654	920
Egilsay	472	0.5	360	501
Westray	1,640	1.9	2,192	683
North Ronaldsay	892	1.0	1,089	572
Hoy and Walls	1,158	1.3	631	221
Wyre	211	0.2	75	283
Burray	67	0.1	1,467	314
Flotta	355	0.4	115	160
Graemsay	0	0	0	70
Total	63,655		63,483	

a) Montrose Basin, Angus



b) Martin Mere, SW Lancashire

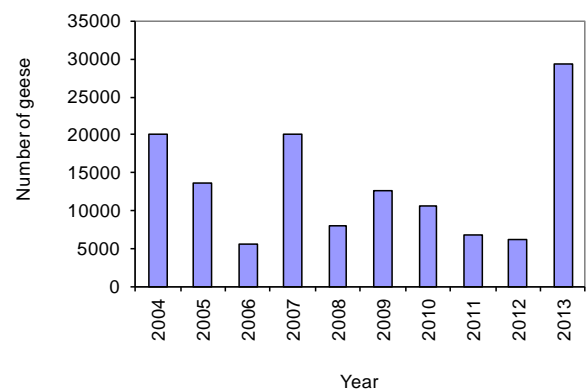


Figure 4. Peak IGC counts of Pink-footed Geese at a) Montrose Basin, Angus and b) Martin Mere, SW Lancashire, 2004 to 2013.

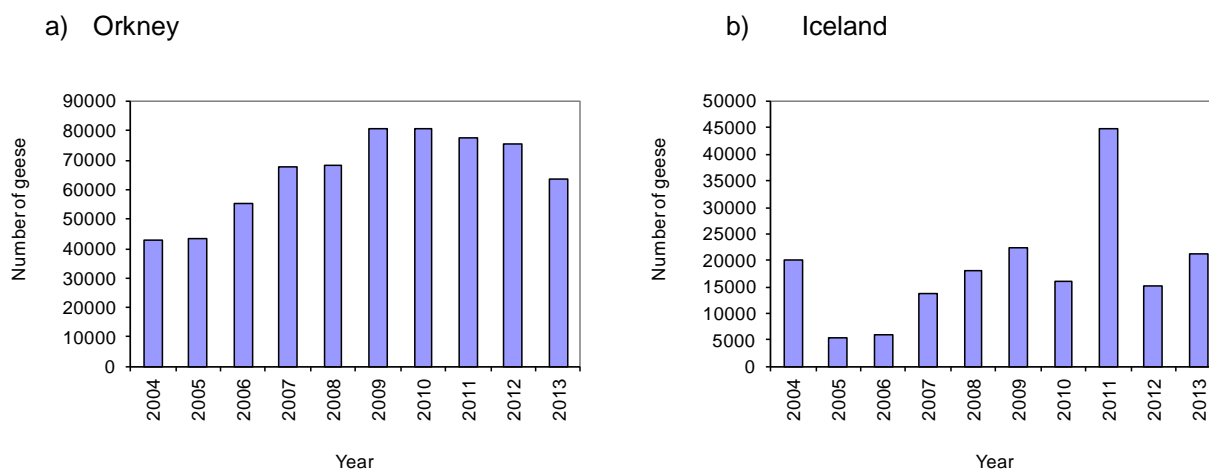


Figure 5. Peak IGC counts of Iceland Greylag Geese at a) Orkney (includes British birds) and b) Iceland, 2004 to 2013.

3.5 Breeding success

Totals of 7,050 Pink-footed Geese (from 22 flocks) and 2,588 Greylag Geese (31 flocks) were aged at various localities primarily in Scotland between 13 September and 9 November. The percentage of birds aged in relation to the estimated size of the population in 2013 was 1.9% for Pink-footed Geese and 2.9% for Greylag Geese. Information on the brood sizes of 121 families of Pink-footed Goose and 43 families of Greylag Goose was also collected during this period.

The breeding success of Pink-footed Goose was slightly lower than the mean for the previous decade at 17.1% young (mean proportion of young 2003–2012: 18.6%, \pm 1.22 SE). The mean brood size of successful pairs was 2.16 goslings, slightly higher than the mean recorded during the preceding ten years (2.08, \pm 0.07 SE) (Table 7, Figure 6).

Age counts were taken in several regions, but at different times during the autumn. This leads to differences in the percentage young and mean brood sizes recorded both spatially and temporally (Table 7). Successful families tend to arrive early on the winter quarters, with non-breeders and unsuccessful pairs arriving later (see Patterson & Hearn 2006) leading to a higher proportion of young recorded earlier in the autumn. For example, 32.5% young was recorded in early September in NE Scotland, compared to 8.2% young recorded in late October in EC Scotland (Table 7, and summarised in Figure 7). Traditionally, all age counts have been collated and an overall figure calculated, but the results from autumn 2013 suggest that there is wide variation in age assessments both geographically and temporally and collating all the figures masks these differences (see table 7 for breakdown). The sample size was low during autumn 2013 compared to previous years and this may have affected the overall estimate.

The breeding success of Iceland Greylag Geese was similar to the mean for the previous decade, with flocks containing 22.2% young (mean 2003–2012: 22.4%, \pm 0.79 SE). The mean brood size of 2.23 goslings per successful pair was also similar to that of the recent ten year mean (2.33, \pm 0.09 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.

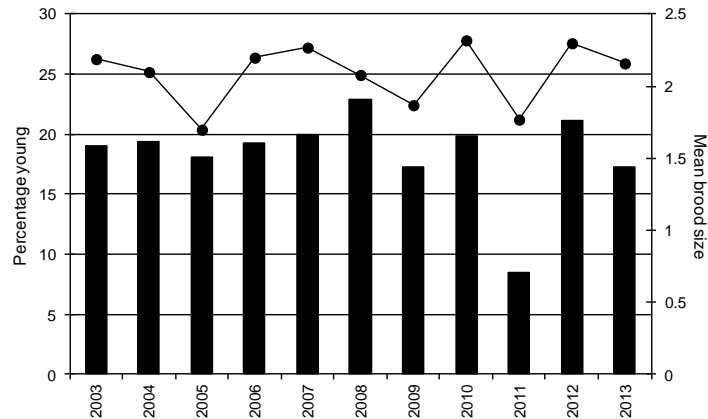
Table 7. The percentage of young and mean brood size of Pink-footed and Greylag Geese in 2013.

	Region	Time period	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose ¹	NE Scotland	Early Sept	1,000	32.5	35	2.26
		Early Oct	1,500	24.1	37	2.11
		Late Oct	300	20.0	1	2.0
	EC Scotland	Late Oct	1,602	8.2	16	1.63
		Early Nov	2,027	11.3	29	2.45
	W England	Late Oct	621	16.6	3	1.67
Total			7,050	17.3	121	2.16
Greylag Goose ²	N Scotland	Early Nov	2,588	22.2	43	2.23
	Total			2,588	22.2	43

¹ Pink-footed Geese were aged between 13 September and 3 November 2013.

² Greylag Geese were aged between 6 and 9 November 2013.

a) Pink-footed Goose



b) Greylag Goose

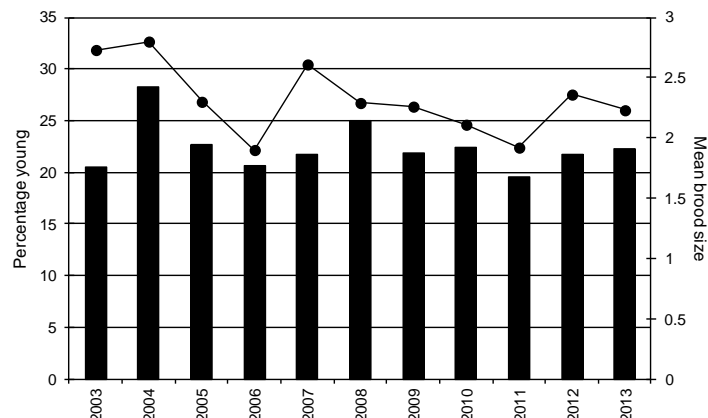


Figure 6. The percentage young (column) and mean brood size (line) found in flocks of (a) Pink-footed Goose and (b) Iceland Greylag Goose, 2003 to 2013.

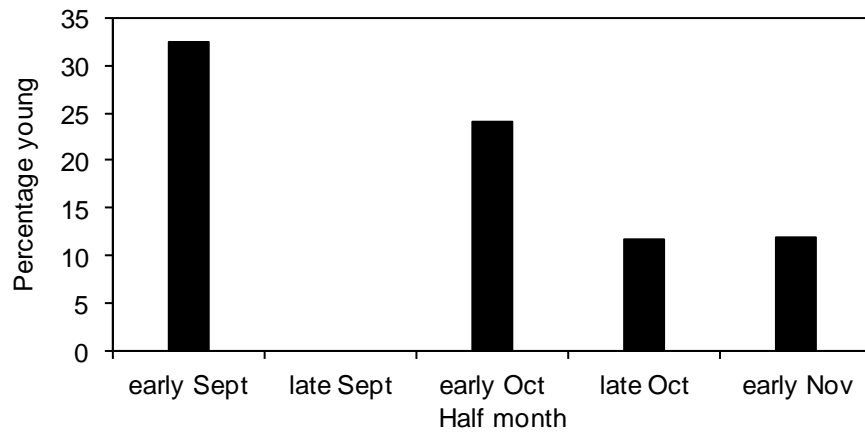


Figure 7. Mean percentage young of Pink-footed Geese during half-monthly periods of autumn 2013.

4 Discussion

The mass arrival of Pink-footed Geese in early autumn 2013 was not as pronounced as in the previous year, although large numbers were reported in early autumn from some key sites. For example, at Montrose Basin, Angus, 63,844 Pinkfeet were counted on 21 September 2012, but in 2013 the maximum September count was only 18,000 on 29 September. There were 46,769 on 8 October, but this had fallen to 32,891 by the time of the IGC count five days later. It is well established 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.

The 2013 population estimate of 372,074 was 3.6% higher than the figure for October 2012 (359,175) and the highest population estimate ever recorded. Breeding success in 2013 was about average and appears to be easily compensating for annual mortality. Both the 2012 and 2013 population estimates confirm that the counts of autumn 2011, and probably in 2010, underestimated the total number of geese in the population in those years.

Despite the year on year variation in counts, the long term trend is one of continued increase (Figure 8), although if the undercounts in 2010 and 2011 are not considered, the population has been between c. 351,000 and c. 372,000 since 2008, and may have reached another plateau of growth. Given the unpredictability of the timing of departure from Iceland (see Mitchell 2012), it would appear prudent to maintain annual coverage of sites holding Pink-footed Geese in both October and November, and, whenever possible, choose weekend dates near the middle of the month for the census.

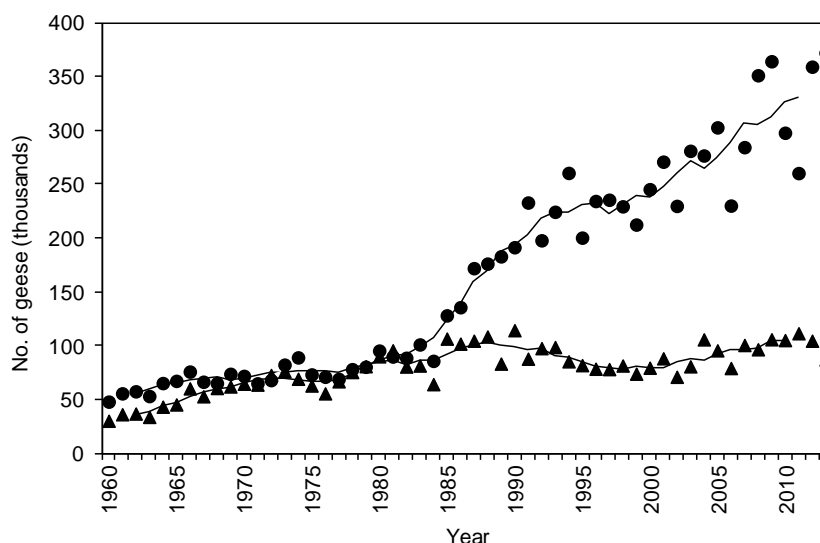


Figure 8. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2013. The 5-year running means (e.g. mean for 2011 is from population estimates for 2009 to 2013) are shown as lines. Both population estimates follow revisions set out in Mitchell (2013).

The departure of Pink-footed Geese from interior Iceland was affected by heavy snow in early September which caused many geese to move south within Iceland (A. Sigfússon *in litt.*). Two Pink-footed Geese fitted with Global Positioning System (GPS) tags moved from the interior of eastern Iceland, where they had been caught earlier in the summer, to the south coast of Iceland on 15 September, they fed here for a week and one of the tagged birds was recorded departing from Iceland to cross the North Atlantic on 22 September.

Pink-footed Goose breeding success in summer 2013, at 17.1%, was slightly lower than the long term average of 18.5%. Reports from Iceland suggest reasonable weather during the spring and

summer months. The average productivity was also confirmed by the proportion of young in the Iceland bag; at 27.6%, this was considered just lower than the recent average (29.1% for the ten year period 2003 to 2012, A. Sigfússon *in litt.*). Hunting of Pink-footed Geese in Iceland appears stable, with 15,291 shot in 2012 (the year for which the most recent data are available) compared to a mean of 14,317 for the ten year period 2002 to 2011 (no data were available for 2003). Unfortunately, no comparable data exists for the number shot in the UK.

The November 2013 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 population estimate of 88,577 geese is 15.3% lower than in 2012. This is the second year in a row that the population estimate has decreased by more than 10%. Whilst the cause of this year on year decline is unknown, the Greylag Goose remains a favoured quarry species in Iceland, and in the past five years the average number shot there has increased from c.35,000 per annum to c.47,000 per annum, including 59,432 birds shot in 2009. Furthermore, as more Greylag Geese are shot in Orkney to reduce the British Greylag Goose population on the archipelago, it is highly likely that more Iceland migrants are being shot there too.

Early snow in Iceland in September may have prompted a few thousand Greylag Geese to depart early, as witnessed by an early count of 1,020 birds at Loch Eye (Highland), a traditional arrival point for migrants. Later, counters reported large numbers of Greylag Geese leaving Iceland at the time of the November census. The census is coordinated, such that all counters are encouraged to check their sites on the same weekend. However, we know from the GPS tracking of Pink-footed Geese that if the geese meet inclement weather *en route*, they can sit out the poor weather on the sea. It would be unfortunate if some Iceland Greylag Geese were neither counted in Iceland nor in north Scotland, although this remains a possibility.

In Orkney, the November count was carried out in reasonable conditions, but the December count was affected by rain and wind. It is therefore possible that this led to an undercount of geese on the islands at that time. In most years, the December count on Orkney is higher than the November count, as many of the birds counted in Iceland (21,266 in November 2013) arrive on the archipelago. However, the December 2013 count was very similar to the November count there and this may have been due to the poor weather. Orkney continues to hold the bulk of the population in winter. After deducting the number of Greylag Geese thought to be from the British population on the archipelago, based on a summer survey carried out in August 2013 (Brides *et al.* 2013), and taking account of those shot under a pilot management programme, an estimated 47,065 Iceland birds were thought to be present in November, 18.4% lower than during the same month in the previous year.

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 it is highly likely that these birds are largely sedentary. The count from November 2013 of 6,045 Greylag Geese was incomplete and local counters estimate the wintering population to be nearer c. 10,500 birds. A rolling programme of summer surveys will help determine the number of both populations.

Assessing the abundance of Iceland Greylag Geese is becoming increasingly difficult. Increasing numbers of British Greylag Geese in core wintering areas for the migrants, such as Shetland, Orkney, the Moray Firth, Bute and other parts of Scotland and Ireland means that extra surveillance is needed to assess the abundance of summering birds before subtracting these figures from winter counts. An attempt to enhance surveillance of Iceland Greylag Geese has been made through a review of current

monitoring. The outcome has been to focus on a single weekend in mid-November to count the entire flyway, combined with a rolling programme of summer counts to try to better estimate the abundance of British Greylag Geese in areas where the two populations over-winter.

Breeding success in the Iceland Greylag Goose population appeared to be average in 2013 (22.2%), 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. The percentage of young in the Iceland bag was 55.6%, the highest ever recorded (A. Sigfússon *in litt.*).

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